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REPORT

ON

FLOUR-MILLING PROCESSES.

BY

KNIGHT NEFTEL, C. E.,
SPECIAL AGENT.

NOTE.

The present report is the result of one of a considerable number of investigations undertaken by Professor Trowbridge and his assistants, as special agents of the Census Office, respecting Power and Machinery used in Manufactures. Other reports from this department of the census work will be found in the Volume on Manufactures, viz, those of Mr. C. H. Fitch on Interchangeable Mechanism and on Hardware, and that of Mr. H. Hollerith on the Statistics of Steam- and Water-Power. The remaining reports from this source will be embraced in a separate volume. Every branch of these investigations has been pursued under the direction and supervision of Professor Trowbridge, and according to plans prepared by him and approved by the Superintendent of Census.

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LETTER OF TRANSMITTAL.

NEW YORK, N. Y., *January* 1, 1883.

Professor W. P. TROWBRIDGE,

Special Agent in charge Statistics of Power and Machinery.

SIR: I have the honor to transmit herewith a report on the flour-milling processes of the United States in 1880.

Owing to the recent introduction of these processes it has only been possible to sketch the outlines and to hint at the various mechanical operations. Many details are still subjects of debate, and, owing to competition, a large number of similar machines have been patented, description of which would involve features foreign to the object of this report. I have, therefore, been obliged to give but general ideas of the principle of such machines.

The descriptions and drawings of mills intended to serve as examples of the latest practice were taken from the working drawings of the architects and millwrights.

The drawings from the microscopic slides were made by Mr. A. D. Churchill, instructor in drawing in the School of Mines, New York.

Yours, very respectfully,

KNIGHT NEFTEL.

NOTE.—This report was prepared in 1880 and 1881. Since then many changes have occurred in the details of the processes, and much that was then still in its beginning is now universally accepted. The Pillsbury mill has been completed since the preparation of the report.

FLOUR-MILLING PROCESSES.

INTRODUCTION.

All great and radical changes in the methods or process of any industry have followed change in demand or supply. In their ultimate development they have often influenced reciprocally the tastes and habits of the consuming classes. We have in the milling industry the latest example of this; for, great as has been the change in process during the past ten years, it was caused by the great and rapid change in the wheat market, owing to the settlement of the northwestern states and their immense production of spring rather than winter wheat. At present flours made by the new processes are the favorites in the market.

In the old historic mills of the Brandywine, whose millers were still the subjects of the British throne, before the days of Oliver Evans, the process was exceedingly simple. The wheat, cleaned by a rude machine consisting of a couple of wire cylinders or screens and an air-blast, passed through a pair of millstones running very "low", that is, close together, in order that the greatest amount of flour might be produced at one grinding. The meal or resultant product was then bolted (sifted), the superfine flour thus separated, and the tailings, consisting of bran, middlings (coarse unground portion), and adherent flour, again separated by sifting through bolting-reels, and reground. This second product varied much among millers, some producing a fine, others a dark, impure flour, containing a high percentage of bran, and used mostly for ship-stuff, etc. It seems probable that the millers of the times, especially Oliver Evans, had some notion of the high grade of flour ground from middlings, but no systematic method of procedure was employed.

Oliver Evans (Philadelphia, 1756–1819), whose inventive genius and practical ability were, as in the case of many great inventors, but feebly requited by pecuniary success, was the first to improve materially the processes of the period. His simple contrivances, which are employed to-day in almost the same form, introduced into milling the feature that has done so much for other American industries, viz, the automatic handling of the raw material and the product in various stages by the motive power of the mill. His chief inventions were the elevator, the conveyer, the drill, the descender, and the hopper-boy. Evans says:

> By means of these machines may be performed every necessary movement of the grain and meal from one part of the mill to another, through all the various operations from the time the grain is emptied from the wagoner's bag, or from the measure on board ship, until it be completely manufactured into flour, either superfine or of other qualities, and separated ready for packing into barrels, for sale or exportation. All which is performed by the force of water, without the aid of manual labor, except to set different machines in motion, etc. This lessens the labor and expense of attendance of flour mills *fully one-half*. (*a*)

The most important and useful of his machines, the elevator and the conveyer, are too well known to need detailed description; the former being an endless band, with cups attached to the outside, which, acting like scoops, raise the grain, meal, etc., and discharge the same on reaching the top.

The conveyer consisted, for grain, of two helicoidal surfaces on a revolving shaft, and, for meal, of a shaft with a series of small wooden blades set spirally and at an angle. These were called "flights". In both cases the contrivance was inclosed in a box, and moved the material by the principle of the screw or plow.

The hopper-boy, now no longer in use, consisted essentially of an arm revolving horizontally about an axis with flights or pieces of board set at an angle. This first spread the warm meal as it came from the millstones and then collected it to the center, where it fell through spouts to the bolts on the floor below. The angle of the flights could be changed and the motion of the meal thus regulated. The motion of the arm was slow, being not above 4 revolutions per minute.

The drill was an endless band with rakes or blades attached, and moving horizontally. It was designed by Evans to move the meal and other products in a horizontal direction. It is no longer in use, the conveyer having supplanted it entirely.

The descender, now also obsolete, was an arrangement for moving meal, etc., horizontally without the application of power. The meal was dropped upon an endless band set at a slight incline, and consisting of leather, canvas, flannel, or some other similar pliable material. The weight of the material was relied upon to produce the

a *Young Millwright and Millers' Guide*, 13th edition, Philadelphia, page 211.

necessary motion. Evans, however, recommended the application of auxiliary power to this contrivance, as there was otherwise danger of clogging. Two small buckets carried up any matter that spilled from the band and collected on the bottom of the box.

Of the benefits derived from the use of these machines, Evans enumerates the following in his *Young Millwrights' Guide,* 13th edition, pages 246, 247:

A better preparation of the meal for bolting, for packing and preserving, in much less time than usual; the work of cleaning the grain, elevating and mixing various parts to be again treated, is effected in one operation; there is considerable saving in meal; there is economy of space; the work is performed more rapidly, the elevating done with less power while preventing sudden variations of speed in the stones; and, finally, there is a great saving in cost of attendance, one operative turning out twenty barrels of flour instead of ten, as by the old method, a forty-barrel mill requiring in all only two men instead of four men and a boy. The machines were durable and economical, as their motion was generally slow.

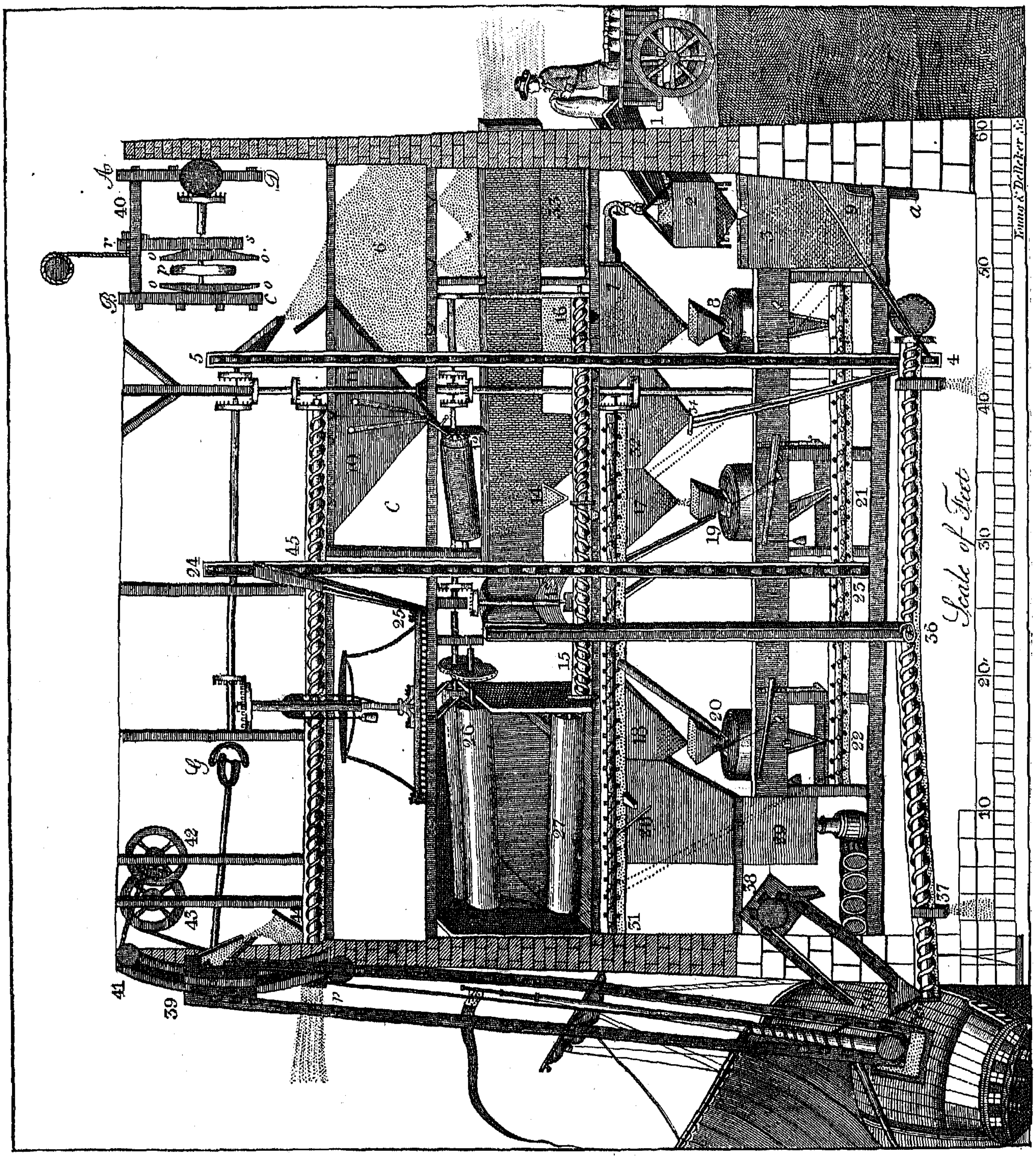


Fig. 1.

From these improvements, as stated before, dates the long period of so-called "American" milling, which produced flour as economically and of as good a grade as that of foreign millers.

As there was but little progress from the days of Evans until the introduction of the new process, about 1870, a description of the combination of his machines in a mill is here given. The cut (Fig. 1) is taken from Oliver Evans' *Young Millwrights' Guide* (Plate VIII, 13th edition), and was not given by him as a plan of a mill, but simply to show the combination and the duties of the machines.

The grain taken from the wagon 1 is spouted to the hopper-scale 2, weighed and dropped into the garner 3, whence it runs to the elevator 4 5. Having reached the top floor, it is spouted into the large storage bin 6, whence it descends by gravity to the stones 8. These break up the smut-balls and clean the grain of adherent impurities. It then returns to the bin 3, where a blast of air removes the dust, which passes out through the aperture *a*, and allows the chaff to settle. The wheat is then returned to the elevator 4 5, the crane or movable spout 5 being turned over the hoppers 10 or 11, and allowed to pass through the cleaner 12. The good wheat then falls through 14 to the hoppers 7, 17, and 18, and thence to the stones 8, 19, and 20. The ground meal from these is collected by the conveyer 21 22, and fed into the elevator 23 24, which raises it and delivers it to the hopper-boy or cooler, 25. This spreads it over a considerable surface, thus allowing it to cool, and then collects it and feeds it through the central spouts to the bolting-chest 26 27. The superfine flour is dropped in the bins 28 or 29, according to the floor on which it is to be packed in barrels.

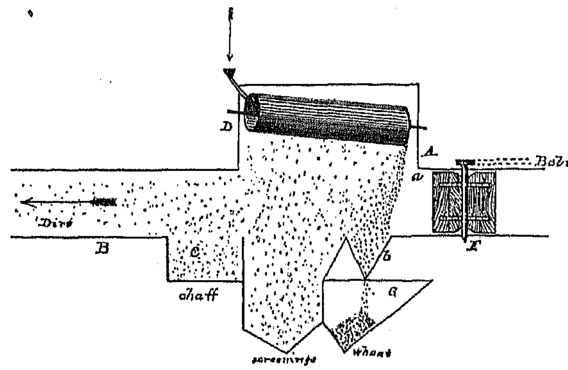


FIG. 2.

The bran, tailings, etc., are rebolted, being either returned to the conveyer 22 21, and mixed with the meal, or, by an auxiliary conveyer 31 32, are brought over the garners 18 and 17, and reground with the wheat.

The middlings or coarse-bolted meal are brought by the conveyer 31 32 to the wheat garners 17 and 18, and are reground with the wheat; 33 is a chaff-room to collect the material blown from the grain by the fan 13, the dust passing out of the mill; 32 is a garner for the screenings from 12.

These screenings can be cleaned any number of times by returning them to the elevator 4 5, spouting them into 11, 12, and 14, by means of the spout indicated by dotted lines, back to the elevator 4 5, and to the bin 10, where the process may be repeated any number of times. They are then ready for regrinding.

The second screenings being similarly purified, the last remainder may be used for cattle-feed.

The remaining parts of the figure and the design 40 refer to Evans' system of unloading ships. To use his words, "this completes the whole process from the wagon to the wagon again, without manual labor, except in packing the flour and rolling it in."

Of the component parts of the mill there remain to be described the grain-cleaning machines and the millstones. The grain-cleaner shown in Fig. 2 consists of two wire cylindrical screens, A D; the inner one, being coarser, allows all to pass but the impurities larger than a wheat-berry, while the outer one, being finer, retains the wheat and allows smaller impurities to fall into the bin. The heavy grain is discharged at *a* and falls into garner G through the current of air F B, produced by the fan F, at least 3 feet in depth.

The chaff is collected at *c* and the dust is blown out of the mill at B. This contrivance is all that was used for the cleaning of the wheat, excepting in some instances the employment of a run of stones for breaking up adherent particles of dirt.

The millstone, the chief machine of the mill, received, as may be expected, much of Evans' attention, though being at that time usually made of granite instead of the hard French burr now commonly used.

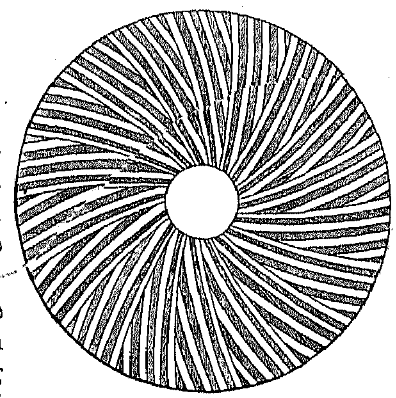


FIG. 3.

The proper "dress", that is, the furrowing of the grinding surface of the stones, was a matter which he studied, and, comparing different styles of those in use, he recommended the one shown in Fig. 3. The figure is constructed according to his directions, and shows the curved furrows in the lower or bed stone, and their relative arrangement.

It was designed to produce the greatest possible amount of superfine flour by one grinding; in other words, to secure the complete reduction of the wheat-berry, at the same time avoiding any comminution of the bran, and cleaning it from all adherent particles of floury matter. The thoroughness with which these operations are performed depends on the sharpness of the stones and the condition of the "land", or surface between the furrows, amount of wheat fed, the distance between the stones, the speed, etc. Evans, therefore, called the attention of millers to the necessity of giving great care to the condition of the stones, of watching them carefully and constantly, "cracking" or roughening the land appropriately to the porosity, and considering them accurate machines, to be adjusted with the greatest nicety.

Besides the improvements mentioned above, the bolting, or separating of the meal into flour, middlings, and bran, was also modified to meet newer views, the principal innovations being the use of finer cloths, excepting on reels of 22 inches diameter or less, on which they choked; keeping the cloth free by allowing the material to fall a greater distance, which was effected by increasing the diameter of the bolting-reels to 27½ inches; the lengthening of the bolts to produce a more complete separation; and, finally, rebolting the flour to a greater extent than was done previously.

The motive power of these mills was entirely water, and was derived from the styles of wheels in use at that time—mostly tub, breast, and under- and over-shot wheels, the turbine not having been invented till 1823.

In a technological work describing the condition of the industries of all countries, published in Germany about 1843, a model American mill of the period is described as distributing the power from three breast-wheels by means of vertical shafts running from cellar to roof and from the shafts to the various machines by belting and gearing. The above work also enumerates the advantages of American milling, which, besides including those mentioned above, gives the old-fashioned lever-packers and the crane for removing the runner-stone as characteristic improvements of the Americans.

The efficiency of the mills of his time may be surmised from the following table, given by him as the results of his own experiments: (*a*)

Quality of grain.	Weight per bushel.	Screenings and loss in grinding.	Breadstuff, shorts, and bran.	Ship-stuff.	Tail flour and middlings.	Superfine flour.
	Pounds.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
White wheat, clean	59.50	1.72	13.10	2.50	3.68	38.50
White wheat, well cleaned	59.00	1.00	12.00	2.12	3.65	40.23
Red wheat, not well cleaned	60.00	7.57	8.52	1.61	3.60	38.70
White wheat, mixed with green garlic	61.00	3.68	9.54	2.40	5.68	39.70
White wheat, very clean	56.00	5.48	7.86	1.85	5.00	35.81
Red wheat, with some cockle and light grains	59.25	6.79	11.33	1.47	4.40	35.20

From this table we see that from 59 pounds of well-cleaned white wheat 40.23 pounds of superfine flour were produced. This is an exceptionally good result, and was probably far above the average. The yield, in other words, was 196 pounds for every 287.45 pounds of wheat, or a loss of 91.45 pounds. It is probable that the quality of the flour was considerably inferior to our present products.

From the death of Evans in 1819 until the introduction of the new process no great progress in method was made, though the separate machines were considerably improved, the grain-cleaning machines being greatly perfected, silk substituted for woolen cloth and other fabrics on the bolting-reels, and the imported French burr substituted for the old-fashioned granite stone. Later, the hanging and balancing of the running-stone were improved upon, and the general increase in efficiency, due to superior workmanship and better design, assisted materially in improving the quality of the flour.

The census returns of the United States for wheat produced in Minnesota, Dakota, Wisconsin, and Iowa, in 1850, 1860, and 1870, are given in the following tables, 1870 being the first year in which a separation of the spring and winter wheat was made:

WHEAT CROPS IN 1850, 1860, AND 1870 IN THE NORTHWESTERN STATES.

	1850.	1860.	1870.	
			Spring.	Winter.
	Bushels.	*Bushels.*	*Bushels.*	*Bushels.*
Minnesota	1,401	2,186,993	18,789,188	76,885
Dakota		945	170,460	202
Iowa	1,530,581	8,449,403	28,708,312	727,380
Wisconsin	4,286,131	15,657,458	24,375,435	1,230,909

The total crops for these states being for 1850: 5,818,113 bushels; for 1860: 26,294,799 bushels; and for 1870: 74,078,771 bushels, of which latter 2,035,376 bushels were winter and 72,043,395 bushels spring wheat.

These figures show very forcibly the main cause of the rapid extension of the new process, viz, the immense increase of hard spring wheat in the market from the northwest, and the consequent milling possibilities of that section.

This spring wheat, when ground between stones running close together, produced a dark flour, and when reduced to a degree of fineness which permitted it to pass through the finest bolting-cloths, the flour was specky. It became evident that in order to produce a first-class flour some new method must be employed, and Edmund N.

a *Young Millwright and Miller's Guide*, 13th edition, page 275.

Lacroix, experimenting in the mill of Mr. G. H. Christian, near Minneapolis, invented in 1870 a "middlings-purifier", or machine for separating the dust, fluffy material, particles of bran, flour, etc., from the middlings. The principle of this machine had long been known and applied in Europe.

The middlings thus purified were reground to superfine flour, which brought more per barrel than the best flour then in the market. This led to the further development of the new process, viz, grinding the grain very coarsely, making as little flour as possible at the first grinding, producing as large an amount of middlings as possible, purifying these, and then regrinding them to superfine flour.

From the new process some millers went a step further, and adopted the Hungarian gradual-reduction system, an extension of the principles of the new process, with all its intricate mechanical details, and, it cannot be denied, with great success.

Such is a brief outline of the history of the milling art in this country.

PRESENT PROCESSES.

Before entering into a description of the processes now in use in this country, a few words should be said of wheat as a raw material, and the objects of milling.

The wheat-berry has often been described, and magnified diagrams of it have been published, but probably no enlargement is more detailed or plainer than that of M. H. Mège-Mouriès, published in a report by him to the Imperial and Central Society of Agriculture of France in 1860, and lately reprinted in the *Scientific American* supplement, April 9, 1881, No. 275. (See Fig. 4, page 6, which represents a longitudinal section through the crease.)

The wheat-berry differs much in its varieties as to composition in gluten, starch, nitrogenous matter, etc., but the anatomy of the berry is alike in all cases. Consisting of two lobes separated by a crease, it is oval in section. At the pointed end there is a light beard of fluffy material, which, with the dirt collected in the crease, necessitates the use of peculiarly ingenious machinery for its removal. It consists essentially of four parts:

No. 1 represents a superficial side of the crease.

No. 2 indicates the *epidermis* or cuticle. This covering is extremely light, 100 pounds of wheat containing about ½ pound of it.

No. 3 indicates the *epicarp*. This envelop is distinguished by a double row of long and pointed vessels; it is, like the first one, very light and without action; 100 pounds of wheat contain about 1 pound of it.

No. 4 represents the *endocarp*, or last tegument of the berry; the *sarcocarp*, which should be found between the numbers 2 and 3, no longer exists, having been absorbed. The endocarp is remarkable by its row of round and regular cells, which appear in the cut like a continuous string of beads; 100 pounds of wheat contain about 1½ pounds of it.

These three envelops are colorless, light, and spongy; their elementary composition is that of straw; they are easily removed besides with the aid of damp and friction. This property has given rise to an operation called decortication, the results of which we shall examine later on from an industrial point of view. The whole of these three envelops of the berry amounts to about 3 pounds in 100 pounds of wheat.

No. 5 indicates the *testa* or *episperm*. This tegument of the berry is closer than the preceding ones; it contains in the very small cells two coloring matters, the one of a palish yellow, the other of an orange yellow, and in proportion as the one or the other predominates, the wheat is of a more or less intense yellow color; hence come all the varieties known in commerce as white, reddish, or red wheats. Under this tegument is found a very thin, colorless membrane, which, with the testa or episperm, forms about 2 per cent. of the weight of the wheat.

No. 6 indicates the *embryous membrane*, which is only an expansion of the germ or embryo, No. 8. This membrane is here represented with imaginary spaces in white on both sides, to render more visible its form and insertions.

No. 7. The *endosperm*, or floury portion. This is composed of large cells, in which the granules of starch are found. The center is the softest part, and contains relatively the least gluten and the most starch; it is the part which pulverizes easiest under the stone, and gives, after the first bolting, the fine flour. As this flour is poorest in gluten, it makes a dough with little consistency, and is incapable of making a light, well-raised bread. The layer which surrounds the center produces small white middlings, harder and richer in gluten than the center; it bakes very well, and weighs 20 pounds in 100, and it is these 20 parts in 100 which, when mixed with the 50 parts in the center, form the finest quality of flour for making white bread.

The layer which surrounds the preceding one is still harder and richer in gluten; unfortunately, in the reduction it becomes mixed with a small proportion of the bran, which renders it unsuitable for making bread of the finest (whitest) quality; it produces in the regrinding lower grade and dark flours, together weighing 7 per cent. This layer, naturally adhering to the membrane No. 6, becomes mixed in the grinding with the bran, to the extent of about 20 per cent., which renders it unsuitable for making bread; it serves to form the regrindings and the offals destined for the nourishment of animals. This layer is, however, the hardest, and contains the largest quantity of gluten, and it is by consequence the m[illegible]tritive. We now see the endosperm increasing from the center, formed of floury layers, which augment in [illegible]s in gluten in proportion as they are removed from the center. Now, as the flours make more bread in proportion to the quantity of gluten they contain, it is the aim, in all the improved processes, to retain as much of the gluten in the flour as is possible, without, also, retaining any adhering bran, which injures the color of the bread even more than it does the flour.

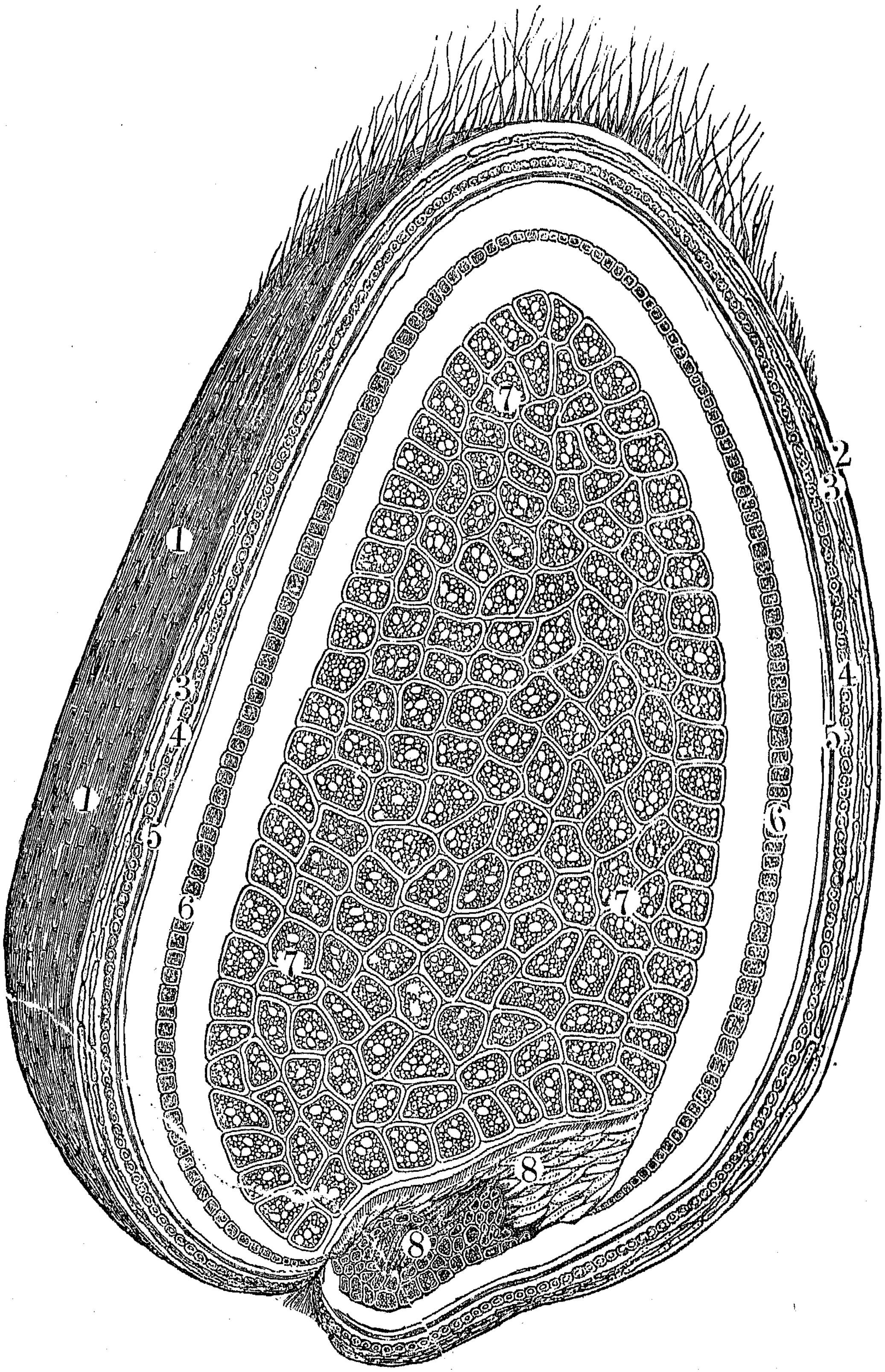


FIG. 4.

No. 8 is the *embryo* or germ, and is situated at the base of the berry opposite the crease, and is immediately surrounded by a quantity of fatty cells. Concerning this germ a prolonged discussion has arisen, as it contains phosphorus, which, being considered necessary for the hu[illegible]ystem, should, it is believed by many scientists, be left in the flour. The opposite view of the subject has [illegible]er, gained foothold in this country, the "patent process" eliminating the germ from the flour, as being d[illegible] to its color and baking qualities.

To crush the wheat-berry to the finest possible flour, without impairing the elasticity of the flour, and to remove the bran, germ, etc., which cause the bread to bake dark, are the ends which the miller aims to attain. His process evidently must differ for different varieties of wheat, and, as indicated before, this feature has caused the great difference in present methods.

Wheat in this country varies considerably in character in different localities, and there are many varieties, there being usually a great difference between the "spring" and the "winter" grain. The former has a hard endosperm, rich in gluten, and a thin, brittle bran, which is easily broken and pulverized; while the latter is more starchy, has a tough skin, which resists grinding much more effectively than the floury portion, which crumbles easily. It is this difference in the properties of the grain that has so rapidly and so extensively brought about the introduction of the middlings-purifiers and the use of rollers. The northwestern states being the great spring-wheat producers, it is natural that the largest "new" and Hungarian process mills are located at the greatest water-power of the section, Saint Anthony's falls, at Minneapolis, and that the country in that region should be dotted with many new mills.

There are, at present, essentially three processes in operation in this country, though the details of each method vary considerably, each miller or mill-owner having his own ideas on bolting, dress, etc., and each of these processes passing by gradations into the others. These processes are commonly known as the "old process", the "new process", and the "Hungarian" or "gradual-reduction process", the latter two dating in the United States from about the year 1870.

Before describing them in their various particulars, however, it should be stated that in few industries has there been so much litigation and controversy. A great number of patents for machines with the same object in view were taken out within a short space of time; the rapid introduction of many new forms, and probably the operations of dishonest speculators, have caused many suits in the various courts of the country.

In the following descriptions, therefore, the names of manufacturers of machines and any questions of priority of invention will be omitted, as well as the question of relative efficiency of machines produced by rival manufacturers. This latter feature of rivalry is not developed more in any industry than in the manufacture of middlings-purifiers; and, in general, in all forms of milling-machines competition is extremely brisk.

THE "OLD" PROCESS.

This process, described in its earlier forms in the preceding pages, is now but rarely found in new mills, the "new" process superseding it very rapidly. Many old millers, however, still run "low", or grind the wheat in one operation. This is especially true of mills situated in winter-wheat sections and in small custom mills. The "old" process consists essentially of two parts:

a. The reduction of the wheat to flour by passing it through a run of stones.

b. The bolting of the resultant material and the separation of flour, bran, etc.

The principal object of the miller when running by this process is to produce the greatest amount of fine, live flour in passing the grain but once between the millstones. The exactness and perfection with which this is done depend on the following:

a. The dress of millstone.

b. The face or grinding surface.

c. The balancing of the upper or runner stone.

d. The speed of the runner.

The dress of the millstone is a subject of great importance, the proper shape of the furrows, their width and depth and draught, that is, deviation from the radius, influencing the perfection with which the operation is performed. The end to be attained is to cut the berry into small fragments, and then to crush these into fine powder, allowing the meal to pass outward from the center of the stones to the circumference as rapidly as it is reduced, surrounded by a considerable amount of air to prevent too great a rise of temperature.

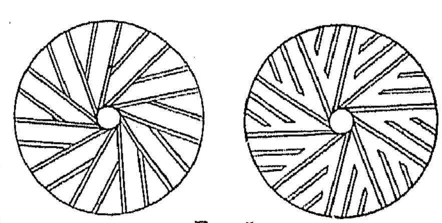


Fig. 5.

If we imagine two perfectly smooth stones revolving within, say, 2 inches of each other, and wheat fed at the center, the latter would fly out from between the circumferences of the stones in an unground condition. If, however, the stones be brought nearer together, the distance between them being less than the diameter of a berry, the wheat would be crushed near the center or eye, and would choke up the space between the stones before many revolutions of the runner. It is, therefore, evident that channels must be provided for the escape of the meal, the edges of which channels would act like shears and slice each berry into several fragments. These channels are placed on the surface of both stones, and are called "furrows". The part between the furrows, called technically the "land", serves to crush into fine powder the slices or fragments of the berry formed by the furrows. These two steps form the process of grinding between the millstones, and it remains for other machines to further treat the meal.

Without indorsing any particular dress or plan of furrows as the best, it may be stated that the dresses in Fig. 5 have proved efficient, and are given to illustrate the meaning of the word "dress". Opinions among millers vary much as to the details, but in general terms all agree that the furrows should be sharp, deep, and deepen gradually, dwindling to a feather-edge at the exterior.

The grinding surface or land is cracked or roughened. The degree to which this is to be carried depends, as well as the furrowing, on the porosity or natural roughness of the stone. As the millstones now in use are almost invariably of the French or of the Georgia burr, a porous metamorphosed sandstone, containing cavities formerly occupied by fossils, the surface is variable, and each stone is usually built up of several blocks, as in Fig. 6, to insure an even degree of porosity over the whole surface. The blocks are arranged in different ways, B showing a construction by which the joints are so placed as to coincide with the furrows.

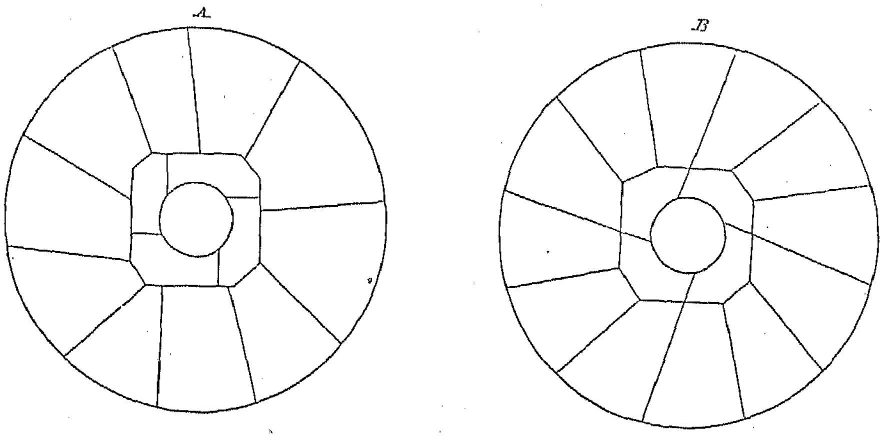


FIG. 6.

Another feature of prime importance in the case of millstones is a perfectly plane surface in both stones. It is evident, in order that the product may be uniform, that the same conditions should prevail over the whole grinding surface. If there be any variation from a perfect plane in either of the stones the meal will contain large unground fragments and the grinding will be incomplete. The necessary surface is produced by removing the higher portions with a steel pick, and frequently testing with a straight-edge, called a "paint-staff". A proof-staff, a narrow iron rectangle having a perfectly plane face, is usually kept in the mill to correct any shrinkage or variation in the paint-staff. The latter, while coated with fresh paint, is rubbed over the surface, and the higher portions are thus determined. These are worked down by small picks or other tools until every portion is reduced. Too great care cannot be given to the dressing and facing of the millstone, and this should be attended to very frequently. As may be naturally inferred, the general features of the furrowing and cracking depend on the variety and condition of the wheat to be ground, and here the experience and judgment of the miller come into play.

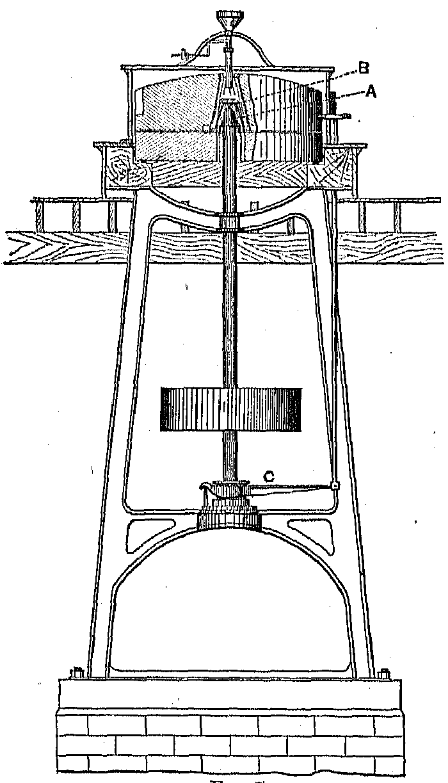


FIG. 7.

The balancing of the upper or running stone is a subject of importance, as, however true the face and efficient the furrowing may be, if the stone does not run truly horizontal the product will be uneven. It is, of course, premised that the lower or bed stone should be accurately leveled.

The usual manner of hanging the upper stone at present is shown in Fig. 7. A is the end of the spindle or vertical shaft, upon which rests the pivot B, thus allowing a free motion around A, and a single point of suspension. The mechanical details are easily seen from the figure. The lever C enables the runner-stone to be raised. Several other styles of hanging are in use but the principles involved are the same.

Like all masses when suspended on a pivot, the millstone has two conditions of equilibrium, called commonly the "standing" and the "running" balance. Each is independent of the other; that is, if a stone be in a horizontal plane when standing, it may not remain so when rotated about its axis, and, conversely, if horizontal when rotated at a certain speed, it may not be so when at rest. This mechanical truth involves the use of the contrivances shown in the upper corner of the running stone. These are simply iron pots into which shot is poured, or a weight moved vertically by a screw. By either means the plane of rotation is changed, and the surface is brought to a perfect level, so that the grinding surfaces may operate uniformly over their entire area.

The fourth and last consideration is the speed of the stones. It being the object of this process to produce as much flour as possible at one grinding, the speed of the stones is much greater than in the other processes, sometimes reaching as high as 300 revolutions per minute. This, however, is exceptional, and the average is rarely over 250, too high a speed producing a high temperature, deleterious to the meal. The speed varies according to the dress and according to the grain to be ground.

The second part of the "old" process is the bolting or the separating of the flour from the bran and coarse matter. The machine, called a bolt, by which this is effected consists of a cylindrical frame of wood, some 18 feet long and about 30 inches in diameter, covered with a silk bolting-cloth sewed to ticking, which is in turn tacked to the longitudinal pieces of the frame. The cloth, now in every case silk, is of various degrees of fineness according to the material to be bolted. Generally four bolts are inclosed in a frame, two for bolting and two for rebolting, called "return bolts". The whole arrangement, called a chest, is shown in Fig. 9, page 10. The flour thus separated is packed without further treatment This process, though essentially the same in principle as that of Oliver Evans, is considerably more efficient, owing to the following improvements introduced since his time:

a. The change from poor bolting-cloths to nicely-woven silk bolting-cloths.

b. The greater accuracy in the adjustment and running of the stones.

c. The greater efficiency in grain-cleaning.

d. Better devices for packing the flour in barrels.

e. The general improvement in all parts of the mill, due to better workmanship and design.

The use of silk bolting-cloths permits a finer and more complete bolting and increases the efficiency of the mill to a very appreciable extent. The greater accuracy of adjustment in running of the stones produces more and finer flour from the grinding, and the improved packers enable a more economical packing as respects time, labor, and flour. A description of the present grain-cleaning machines is given in the following pages. The system of "low grinding" is giving place, as previously stated, to the "medium high-grinding" or "new" process in new mills, even in soft-wheat sections.

THE "NEW" PROCESS.

The process consists of four parts, the features of purifying and regrinding middlings being added to the first grinding and bolting. As in the other processes, a complete and thorough grain-purification is necessary.

Briefly outlined, the process is as follows: The perfectly clean grain is conducted to the burrs and "granulated", not ground, as in the previous process, and the resultant "chop" is separated into its component parts—flour, middlings, and bran—by means of bolts technically called "scalping-reels". The flour thus produced is of an inferior grade. The middlings are the coarse particles of the endosperm of the berry, which give the strongest and best flour, and it is from these that the "patent" or high-grade flour is made. The bran and dirt from the crease of the berry, which will remain, however good the cleaning, are separated out; the middlings, usually by the cloth near the tail ends of the scalping-reels, are then dusted in dusting-reels and conducted to the middlings-purifiers, which remove all light fibrous matter, fuzz, etc. They are then graded and reground to flour, either on separate stones, or mixed with other wheat. The former is the more approved method.

As soon as the principle of the purification of middlings was introduced into this country, the idea was realized by a great number and variety of machines. Indeed, so many machines are now in the market, whose efficiency varies but little, and the rivalry is so great, that it will be impossible to describe the various forms of the machines or to give any illustration of a particular variety in a report of this nature. The end sought is to extract the lighter material, the dust, bran, and fuzz mixed with the middlings, and to leave the latter clean and pure.

The various contrivances may be divided into any number of classes according to their mechanical details; but a subdivision into the air-and-sieve and the electric machines will cover all cases. The former and usual form of purifiers consists essentially of a series of sieves in connection with an air-blast, the former being to separate the middlings and the tailings, and the latter to remove the lighter impurities. I have constructed the diagram, Fig. 8, as showing the essential parts of the air-and-sieve class of puriers. The impure middlings are dropped into the chest through the hopper A and fall upon the sieve *b*; from *b* they slide to *c*, and from *c* to *d*, whence they fall off and are spouted out at *e*. The fans *f* and *g* cause a draught through the sieves, and as the material passes through the air in its descent, the light matter is removed while the tailings drop beneath. These are the chief elements of a purifier, though present forms are much more complicated. In some machines the draught is produced by a suction-fan alone, in others by a blast alone, and again in some by a combination of both varieties of fans, as in Fig. 8. Some forms of the machines contain reels for dusting the middlings before purification, while in others no provision is made for this preliminary step.

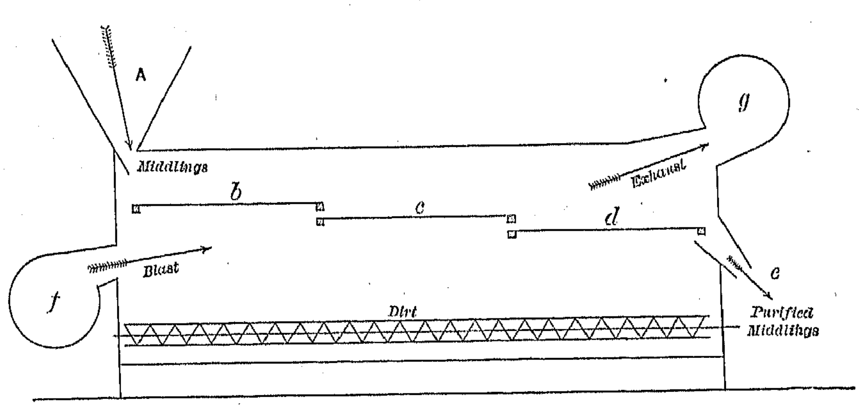


FIG. 8.

In order that the separation may be complete the sieves are agitated, and this is done in a variety of ways. The sieve-frames are given a rapid reciprocating motion by an eccentric and pitman contrivance, or light hammers strike small cloth pads on the sieve-frames, and thus give a short, sharp rap, which raises the stuff from the sieves and spreads it for the air-blast. Several other forms are used for the same object. Early in the use of purifiers a difficulty arose, which, however, was soon obviated, namely, the clogging of the sieve-cloths, owing to their flat surface and the nature of the product to be treated. At present many devices are used for preventing this, such as traveling brushes, elastic bands which strike the cloth, traveling blasts, which, it is claimed, do not wear the cloth, and rubber balls bouncing between the sieves and a wire net.

These various methods for insuring the same results explain the large number of patents issued for purifiers and the great number of machines of various makers.

As previously stated, many lawsuits have been caused by the rapid invention and introduction of various milling-machines, and there has been a prolonged legal strife, involving many millions of dollars, concerning the manufacture of middlings-purifiers.

The so-called electric purification of middlings, due to the property of attracting light material existing in electrified surfaces, has taken considerable prominence lately, and there is a question of priority of invention.

Of the two machines of this kind recently exhibited, one consists of several vulcanized-rubber bands running over pulleys, passing over the surface of the middlings, and thus removing all the lighter portion of the material; the band is excited by pads rubbing against its surface. In the other machine rubber cylinders revolve over the middlings and similarly attract the impurities. Should this apparatus be found in practice to work as well as the sieve-and-air machines, it will have some advantages, such as economy of space, obviating the somewhat cumbersome use of fans, clogging, and wear of cloth.

Besides these forms, several designs of purifiers have been introduced which do not fall in either class, but depend on gravity to cause the necessary separation.

The comminution of the wheat in the new process is granulation, not grinding; that is, the endosperm of the berry is not reduced to flour in its first passage between the millstones, but is simply crushed and liberated from its covering of bran.

The smaller the amount of flour made during this operation and the coarser the fragments (*i. e.*, middlings) of the endosperm, the greater the subsequent yield of "patent" flour. It is evident, therefore, that dress, speed, distance apart, etc., of the millstones must be very different from the corresponding features in the "old" process stones.

The present practice in the "new" process burrs is to make the furrows from 1 inch to 3 inches wide and sometimes to the number of 70 on one stone, the object being to reduce the "land" or grinding surface; some millers even advocating a perfectly smooth "land", while others believe in a certain amount of cracking.

The theoretically perfect dress and face have not yet been determined, the matter being still in active debate.

The speed of the burrs has been materially decreased, and instead of 200 or 300 revolutions per minute, the "new" process millstone revolves on the average 140 turns per minute, in some cases even below 100, and takes about one-half of a horse-power instead of one horse-power as before. With this decrease in speed the diameter of the stones has also been diminished from 6 to 4 or 4½ feet, the object being to allow the material to escape as soon as granulated and to reduce the production of first flour to a minimum. Stones of these dimensions and running at present speeds, 140 revolutions per minute, will granulate about 5 or 6 bushels an hour. This is considerably less than the amount ground by the "old" process on one reduction, but the superior product in the end compensates for the lesser quantity.

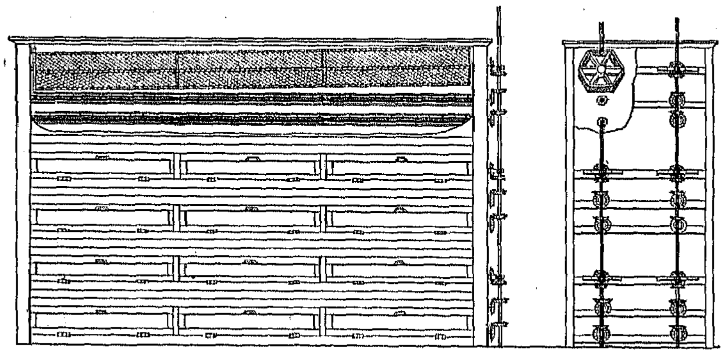


Fig. 9.

The quantity of middlings varies greatly, according to the dress and the conditions of the stones, the wheat used, etc., the limits being about 40 and 70 per cent. To produce one barrel of the best flour, from 4½ to 8 bushels of wheat are used.

The grinding of the middlings to flour is usually effected on stones, though rollers are rapidly coming into use for the same purpose. When stones are used, the furrowing is shallow compared to that on the granulating stones, as the material to be reduced is smaller in size.

At some mills the wheat and middlings are mixed together so as to pass through the stones at the same time, while at others the middlings are carefully graded and reground on separate runs of stones. The number of grades to be made is as yet a matter of debate.

The principal innovation in bolting in the "new" process is a considerable reduction in the size of the reels, the average dimensions being from 16 to 18 feet long and 30 inches in diameter. In some cases reels but 12 feet long have been used.

Fig. 9 gives an end and a side elevation of a bolting-chest, one part of the casing being left open to show the bolt and the two conveyers. Between the conveyers and the reels is a series of flat slides called "cut-offs", which facilitate the regulation of the bolted material from the cloth to the conveyers.

The reels and the conveyers are usually operated from one vertical shaft by small gears about a foot in diameter. The sides of the chest are inclined hopperwise to allow the flour, etc., to slide down to the conveyers.

In the figure the whole is inclosed in a case, as is often done in practice, with swinging doors to allow access to the various parts.

The hexagonal cross-section of the reel is shown in the side elevation. The silk bolting-cloth is imported mostly from Switzerland or the Netherlands, the brands made in those countries being usually considered the best, but bolting-cloths claimed by the makers to be equal to any imported silk are manufactured in this country.

The cloth for the various separations ranges from "000", or 780 apertures to the square inch, to the finest, "No. 13," having 18,496 apertures to the square inch.

This system of grinding, preventing as it does any considerable development of heat, obviates the necessity of any cooling arrangments and two inconveniences of low-grinding, viz, the "sweating" of the burrs—that is, the production of moisture during grinding—and the pasting or choking of the bolting-cloths. Several devices have, however, been introduced to keep the cloths open, such as whips and straps extending through the interior of the reel, and removing the matter caught in the meshes of the cloth by sharp raps. An objection to the use of these appliances is a certain amount of wear on the cloth.

The chest in the figure contains six reels, three being vertically in line, one above another.

Before leaving the "new" process something should be said of several appliances which have greatly facilitated the work of the miller and improved the quality of the product, but which do not necessarily form part of the process, and have been applied to "old" process mills as well.

It having been noticed that wheat when damp is ground into a flour containing too much moisture, deleterious to its treatment, its transportation, and to its baking qualities, a system of drying has been introduced, usually by steam, prior to the grinding.

This plan, it is claimed, will produce an appreciable improvement in the products, and has been introduced in a number of mills. Another scheme, but not so successful in its result, is the steaming of the wheat, the object in view being the toughening of the bran to prevent its too fine comminution.

Another valuable contrivance is the bran-duster, which saves a considerable amount—from 1 to 5 per cent.—of flour. This machine usually consists of a cylindrical or conical brush in connection with a wire sieve, the bran remaining on the inside and the brush forcing the flour through the sieve. Several other designs have been introduced, but this is probably the most widely used.

The artificial ventilation of millstones, another new improvement, has proved to be a success, in preventing fire from spreading from sparks caused by millstones running empty, and penetrating into conveyers, etc. It has been applied in the latest gradual-reduction mills on their regrinding stones. The air is withdrawn from the circumference by suction, and the resultant draught in the furrows tends, besides the above advantage, to prevent any undue rise in temperature of the material ground.

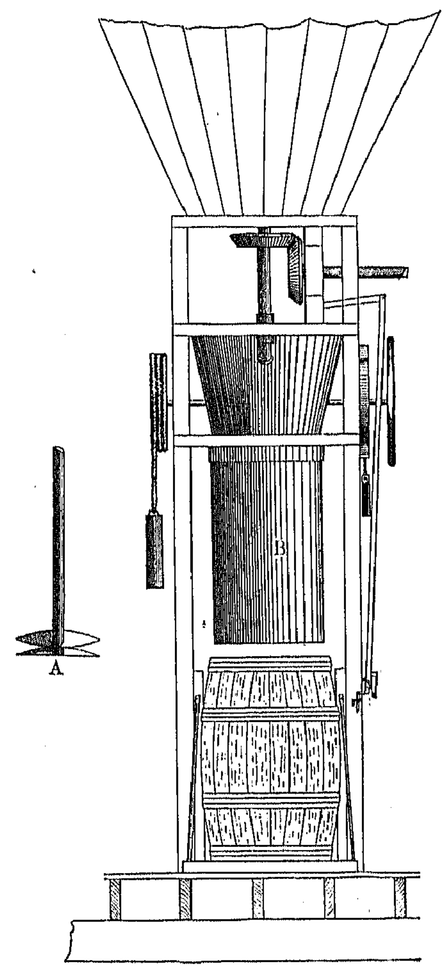


FIG. 10.

The packer, another improvement, is shown in outline in Fig. 10.

It consists of a cylinder of wrought-iron into which the flour, bran, or other material to be packed is fed, and by means of the screw-blade A is forced into small bulk in the barrel or in bags. When different sized bags are to be packed the cylinders B are changed, a number of different sizes being kept to fit the bags. An outer casing of iron is put around the bag to keep it in place. As the platform descends the weight rises, thus representing the pressure on the flour. Roller packers and some other forms are also used, but the form described above is used to the greatest extent.

We have now followed out the "new" process in its steps from the cleaned wheat to the packed flour.

While a fine quality of flour can be made from purified middlings, that is, the part of the berry richest in gluten, from either spring or winter wheat, many millers of the old school still believe that a single reduction is practically sufficient. It is undoubtedly true that for small mills of not over two run of stone, and for mills running on very soft wheat, the two processes may approach each other in efficiency, but the purification of the middlings and the production of "patent" grades have been established as undoubted improvements, and it would be impossible for spring-wheat mills to produce a flour approaching the best winter-wheat brands without the principle of regrinding middlings. At present these mills are producing flour rating higher in the market than any low-process mill.

There now remains to be described the third or gradual-reduction (often called the Hungarian) process, which is an extension of the principles of the "new" process.

THE GRADUAL-REDUCTION PROCESS.

This process has been adopted in the mills recently erected in the spring-wheat sections of the northwest. Its greater mechanical complication, and the large number of steps from cleaning to packing, cause it to be of greater interest to the mechanical engineer, and several portions of it, although adopted by "new" process mills, have not been described in the section pertaining to the "new" process.

The process, reduced to its essential features, consists of—

a. The cleaning of the grain.

b. The granulation of the wheat.

c. Separating the resultant products.

d. Reducing the fragments of the berry, again separating, and further reducing the fragments, usually five or six times.

e. Purifying the middlings from these various reductions.

f. Grading and regrinding the middlings.

g. Bolting.

h. Packing.

From the nature of the process, the larger the mill the more economy in the manufacture; and for small mills the "new" process is probably as efficient.

The principles of the process, introduced into this country during the past four or five years, were taken from the practice of Hungarian millwrights.

Many American millers have visited the cluster of mills at Buda-Pesth, the principal home of Hungarian milling, where the wheat is of a very similar nature to our northwestern varieties, and the process is now used in the largest mills of Minneapolis.

Starting with the cleaning of the grain, as it is delivered to the mill, to the final shipping, a description is here given in as much detail as the scope of this report will allow.

The perfect cleaning of the wheat-berry before reducing it, both as to its surface and as to foreign matter mixed with it, is a subject of great importance, and a large number of machines have been devised for the purpose.

All varieties of grain-cleaning machines fall into two classes:

a. Those for separating the wheat from loose foreign matter, such as cockle, oats, chips, iron, wire, etc.

b. Those for removing adherent matter and leaving the bran polished, the fuzz at one end removed, and the dark matter usually found in the crease extracted as far as possible.

Machines for extracting the loose foreign matter, usually termed separators, consist generally of riddles or screens and an air-blast or suction to remove light impurities. The number of separations varies; sometimes as many as four are combined in one machine. The separator is often combined with scourers, and the wheat is almost entirely cleaned in one machine. It is usual, however, in large mills to employ, first, storage separators, designed to treat large amounts of wheat, then wheat-separators, and finally cockle-separators. The most approved design at present is to place the screens, with apertures of the shape of the impurities, and often inclosed in a wooden chest, so that the wheat descends from one to the other by gravity and by the reciprocating motion of the screens. The blast is produced by a suction-fan and the dust is blown out of the mill.

A great variety of machines for cleaning the berry of adherent matter have been introduced during the past 15 years. It will be impossible to specify here more than the general principles involved.

The wheat in these machines is usually cleaned of adhering matter by friction, either of the kernels among themselves or with some foreign substance, such as stone surfaces, brushes, etc. A draught, usually caused by a suction-fan, removes the dust as it is formed.

A usual form of scourer consists of a series of vertical rods revolving about the axis of a cylindrical steel jacket, and operates by the resultant attrition of the berries among themselves, and against the rods and the surface of the cylinder.

Another form much used is the brushing of the grain, either between two revolving cylindrical or conical brushes, or between a brush and some other surface; this polishes the grain and leaves it ready for grinding.

Stone surfaces for the same purpose, viz, polishing, have also been employed.

The present typical separating and scouring machines are usually vertical, with vertical axes. The machines are set directly one over another on the various floors, and one shaft usually moves those in one mill. The power required for cleaning varies with the machines, the scourers requiring more than the separators.

The separators handle from 10 to 1,800 bushels an hour; the scourers, brushes, and combined machines from 10 to 300 bushels an hour.

As may be expected, these machines vary from the simplest wind trunk and sieves to the complicated separators, smutters, and scourers combined in one machine.

Many small devices have been introduced to further purify the grain and polish the berry, such as magnets set in a spout to extract iron, nails, wire, etc., from the stream of wheat.

The great contrast between the cleaning appliances of Oliver Evans' time and the complete series at present in use in our large mills is apparent. At present no miller considers his mill complete unless he can remove entirely all chaff, cockle, etc., from his wheat before grinding, polish the bran of each berry, and remove the dark matter from the crease.

Another operation introduced in the grain cleaning is the so-called "ending", that is, shearing off of the beard (Fig. 4) of the berry. This is done on a run or on several run of stones, according to the size of the mill, the stones running far apart and so adjusted as to remove simply the extremities of the berries, which are then passed through wire-cloth bolting-reels and are ready for the "gradual reduction". In this the millstones are wholly or in part abandoned, and the work is done by means of grooved and plain rollers (invented in Switzerland about 1820), made of chilled iron or of porcelain. In some cases disks of chilled iron, suitably furrowed, are used, and in others concave machines, consisting of a cylinder running against a concave plate. The system consists in reducing the wheat to flour, not at one operation, as in the "old" system, nor in two or three grindings, as in the "new" process, but in several successive reductions—four, five, or six, as the case may be. The wheat is first passed through a pair of corrugated chilled-iron rollers, which merely split it open along the crease of the berry, liberating the dirt which lies in the crease so that it can be removed by bolting. 2, Fig. 12. A very small percentage of low-grade flour is also made in this reduction. After passing through what is technically called a "scalping-reel" to remove the dirt and flour, the broken wheat is passed through a second set of corrugated rollers, by which it is further broken up (each such operation is technically called a "break"), and then passes through a second separating-reel, which removes the flour and middlings. This operation is repeated successively until the flour portion of the berry is entirely removed from the bran, the necessary separation being made after each reduction. The middlings from the several reductions are passed through the purifiers, and, after being purified, are reduced to flour by successive reductions on smooth iron or porcelain rollers. In some cases, as stated above, iron disks and concave mills are substituted for the roller-mill, but the operation is substantially the same in principle.

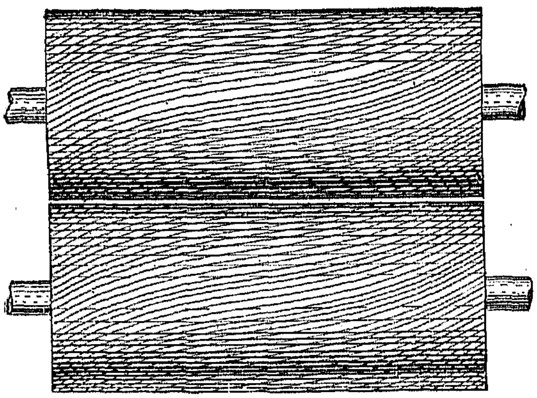
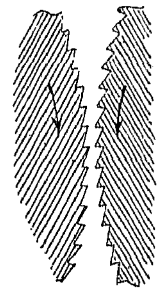


FIG. 11.



The rollers for reducing are of various forms, a lively competition having arisen in this country since their introduction. A complete machine for granulating usually consists of four rollers, in sets of two, with a double hopper above. Each roll is of chilled iron, rifled or fluted, with spiral corrugations. A section of a pair with sharp projections is shown in Fig. 11.

One roller revolves faster than the other, the differential speed thus produced enabling the projections of one to shear the berry caught in the projections of the other, and thus affect its granulation. Each form of corrugation, round, sharp, etc., is praised by its maker.

The rollers are either geared or belted together, the latter causing a quieter motion, while the former, it is claimed, prevents any slipping or inequality in the relative speeds.

At the present writing the roller-machines have attained such perfection, especially as to adjustment, ease of throwing in and out of operation, and perfection of workmanship, that it is extremely doubtful whether any foreign nation, Hungary included, has better or more efficient machines.

Several devices have been adopted for the adjustment of the rollers, so that they may be suddenly separated when starting or stopping; also, so that, in case of any foreign matter entering with the wheat or material to be ground, the rollers may separate of themselves and allow it to pass.

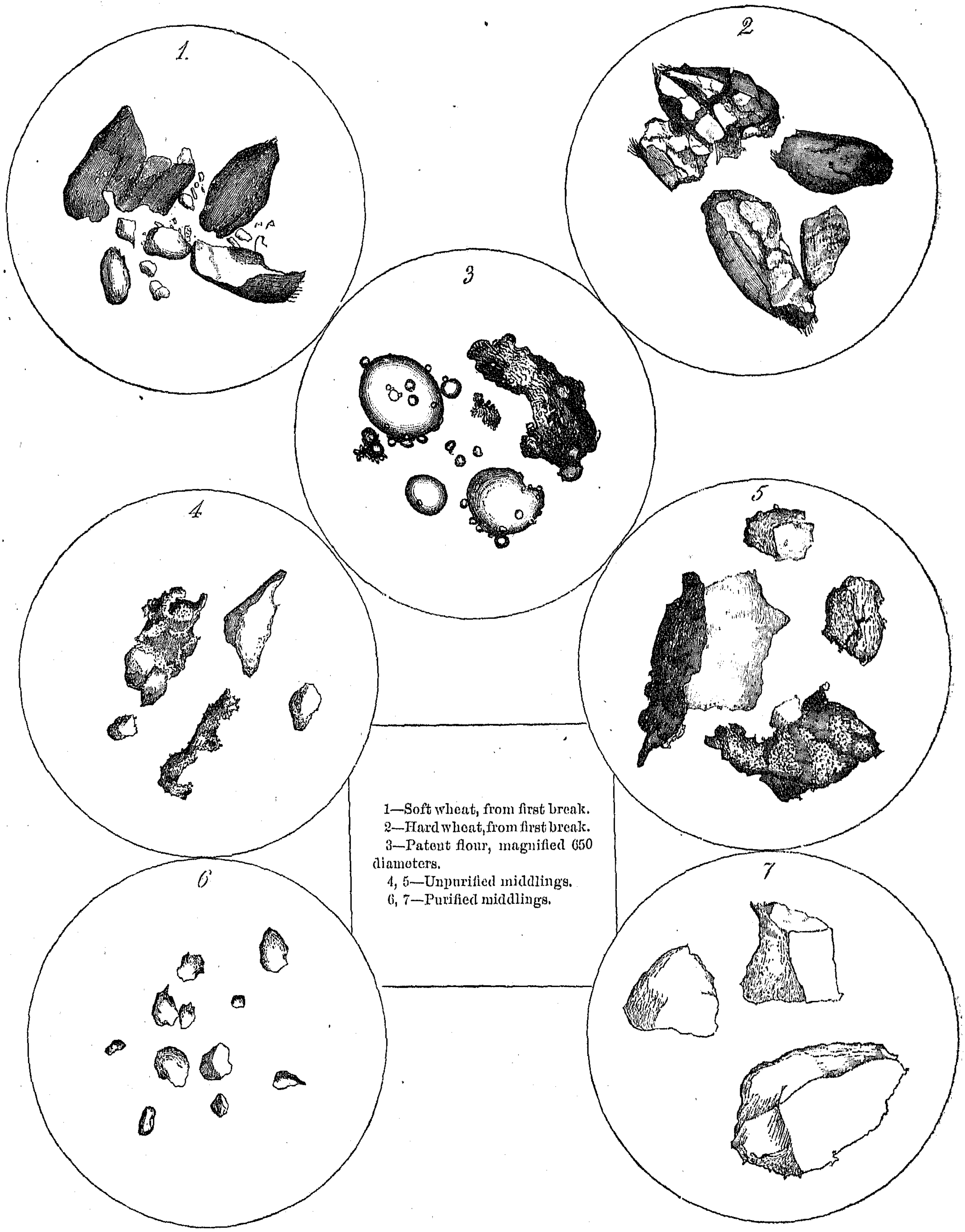
The usual design is to make the bearings movable and arrange them in such a manner that the two rollers are pressed together by springs.

The power necessary to drive a four-roller machine is claimed by makers to be nearly one-third less than that necessary for a millstone granulating the same amount per hour.

The details of feed, gearing, belting, etc., have been brought to a high state of perfection, but they cannot well be given here.

In some mills the first break consists of runs of stones running very high (far apart), the other reduction being on rollers; and in some other mills certain of the last reductions are also made with stones. Various arrangements of detail are now on trial.

From the first boltings succeeding the scalping-reels in the first few breaks the greater part of the oily germs are separated, and, with the tailings from these reels, are aspirated and reground on smooth iron rollers. These flatten the germ, and it is separated in the succeeding boltings.



1—Soft wheat, from first break.
2—Hard wheat, from first break.
3—Patent flour, magnified 650 diameters.
4, 5—Unpurified middlings.
6, 7—Purified middlings.

Fig. 12.

The best grades of middlings produced are often reground between porcelain rollers.

All the various regrindings are separated and handled by bolting until the various grades of flour, about five or six in number, are ready for the packers. These are of the form described on page 11, and are of great mechanical perfection.

To show the effect of the various machines on the wheat, Fig. 12 has been prepared from samples taken from Minneapolis, Minnesota, and from Richmond, Virginia. No. 1 is the broken soft wheat from the first break, millstones being used; 2 is the same for hard wheat broken on rollers (the lesser comminution of the latter is plainly visible); 4 and 5 are unpurified middlings from soft and hard wheats respectively; 6 and 7 are purified middlings from soft and hard wheat; and 3 is patent flour. This latter is magnified to 650 diameters, while the other figures are much less magnified.

At present, in a perfect gradual-reduction mill, about 4½ bushels of good spring wheat are needed to produce one barrel of flour (196 pounds), 74 pounds of feed being made at the same time.

The quotations in New York for various flours on June 1, 1880, were as follows, showing the preference accorded "patents":

Western spring extras	$4 00 to $4 20
Minnesota clear	4 25 to 5 40
Minnesota straights	5 50 to 7 35
Spring-wheat patents	6 00 to 8 00
Winter-wheat seconds	4 50 to 4 75
Spring-wheat extras	4 50 to 4 60
Saint Louis flour	5 10 to 6 00
Winter-wheat patents	6 00 to 8 20
Southern flours	2 00 to 6 00
Northern flours	2 40 to 8 60

Besides the processes described above, several individuals have introduced systems of their own, of which they have patented the principal features. Their mills, of which a number have been built, are all essentially gradual-reduction mills, but the details of handling vary. Among this class may be mentioned the "degerminator", or metallic millstones with rounded furrows, allowing the germ to drop out of the split berry before it is crushed; a system of wind trunks to gather the dust from the purifiers in the mill; a granulating mill, consisting of a hollow cylindrical stone, with a runner inside, the grain being crushed between the concave surface of one and the convex surface of the other; and many innovations in bolting, such as elaborate systems of rebolting and separating.

Many of these devices are probably efficient, and may be applied with gain to the user, but a longer practical use is necessary to determine their respective values.

Two small forms of apparatus, however, which have been introduced lately, will probably tend to a better knowledge of milling products. One, the molarimeter, invented by Edward Campbell, consists of a bent thermometer, the bulb of which projects into the stream of meal from the millstone, the temperature of the meal being shown on the stem. Several points previously suspected are confirmed. It is found that different varieties of wheat can endure different degrees of heat, that the temperature varies with the grinding surface, etc.

The other device, the aleurometer, measures the relative elasticity of the gluten extracted from the flour by means of a piston moving in a cylinder.

The combined use of these two appliances has yielded the following table, which appeared in the *American Miller*, Vol. 6, page 33:

Temperature of flour ground, indicated by molarimeter. Degrees F.	Elasticity indicated by aleurometer. Degrees.
90	48½
104	42
110	38½
120	34

From these figures it appears that the flour produced at the temperature of 90° Fahr. yields the most elastic gluten, indicating the strongest flour.

In order to complete the account of gradual reduction, two mills will be described, one being partially in operation and the other in process of erection.

THE "WASHBURN A" MILL.

Among the mills at the falls of Saint Anthony, the largest and most prominent, the Washburn A, is an example of the latest application of the gradual-reduction process, and illustrates the magnitude which single mills and milling operations have attained. The site now occupied by the handsome and imposing structure is that on which the great explosion (1878) destroyed the old Washburn A, badly shattering the adjoining mills, and killing and maiming a large number of persons. The mill is shown in Plates I and II, Plate I being a longitudinal elevation, and Platé II an end elevation. The building is 100 feet wide by 244 feet long, eight stories high, about 158 feet from street to cupola, built of masonry, and resting on the solid rock.

The floors are supported by vertical pillars between walls, the girders resting on cast-iron plates, to prevent settling. The various stories vary from 14 to 18 feet in height. A brick fire-wall divides the mill into two parts, one called the "north", and the other called the "south", end.

The mill is further divided longitudinally on each floor by a center aisle or passage about 14 feet wide, the stairway between floors and a passenger and freight elevator near the fire-wall being the only interruptions.

Each half of the mill divided by this passage is complete in itself from cellar to attic, and is run by a separate turbine wheel, independent of the other half. This system allows one portion to be stopped for repairs without the necessity of suspending operations in the whole mill. The machines are arranged symmetrically on each side of the passage, and the drawings and description of one side are true of the other. The motive power of the mill is derived from two turbine wheels, each 55 inches in diameter, and expected to yield 1,000 horse-power under the head of 45 feet. From these wheels the power is distributed by two main shafts, one for each half of the mill, and by belting to the various floors and machines. The hands employed when the mill is in full operation will be in all 94, as follows: Employed in flour-making 49; millwrights, 10; sweepers, watchmen, rackmen, engineers, etc., 20; roustabouts, 15.

The system employed is the latest form of the "gradual-reduction" system, adopted after long and detailed experiment by the owner in his other mills. The wheat is brought to the mill by railway, and is conducted directly to storage-bins in the basement, of which there are forty, each of 2,000 bushels capacity, or a total capacity of 80,000 bushels. From these it is elevated and conveyed into the adjoining elevator-building, 35 by 94 feet in plan, and of the same height as the mill, having also a storage capacity of 80,000 bushels. All the wheat-cleaning apparatus is in this elevator, comprising the following machinery: Two large storage separators, which remove the grosser impurities, seven mill separators, and six double cockle-separators. The grain is then further cleaned by sixteen brush-machines, and graded into "small" and "large" wheat. The fuzz, etc., is then removed by ten run of ending-stones, five for each grade, and the resultant material is bolted on centrifugal reels, covered with wire-cloth, and separated.

The fine material from these centrifugal bolts goes to second low-grade flour. After granulation on the corrugated rollers of the first break, the wheat is scalped in four reels, the tailings, still containing the best part of the berry, being aspirated and conducted to the rollers of the second break. What passes through the bolting-cloth is divided into two streams and rebolted, and the flour thus separated is conducted to the low-grade flour-bins. The tailings of the flour-reels are separated into three grades by grading-reels, part mixed with other products and part further reduced by means of rollers, the resultant flour being of two grades: low grade and baker's grade. The middlings obtained from the boltings of the scalping-reels are brought to middlings grades and divided into ten distinct grades. These are then purified, reground on smooth rollers, and bolted. Wherever the same grades are produced they are mixed, and the operations thus simplified.

The wheat passes from one break to the other, in all six times, until the bran is absolutely free from all flour particles. The first break or reduction consists of four roller machines, the second of seven, the third of nine, the fourth of six, the fifth of four, and the sixth of three. The rollers of the earlier breaks are all of corrugated chilled iron. The second, third, fourth, and fifth breaks are treated similarly to the first, the best middlings being reground after purification on smooth porcelain rollers, and the finest flour made therefrom. The tailings from the last boltings are reground on stones. The grades of flour are six, and range from second low grade to superlative.

At present, there being only one-half of the mill in operation, the output is only about 1,700 barrels, the mill being designed to produce 4,000 barrels a day. A full inventory of machines in one-half the building in given below, to give an idea of the number and variety of machines necessary for producing the large amount of flour daily manufactured.

WHEAT-CLEANING MACHINERY.

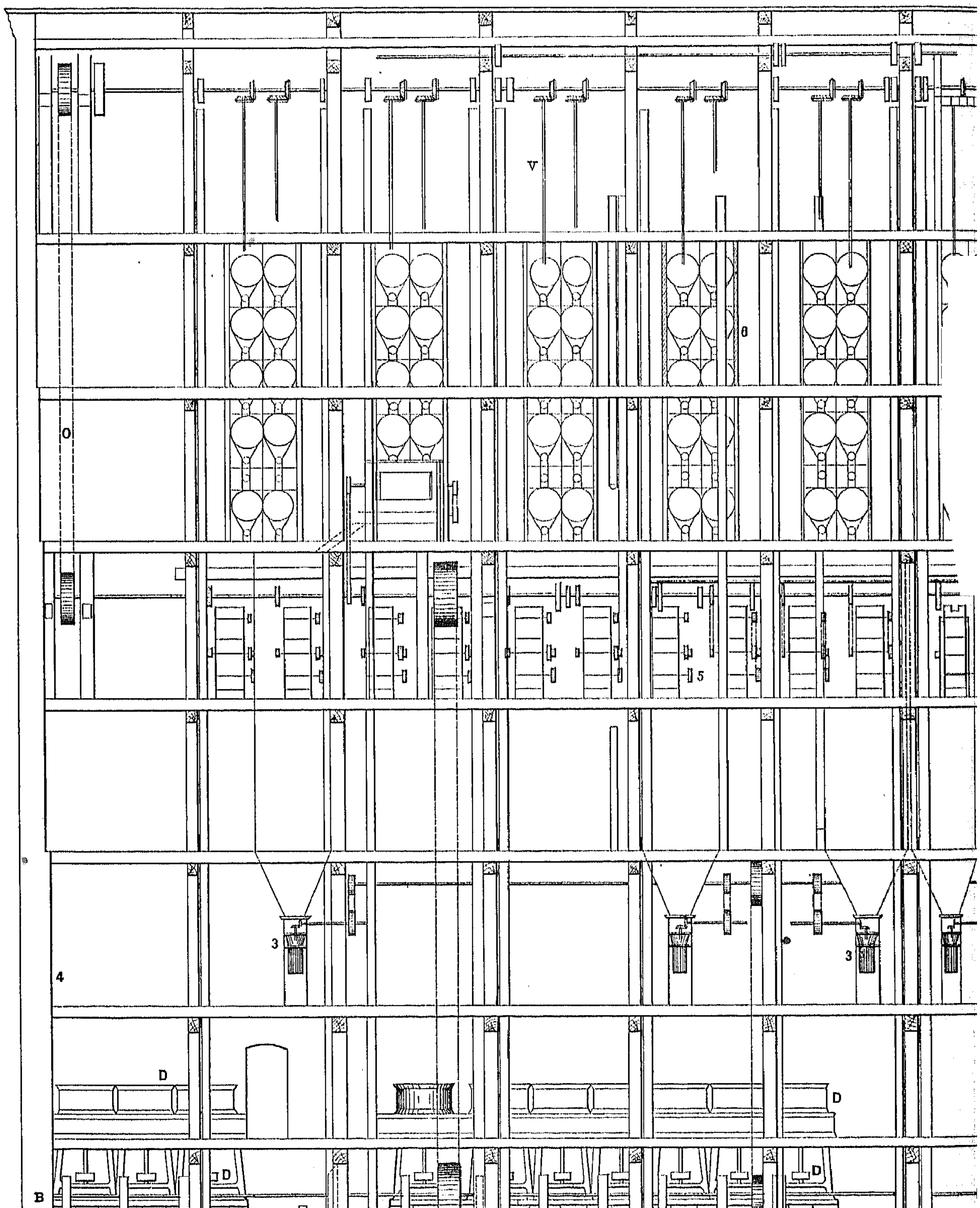
2 elevator receiving-separators.	16 brush-machines.
7 wheat-separators.	10 run of ending-stones.
6 double cockle-separators.	3 wheat-graders.

MACHINES FOR REDUCING, BOLTING, ETC.

86 sets of rollers, as follows:	16 aspirators.
48 sets of corrugated iron.	148 bolting-reels.
26 sets of smooth iron.	10 sets of French millstones.
12 sets of porcelain.	14 graders.
78 middlings-purifiers.	38 sections of dust-rooms.

These machines are all driven by one of the turbines mentioned above.

Plates I and II have been copied from the working drawings of the mill, and show the position of the machinery and the transmission of power. In the basement or ground floor, directly upon the rock, rest the



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and maiming a large number of persons. The mill is shown in Plates I and II, Plate I being a longitudinal elevation, and Platé II an end elevation. The building is 100 feet wide by 244 feet long, eight stories high, about 158 feet from street to cupola, built of masonry, and resting on the solid rock.

The floors are supported by vertical pillars between walls, the girders resting on cast-iron plates, to prevent settling. The various stories vary from 14 to 18 feet in height. A brick fire-wall divides the mill into two parts, one called the "north", and the other called the "south", end.

The mill is further divided longitudinally on each floor by a center aisle or passage about 14 feet wide, the stairway between floors and a passenger and freight elevator near the fire-wall being the only interruptions.

Each half of the mill divided by this passage is complete in itself from cellar to attic, and is run by a separate turbine wheel, independent of the other half. This system allows one portion to be stopped for repairs without the necessity of suspending operations in the whole mill. The machines are arranged symmetrically on each side of the passage, and the drawings and description of one side are true of the other. The motive power of the mill is derived from two turbine wheels, each 55 inches in diameter, and expected to yield 1,000 horse-power under the head of 45 feet. From these wheels the power is distributed by two main shafts, one for each half of the mill, and by belting to the various floors and machines. The hands employed when the mill is in full operation will be in all 94, as follows: Employed in flour-making 49; millwrights, 10; sweepers, watchmen, rackmen, engineers, etc., 20; roustabouts, 15.

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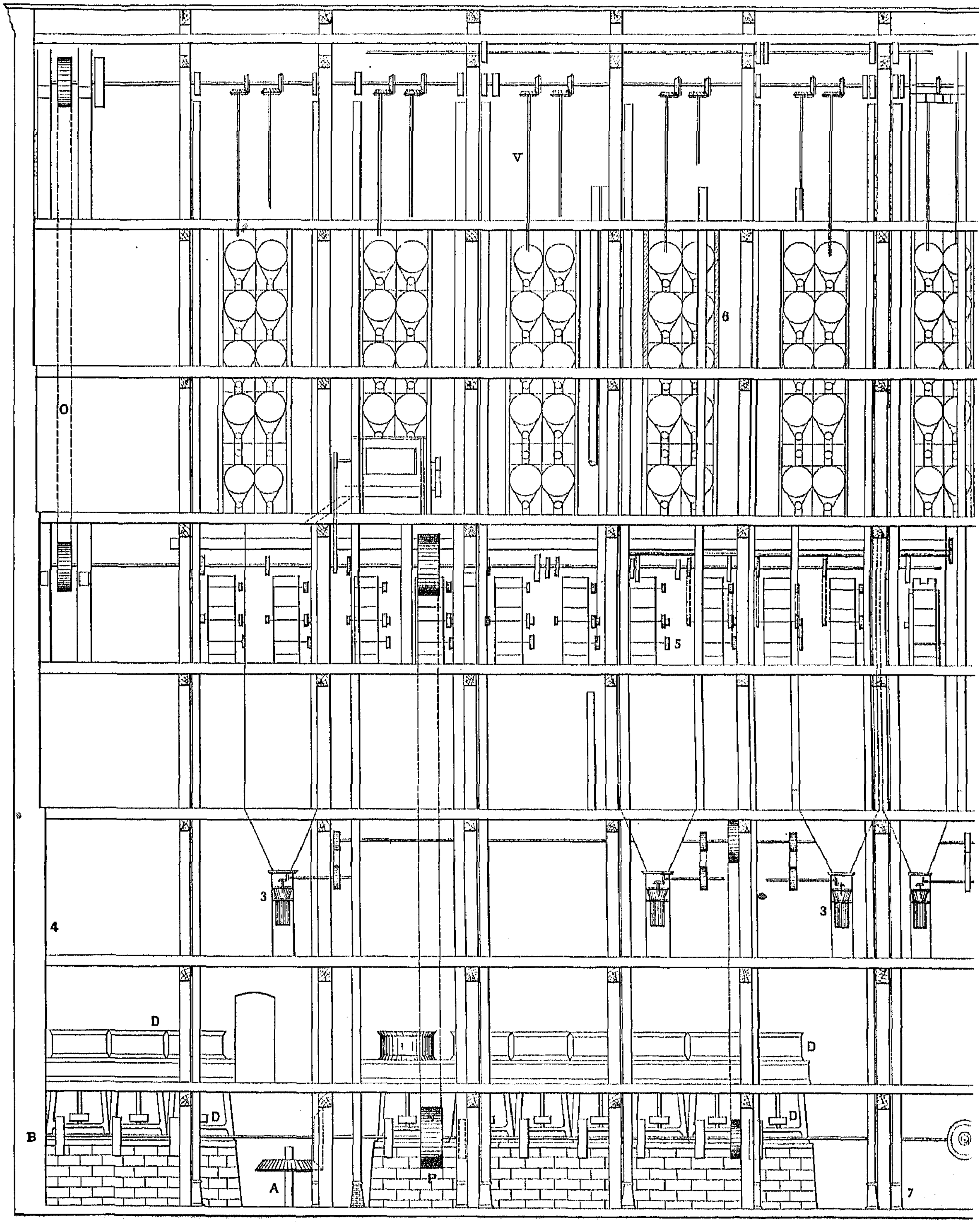

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PLATE I.

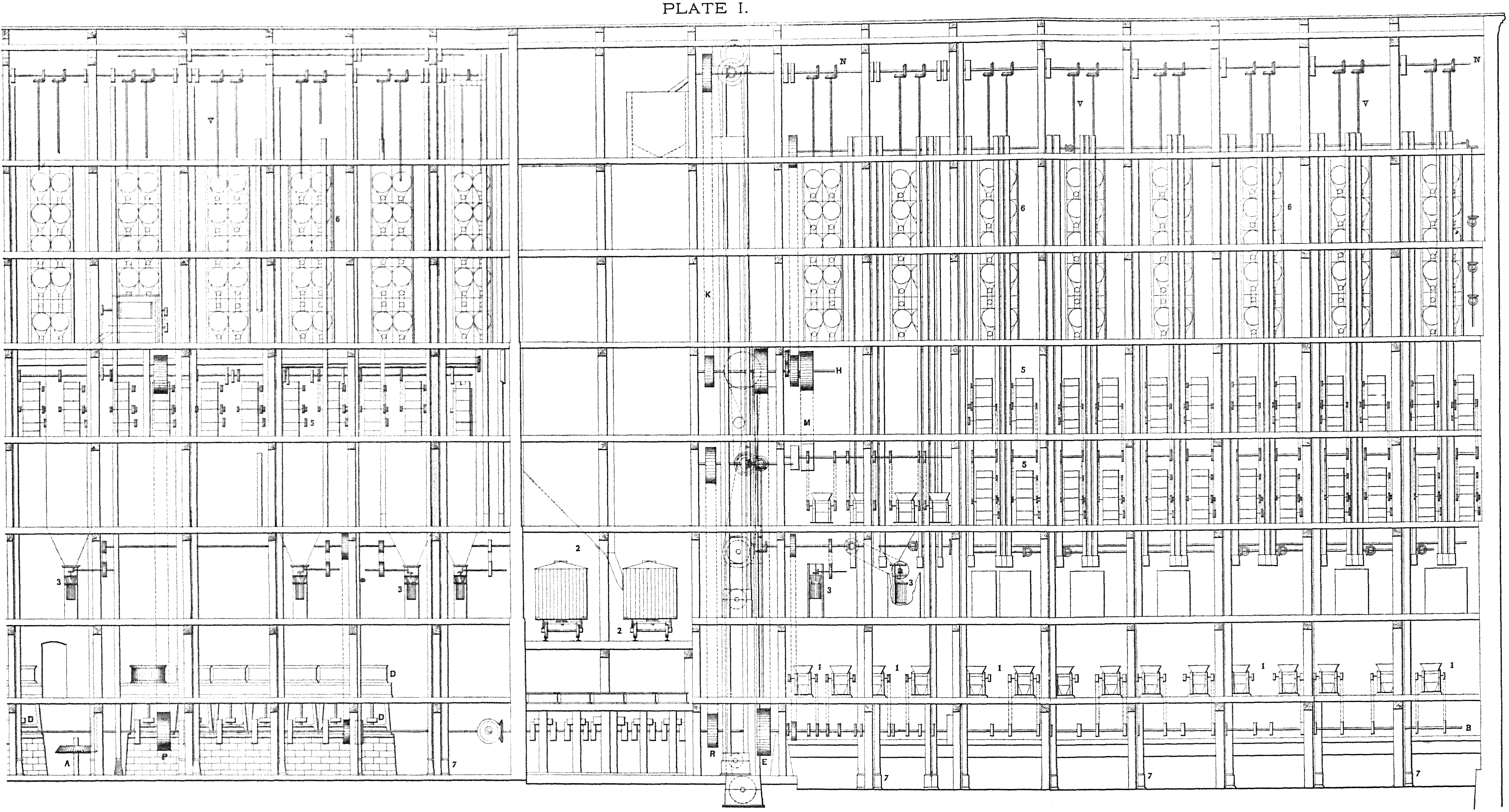

PLATE II.

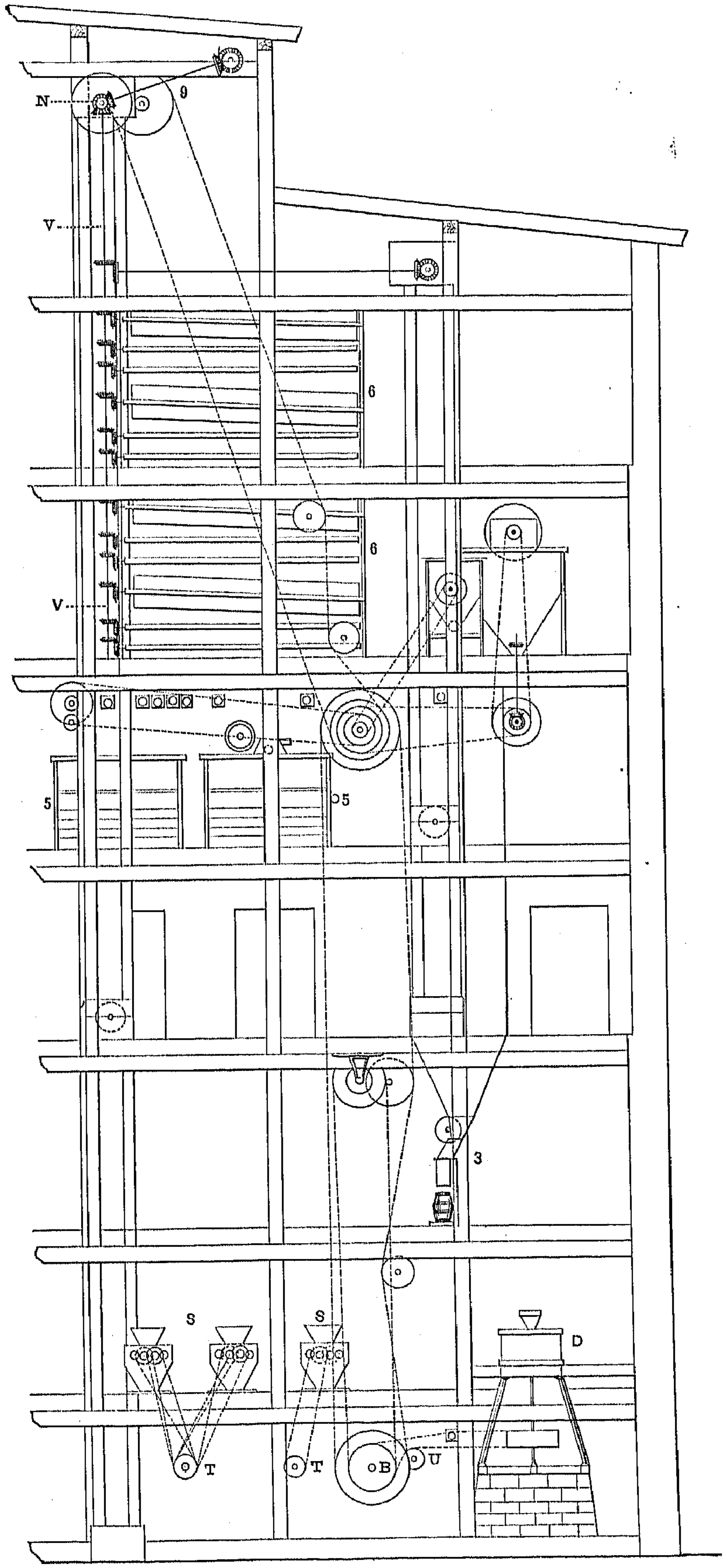

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PLATE IV.

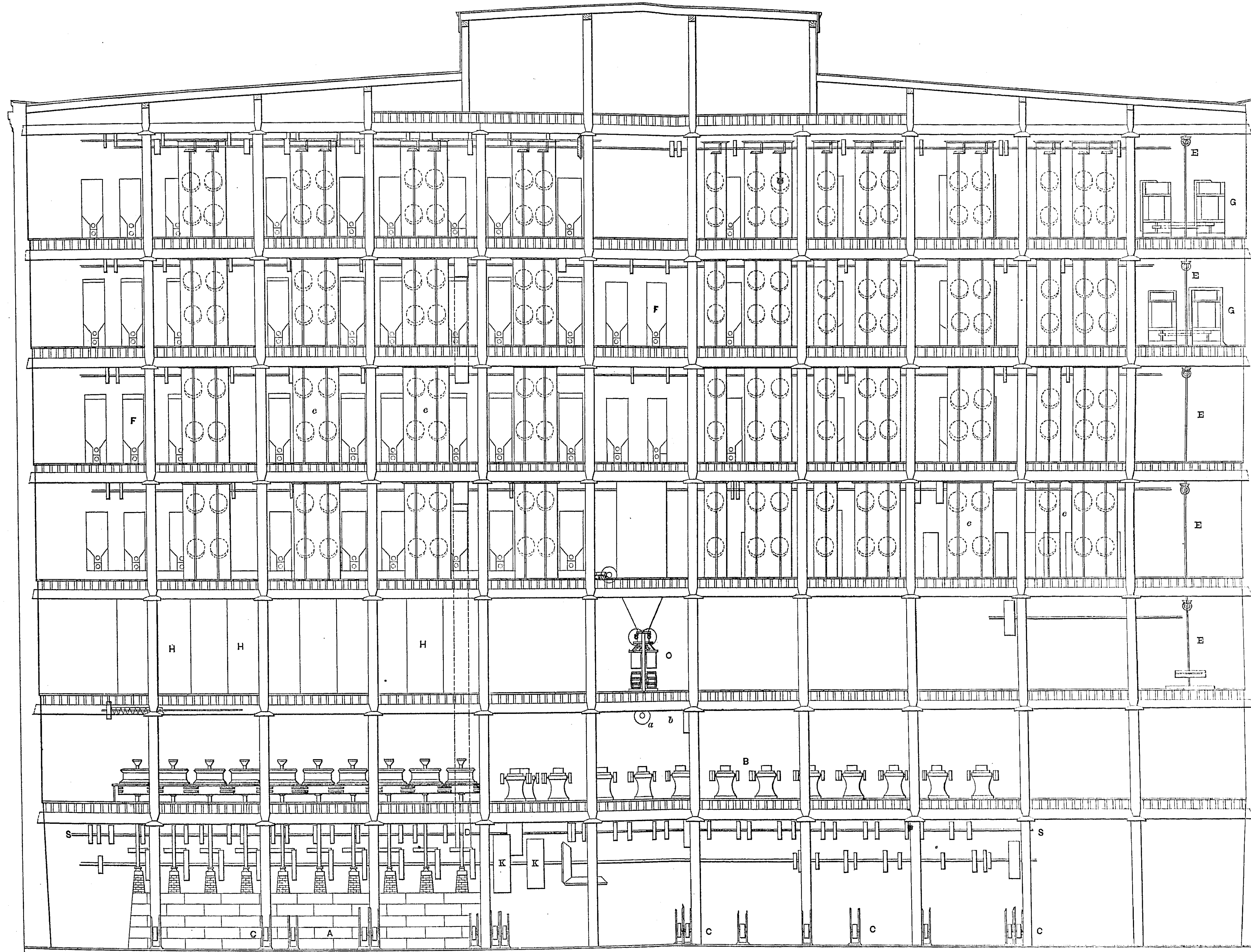


PLATE V.

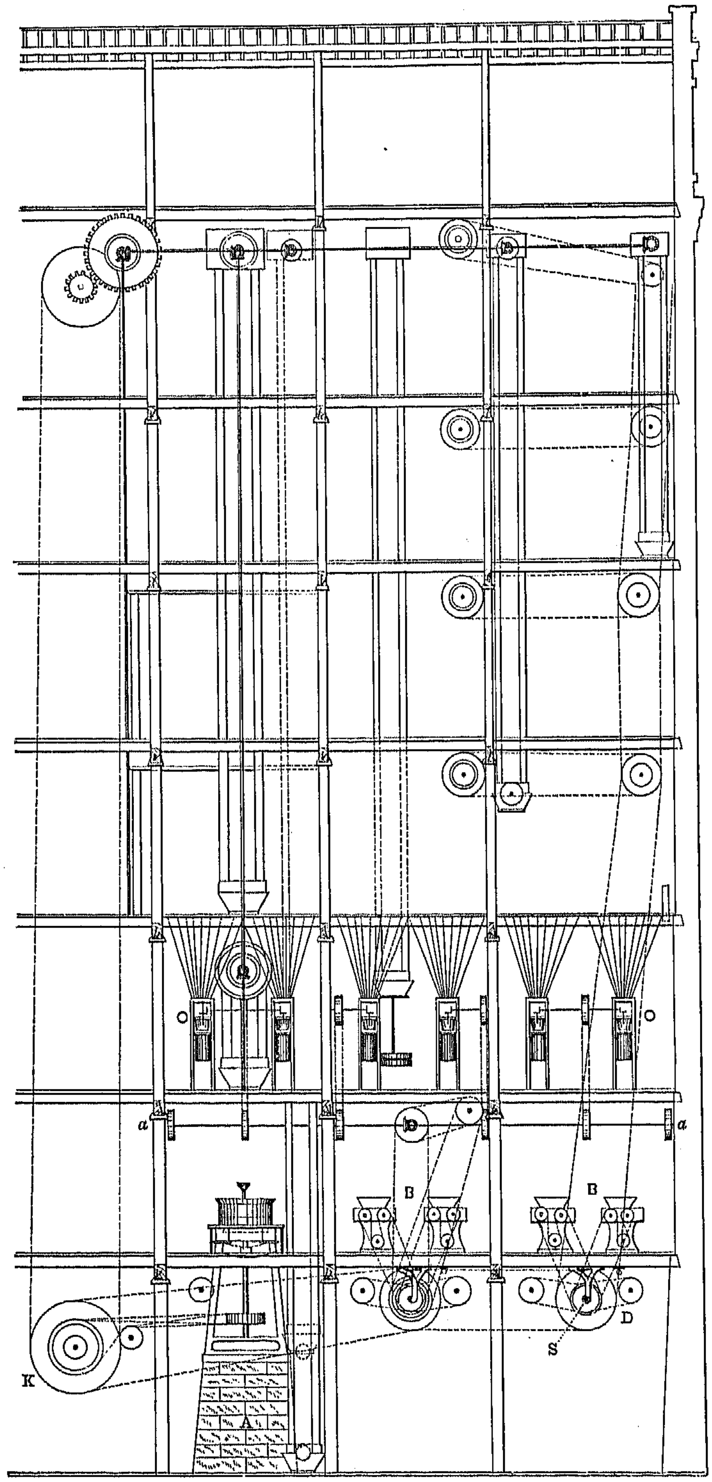
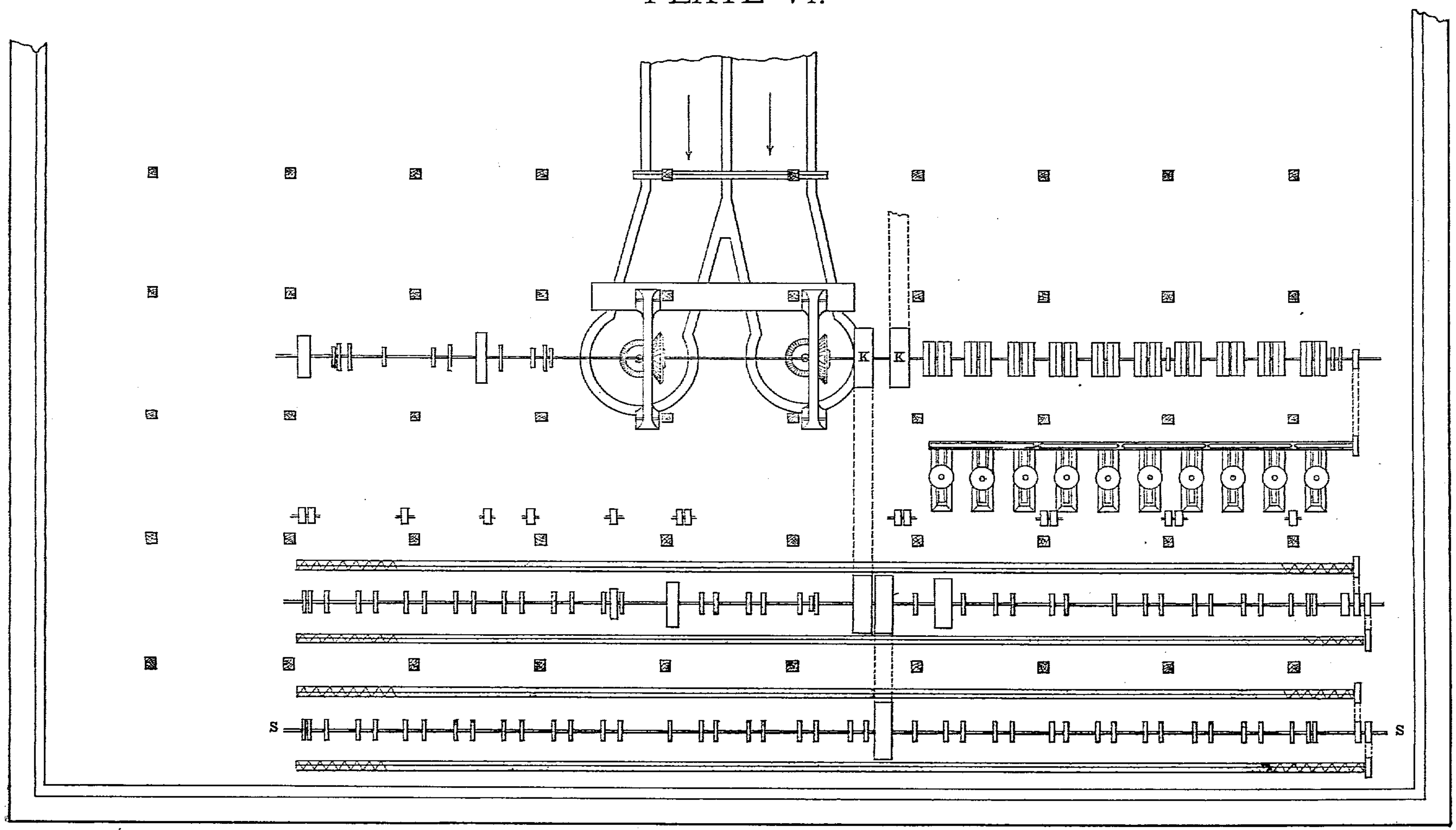


PLATE VI.



foundations for the millstone hursts, as shown in Plates I and II, and the foundations for the pillow-blocks of the main shaft B B, Plate I, which runs through from end to end of the mill, and to which the spindle-pulley of the stones D D D D are belted directly. The main gear and wheel-pit are located at A. The power for the south end of the mill is taken from the main shaft, from the pulley E, and distributed as follows:

E is belted to the pulley on the short shaft H, on the fifth floor, which in turn runs the shafting on the fourth and the eighth floors by the belts M and K. The latter furnishes the power to all the elevator heads on the eighth floor, as shown in the plate. The bolts on the fifth and sixth floors all run by vertical shafts, which are geared to the shaft N N. The rolls on the second floor are belted to the auxiliary shaft running near the ceiling of the basement and geared to the main shaft B B. The portion of the mill north of the brick fire-wall derives its power from the pulley P, which, similarly to E in the south portion, is belted to the shaft on the fifth floor; this in turn operating the bolting-reel shafts on the eighth floor, by means of the belt O, near the wall. The shafting on the packing floor is belted direct to the main shaft, as shown at R. On the seventh floor the purified middlings are carried from one end of the mill to the other by means of a car running over a track, the object being to transport the middlings from one end to the other without loss by friction, which would be considerable if a common conveyer were used. This deviation from the principles of automatic handling does not involve manual labor to any great extent, and saves a considerable amount in middlings.

The belting of the rollers and burrs is shown in Plate II. The rollers S S running together, require two belts (one being crossed), which are attached to the auxiliary shafts T T. The burrs, as stated before, run directly from the main shaft B, the belt being kept in position by the belt-tightener U. The bolts are operated by the shafts V V, which in turn take their power from the shaft N. The belting of the purifiers, of the graders, and Sturtevant fans is also shown in this plate. The portion of the mill over the car-track (the fourth floor) of the "north" part and the basement and the second floor of the "south" part are devoted in great measure to bins for wheat, bran, and flour. All the elevators throughout the mill are vertical, none whatever being set at an angle.

The flour, packed in barrels, is delivered to the cars by a simple arrangement, each barrel being allowed to run down an inclined plane, the velocity being checked by a heavy plank placed near the bottom, and pivoted at its upper end; by raising the top of the beam, in case a barrel stops entirely, the hand allows it to roll slowly into the car.

Plate I is a section through the central aisle of the mill, looking east. D D are the burrs, their hurst frames and foundations extending to the floor below; 1 1 are the corrugated iron rollers (their belting is seen better in Plate II); 2 2 are the tunnel and car-track for the incoming wheat; 3 3 are the packers; at the north end of the building, at 4, the fine grades of flour are loaded on the cars by the inclined plane previously described; 5 5 are the middlings-purifiers; these machines on both floors are belted to the same shaft in the fourth floor; 6 6 6 are the bolting-chests (the reels proper are omitted, to avoid complication in the plate); 7 7 are the elevators for raising the grain, middlings, etc. (the spouts, etc., are omitted).

Plate II is an elevation of the "north" end of the mill. At D is shown the end of the row of burrs; S S are the rollers; 3, the packers; 5 5, the purifiers; and 6 6 are sections of the bolting-chests, showing gearing, conveyers, etc. At 9 the gearing for reducing the speed of the bolt-shaft and the manner of gearing elevator-heads, etc., are shown.

To give a general idea of the immensity of the amount of material handled and the size of the mill, it may be stated that 621,125,000 cubic feet of masonry and 2,750,000 feet of lumber were used in its construction. When full it will hold 80,000 bushels of wheat, the amount ground daily being about 18,000 bushels. About 40,000,000 pounds of feed and $4,000,000 worth of flour are produced annually. From 18 to 24 car-loads of wheat are daily unloaded at present, but when the mill is running to its full intended capacity of 4,000 barrels it will require over 50 car-loads of wheat every day. To ship the flour it will require daily 32 cars, and for bran, feed, and other offal it will need thirty additional cars, which will require the use of more than a hundred railroad cars every day. The bran is assorted into two qualities, fine and coarse, and is shipped for feed.

THE "PILLSBURY A" MILL.

This mill, now being erected on the eastern bank of the Mississippi at Minneapolis, will exceed, when completed, even the Washburn A in size, and it is believed will be the largest mill in one building in the world, the productive capacity having been placed at the enormous figure of 4,500 barrels per day. Similarly to the Washburn A, it is built of the granite so commonly used at Minneapolis, with high ceilings, many windows, and thick walls to insure steadiness and safety from fire. The floors are supported by pillars with iron capping plates, to prevent settling and the consequent disturbance to the lines of shafting. The power for moving the large number of machines will be derived from two Victor turbines, 54 inches in diameter, and under a head of 52 feet. It is expected by the builders and engineers that the power thus obtained will amount to 2,400 horse-power. The mill is of the most approved gradual-reduction type, and, like its great fellow on the opposite shore, is built on the dual plan, being separated through the center, longitudinally, into two independent series of milling-machines. A "system", now constructed by all good millwrights and engineers before the final plans for a designed mill are completed, is shown for this mill in Plate III. This graphical representation of the path of the wheat from the first break to the packers gives a better insight into the process, even to the reader unversed in the details of milling, than any description, however explicit or minute.

Before describing it, however, a few words should be said of the grain cleaning, which, in plan, is to be much like that in the Washburn A. The wheat will be treated successively in the following machines, which will effectually remove all foreign and adherent matter: First, by two large storage separators; then by eight oat-separators; then, after grading into "small" and "large" wheat on four graders, by four cockle-separators, two for each grade; again by four scourers, by eight brush-machines, by four more separators, and finally it is ended on six run of ending-stones. The wheat elevated to the top floor descends through the various machines by gravity until it reaches the scourers on the third floor; from there it is elevated to the fifth floor, upon which the brushes are placed, and again descends to the final separators on the second floor. After this it is ready for crushing in the rollers. There will be five reductions or breaks, consisting of corrugated iron rollers, with the noiseless belting arrangement described in previous pages. The rollers will be divided as follows:

First break.—Seven sets of four-roller machines.

Second break.—Twelve sets of four-roller machines.

Third break—Fourteen sets of four-roller machines.

Fourth break.—Ten sets of four-roller machines.

Fifth break.—Eight sets of four-roller machines.

After granulation on the first break, shown at A, Plate III, the broken wheat is bolted on the four scalping-reels, 2 2, and the separation between the resultant flour, middlings, and still unreduced particles of wheat is effected. The latter are treated in the four aspirators, 3 3, the shorts from which are conducted to the bin G; the clean broken wheat is then conducted to the second break, B, and the flour and middlings from the scalping-reels are conveyed to the bolting-reel 4. The narrow rectangle represents the conveyer of this bolt, and the line therefrom the path of the conveyer stuff or bolted material. The tailings, represented by the line starting from the end of the reel, are aspirated at 5 5 and conducted to the first germ-rollers, H. The bolted portion passes to the reels 6, 7, and 8; the tailings from 6, which are coarse middlings, run to the graders 9; the tailings from 7 (fine middlings) to the grading-reel **10**; and finally the tailings from 8 to the stones IV. The product of reel 8 is the lowest grade of flour (Red Dog). From the grading-reel 9 the middlings produced on the first break are again graded on the sieves 11, treated by the air-machines 12; the resultant products, as shown in the plate, being three—the tailings and two grades of middlings. The former are purified in the two purifiers, 13, from which the shorts run to the bin G, and the purified middlings to the regrinding rollers, as shown in the plate. Of the two grades of middlings from the air-machines, one is run to the purifier 14, the other to the third germ-roller, K. The second, third, fourth, and fifth breaks are but repetitions of the first, as will be seen from the plate, the large amount of material to be handled causing the only difference—a greater number of each class of machines. The path of the various products and the points at which the same grades, or products requiring the same treatment, are mixed, can be traced without a detailed description of each break. It will suffice to say that A, B, C, D, and E are the five sets of reducing-rollers; G and G^1 the shorts and bran bins, respectively; I, II, III, IV, the regrinding burrs; V to XVI, inclusive, the final sets of bolts; H, I, K, the first, second, and third germ-rollers; and L, M, N, O, and P, five sets of crush-rollers. The grades of flour produced and their names are given at the barrels on the lower end of the plate. They are "low grade" (Red Dog) from the first break; 2d baker's from the bolts XVI; 1st baker's from the second break and the bolts VII and XV; the second patent (*a*) from the bolts VIII and IX; another grade of 2d patent (*b*) from the germ-rollers and bolts V and VI, and finally the highest grade, or 1st patent, as it is called, from the bolts X to XIV. A good idea may be derived from the foregoing of the intricacy of the gradual-reduction system, and of the knowledge of the action of the various machines necessary to design a mill of large dimensions; the results of the various boltings, the appropriate mesh of the cloth, etc., necessitate, as may be easily imagined, a study and practical experience of many years.

A full list of machines for half the building, or one complete milling system, is here given:

WHEAT-CLEANING MACHINES.

2 storage separators.
2 oat-separators.
4 double cockle-separators.
8 brush-machines.
6 run of ending-stones.
6 reels.

MACHINES FOR REDUCING, BOLTING, ETC.

94 sets of rollers, viz:
- 38 sets of smooth iron.
- 6 sets of porcelain.
- 50 sets of corrugated iron.

10 run of burrs.
170 reels.
20 aspirators.
100 middlings-purifiers.
Air-machines.
Packers on flour.
2 packers on bran.
Sections of dust-rooms.

The transmission of power from the wheels to the various machines is very similar to that in the Washburn A, but as there is no transverse wall, the system is somewhat simplified. The power derived from the two turbines, as stated above, is distributed from the main shaft in the basement to the various floors, the stones on the grinding floor being run directly from it. The bridge-tree, miter-gear, race-way, and shafting are shown on Plate VI. The arrangement of T-beams across the head-races for the support of the pillars and the floors above, and the support of the bridge-tree by the arch, are also shown. From the shaft S S the power taken off at D, Plate V, by the main belt, which runs to the fourth floor, where it operates the entire line of shafting. This in turn is belted to the line on the fifth floor, the line on the fifth to the line on the sixth, and the line on the sixth to the shafting on the seventh, which operates all the bolts and grain-cleaning machinery on the third, fourth, fifth, and sixth floors by means of the vertical shafts E E E, Plate IV, geared to it. The main shaft is belted to the auxiliary shaft by means of the pulleys K K. The detailed belting of the various machines will be easily understood from a perusal of the plates.

Plate IV is a longitudinal elevation through the center of the mill, showing at A the foundation, belting, and position of the millstones; at B the rollers and their belting from the auxiliary shaft in the basement; at C C C the elevator-feet, which are broken to avoid complication in the plate; at O the double row of packers extending across the mill and run from the shaft *a* on the floor below (*a* is geared to *b*, and *b* belted to the auxiliary shaft in the basement); at *e e e* the bolting-reels in their chests, actuated by the vertical shafts; at F F the middlings-purifiers, partly concealed by the bolting-chests in front; at G G the various grain-cleaning appliances run by the vertical shaft E; at H H the middlings- and flour-bins, and finally the wheat storage-bins, occupying the four lower right-hand compartments of the plate.

Plate V is an end elevation, showing the main shaft; the foundation and hurst frames of the stones; the belting of the rollers, packers, and grain-cleaning machinery; also the gearing in the seventh floor to obtain the slow motion of the vertical bolt-shafts.

Plate VI is a plan of the basement, showing the race-way, main gears, main shaft, conveyers, etc.

RECAPITULATION.

If we look over the field covered by the preceding pages we see that there are altogether, at present, three processes of manufacturing flour in this country, viz:

a. Crushing the grain to flour between millstones by a single grinding, and then bolting out the bran and coarse matter.

b. Granulating the wheat by millstones or rollers, separating the resultant middlings, purifying and grading them, and finally regrinding them to flour.

c. Granulating the wheat very coarsely, mostly or entirely by rollers, separating the middlings, flour, broken wheat, etc., thus formed, again reducing the fragments of broken wheat, separating and repeating the operation several times, more completely separating bran and flour.

As previously stated, there are other processes introduced by individuals, but in general they are but modifications of these systems.

The two new systems have been introduced in many mills, and have attained much celebrity since the publication of the Ninth Census (1870). In fact they have obtained so many enthusiastic supporters that at present none of the larger mills are being erected on the old system. It is, however, the opinion of those who have watched the various milling systems in Europe that high grinding is adapted chiefly to hard wheats, medium high (or "new" process) to wheats of a greater tenacity of bran and starchiness of endosperm, while the "old" or low process is economically applicable only to very soft winter wheats and for small country and frontier mills.

The great change from low to medium high and high grinding was caused by the impossibility of producing flour of the best market standing by low grinding from the hard spring wheat of the northwest, and the consequent adoption of the two new processes. These in turn being highly successful were tried on wheat of a softer nature and were found to operate satisfactorily, enabling the millers not only to produce their flour more economically, but to name it "patent", for which there has been and yet continues to be a preference in the market.

INDEX TO FLOUR-MILLING PROCESSES.

REPORT

ON THE

CULTURE AND CURING OF TOBACCO

IN THE

UNITED STATES.

BY

J. B. KILLEBREW,
SPECIAL AGENT.

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CHAPTER I.—STATISTICAL REVIEW OF THE TOBACCO CROP OF 1879.

CHAPTER II.—CLASSIFICATION—TYPE MAPS—VARIETIES OF THE TOBACCO PLANT.

CHAPTER VIII.—CULTURE AND CURING OF TOBACCO IN LOUISIANA.

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CHAPTER XV.—CULTURE AND CURING OF TOBACCO IN TENNESSEE.

LETTER OF TRANSMITTAL.

DEPARTMENT OF THE INTERIOR,
CENSUS OFFICE,
Washington, D. C., October 15, 1881.

HON. FRANCIS A. WALKER,
Superintendent of Census.

SIR: I have the honor to submit my report on the culture and curing of tobacco in the United States, together with special reports upon this industry in Arkansas, Florida, Illinois, Indiana, Kentucky, Louisiana, Maryland, Missouri, the New England states, New York, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia, and Wisconsin.

The product of Florida and Louisiana, taken together, amounts to only 77,136 pounds, a very insignificant fraction of the total crop of the Union for 1879.

It is believed that the soil and the climate of Florida are more especially adapted to the growing of tobacco, with the fragrance and texture of Cuba tobacco, than those of any other part of the United States. Enough has been done in this state to show that with proper selection of varieties and intelligent culture and management a product of most excellent quality, closely approximating that of Cuba, can be grown upon a large extent of its territory.

The Perique of Louisiana is unlike any other tobacco in the world, in the peculiar manner of curing and handling and in flavor, but the product is small, and cannot probably be much increased in quantity.

These considerations have made it advisable to include the two states above named in the list of those upon which special reports are made.

To obtain the information necessary, a schedule, prepared in this office, embracing fifty-two distinct questions, was sent to growers of tobacco, and to such other persons as were presumed to possess knowledge on the subject, in every county of the tobacco-growing sections. Subsequently, a second and more elaborate series of questions was incorporated in a supplemental schedule, and distributed with especial care to persons who had positive knowledge of the subject-matter. This supplemental schedule embraced one hundred and seven distinct questions, the object of which was to elicit accurate and trustworthy information about all the details of the industry, from the sowing of the seed until the product passes into the hands of the merchant or manufacturer. It was found necessary to prepare a third series of questions, ten in number, which were submitted to correspondents who had already exhibited a desire to aid in the labor of investigation.

An extended correspondence was required to clear up obscurities and to compare and verify facts. Your special agent made personal examination of numerous districts of territory in which the plant is grown, obtaining in this way a more accurate knowledge of many important details than could possibly be derived from mere correspondence.

The investigation in its scope and character was unprecedented. Tobacco planters, of life-long experience, when asked to make answer as to certain details of the industry, required conference with others to reply intelligently. The examination of farm records, and not unfrequently laborious journeys of many miles, were necessary to obtain the facts desired. The schedules as returned, almost without an exception, evidence a pains-taking care to give full, clear, and accurate information. Special thanks are due to those whose prompt and carefully prepared replies form the basis of these reports.

Acknowledgments are due to Wallace Tappan for valuable data as to the management of tobacco in New York; to Frank R. Diffenderffer for special information as to the industry in Pennsylvania; to R. L. Ragland for an excellent account of tobacco culture in Virginia, Maryland, and West Virginia; to Thomas E. Browder, of Kentucky, for assistance in unraveling the intricacies of the various types grown in that state and in other states; to Professor G. C. Swallow for a description of the soils of Missouri, with their geological derivation; to Professor Goessmann, of Massachusetts Agricultural College, for an interesting account of the soils of the Connecticut valley; to Professor W. C. Kerr, of North Carolina, for a very suggestive report on the tobacco soils of that state; and to H. M. Doak, of Tennessee, for valuable assistance in the preparation of this report. Nor must I omit to mention the services of C. F. Vanderford, of Tennessee, in revising and condensing this report and comparing its statements with the original sources of information.

To Dr. S. S. Rathvon, of Pennsylvania; to M. H. Clark & Bro., of Clarksville, Tennessee; to Sawyer, Wallace & Co., and J. S. Gans & Co., of New York; to Gierke & Niemann, of Baltimore; to John Ott, of Richmond; to F. W. Ferrel, of Danville, Virginia; to Jacob Zimmer, of Miamisburg, Ohio; to C. & R. Dormitzer & Co., of Saint Louis, Mo.; to W. G. Mier, of Louisville, Ky.; and to E. H. Griest, of Cincinnati, Ohio, I am indebted for valuable suggestions.

Very respectfully, your obedient servant,

J. B. KILLEBREW.

CULTURE AND CURING OF TOBACCO IN THE UNITED STATES.

Chapter I.

STATISTICAL REVIEW OF THE TOBACCO CROP OF 1879.

Tobacco is grown to some extent in every state and territory of the Union, except possibly Utah, Montana, and Wyoming. As a staple crop it is produced in only sixteen states, in one of which (Arkansas) the industry is of recent origin. Of the total crop of the United States in 1879 (472,661,158 pounds) these sixteen states produced 469,816,203 pounds. The remainder (2,844,955 pounds) was grown upon small patches in all parts of the country, embracing a range of 22 degrees of latitude and 52 degrees of longitude, and exhibiting the remarkable facility with which the tobacco plant accommodates itself to varying conditions of climate and of soil.

A considerable quantity of tobacco is grown in Alabama, Georgia, Mississippi, South Carolina, and Texas. This product rarely finds its way even to primary markets. It is raised for home use, mostly cured by sun and air, and is consumed almost entirely for pipe-smoking. A very small part of it is stripped and made into twist for chewing, the manipulation being of the rudest character.

In Alabama the plant is grown in all but three counties. The average yield in 1879 was only 206 pounds per acre, an evidence of careless culture and wretched management. More than one-third of all the tobacco produced in the state was grown in the eight counties lying along the Tennessee river—163,264 pounds on 757 acres. In Madison county, upon 224 acres, was produced 36,356 pounds—162 pounds per acre. The very small yield can only be explained by stating the fact that the plant is raised only in patches, simply for a cheap article.

In Georgia three-fourths of the product was made in that part of the state north of Atlanta, though grown to a small extent in ninety-six of the one hundred and thirty-seven counties. The average yield for the state was only 235 pounds, that of Cherokee county (17,900 pounds on 35 acres, an average of 511 pounds) alone showing an approach to profitable production.

In Mississippi the average yield was 282 pounds. Of the total product more than nine-tenths was grown north of the latitude of Jackson, and of this not more than 5,000 pounds were produced along the Yazoo and in the country between that river and the Mississippi. The only county producing a yield indicating even moderately careful culture was De Soto, making 12,026 pounds on 27 acres—445 pounds per acre. The soils of De Soto, Marshall, Tippah, Tishomingo, and of all the northern and eastern counties, except the bottom lands, are well adapted to the production of a fair grade of tobacco, only needing manurial applications and good cultivation to produce remunerative crops.

In South Carolina three-fourths of the total product was grown in nine counties in the northwestern corner of the state. The average yield per acre in this section was 262 pounds, Oconee county making 4,775 pounds on 13 acres—367 pounds per acre. The plant is grown to a limited extent in 23 of the 33 counties of the state.

In Texas the average yield was 323 pounds. The plant was grown in 91 counties; but more than three-fourths of the total product was raised in 35 counties in the eastern part of the state, from Fannin county, on Red river, to Newton county, on the Sabine. Lamar county, in northeastern Texas, adjoining the Indian territory, made the largest yield: 15,003 pounds on 29 acres—an average of 517 pounds. Attempts made by German colonists to produce a marketable tobacco met with little success, the product being coarse and of inferior quality. This may have resulted from an improper selection of varieties, or possibly from unfavorable seasons. Extensive bodies of land well adapted to certain types of tobacco are found in the northern and eastern sections of Texas.

In New Jersey, upon soils and under conditions very much like those of southeastern Pennsylvania, tobacco is grown to some extent, Mercer county producing 69,810 pounds upon 60 acres in 1879, an average of 1,163 pounds, and Burlington county 94,487 pounds upon 76 acres, an average of 1,243 pounds per acre. Only 8,018 pounds were grown in other counties.

Michigan and Minnesota have succeeded well in growing a fair quality of tobacco for home consumption. In Michigan tobacco was planted to a limited extent in forty-seven counties, with an average yield of 494 pounds per acre. Lenawee county, on the Ohio border, reported a yield of 6,863 pounds on 10 acres; Monroe county, on lake Erie, in the southeast corner of the state, 5,757 pounds on 11 acres; and Van Buren county, in the southwest, 4,586 pounds on 9 acres. In Minnesota the average yield was 429 pounds, and the plant is grown in fifty counties. A yield of 643 pounds per acre was reported in Saint Louis county, in latitude 46° 30′—an evidence of the peculiar climatic conditions of this region, and of the wonderful capacity of the plant to adapt itself to a new habitation. In Houston county, in the southeastern corner of the state, on the Mississippi river, a yield of 6,253 pounds on 12 acres was reported; in Meeker county, a degree and a half farther north, 6,403 pounds were grown upon 12 acres.

In Iowa tobacco was grown in eighty-seven of ninety-nine counties. Seven counties—Marshall and Grundy, in the central portion of the state; Decatur, Wayne, and Davis, on the Missouri border; Jones, in the central eastern part; and Madison, in the central southern part—together produced 160,391 pounds, 38 per cent. of the total product of the state. The yield per acre (in Marshall 953 pounds, and in Grundy 1,478 pounds) indicates a favorable soil and evidences good culture. The average yield of the state is 608 pounds, exceeding that of Virginia 40 pounds per acre. Experiments made with the White Burley tobacco have given satisfactory results.

In Kansas tobacco was planted in sixty-two counties. Two counties, Franklin and Chautauqua, produced more than 10,000 pounds each, the former averaging 778 and the latter 567 pounds per acre. The product is red, coarse, and of inferior quality, and is used only for home consumption.

In Otoe county, Nebraska, there were grown 10,065 pounds of tobacco on 11 acres, an average of 915 pounds, but nothing is known of the character of the product.

California produced some bright yellow tobacco of good quality in 1874; but the industry has not grown in importance: an indication that the culture has not been profitable. San Benito county reported 59,100 pounds grown in 1879 on 64 acres, an average of 923 pounds per acre; Los Angeles 8,200 pounds, grown on 10 acres. So far as can be ascertained only a few small crops were grown in 1880. Replies received to inquiries as to tobacco-growers in San Benito state that no tobacco was planted in that county, and that only two persons were known to be engaged in its production in Santa Clara.

Tobacco is grown to a small extent in Arizona, New Mexico, Nevada, Colorado, Idaho, Dakota, Oregon, and Washington territory, but the characteristics and capabilities of the soils of this vast region are comparatively unknown.

The following tabular statement shows the acreage, production, yield per acre, value of crop in farmers' hands or in primary markets, value per hundred pounds, value per acre, cost per hundred pounds and per acre, and profit per hundred pounds and per acre of the tobacco crop of 1879 in the states producing it as a staple, with the rank of each state in acreage, production, etc. Kentucky, Ohio, Missouri, and Illinois produce, in separate districts of their respective territory, two or more distinct classes of tobacco, differing widely in the character and in the value of the cured product. The figures are given in the table for these districts separately:

RANK OF EACH STATE.							STATES.	Acreage.	Production (pounds).	Value of crop in farmers' hands.	Value per 100 pounds.	Value per acre.	Cost of production per 100 pounds.	Difference between cost and value per 100 pounds.
Production.	Acreage.	Total value.	Value per acre.	Value per 100 pounds.	Cost per 100 pounds.	Difference of cost and value.								
1	1	1	0	13	13	12	Kentucky	226, 120	171, 120, 784	$11, 080, 782	$6 48	$40 04	$4 90	$1 58
							White Burley district	53, 474	46, 862, 687	4, 920, 613	10 50	92 02	6 60	3 90
							Shipping districts	170, 421	123, 428, 119	6, 169, 169	5 00	36 20	4 25	0 75
							Remainder (a)	2, 225	829, 978	......	......	......	......	......
2	2	2	14	12	10	13	Virginia	140, 791	79, 988, 868	5, 399, 240	6 75	38 35	5 33	1 42
3	7	3	4	5	5	3	Pennsylvania	27, 566	36, 943, 272	4, 636, 380	12 55	168 19	8 42	4 13
4	6	5	7	9	9	10	Ohio	34, 676	34, 735, 235	2, 670, 484	7 69	77 01	5 91	1 78
							White Burley district	11, 255	10, 826, 083	1, 299, 202	12 00	115 43	7 70	4 30
							Spangled district	7, 551	6, 328, 040	316, 402	5 00	41 90	4 69	0 31
							Seed-leaf district	15, 460	17, 302, 783	1, 054, 890	6 10	68 23	5 27	0 83
							Remainder (a)	410	277, 720	......	......	......	......	......
5	4	8	16	14	14	18	Tennessee	41, 532	29, 365, 052	1, 538, 287	5 24	37 04	4 50	0 74
6	3	4	8	2	4	2	North Carolina	57, 208	26, 986, 213	3, 805, 056	14 10	66 51	9 33	4 77
7	5	7	10	11	11	9	Maryland (b)	38, 174	26, 082, 147	1, 825, 750	7 00	47 83	5 01	1 99
8	11	6	2	3	2	4	Connecticut	8, 666	14, 044, 652	1, 929, 982	13 74	222 71	9 85	3 89
9	8	12	13	17	17	15	Missouri	15, 521	12, 015, 657	600, 256	5 00	38 67	3 58	1 42
							Manufacturing district	2, 977	1, 701, 391	136, 114	8 00	45 72	5 25	2 75
							Shipping district	12, 544	10, 314, 266	464, 142	4 50	37 00	3 41	1 09
10	10	9	6	8	12	5	Wisconsin	8, 810	10, 608, 423	899, 118	8 48	102 06	4 95	3 53
11	9	13	15	16	16	16	Indiana	11, 955	8, 872, 842	443, 642	5 00	37 11	3 60	1 40
12	13	10	5	7	6	6	New York	4, 937	6, 481, 431	721, 059	11 12	146 05	8 00	3 12
13	15	11	3	4	3	7	Massachusetts	3, 358	5, 369, 436	683, 575	12 73	203 57	9 72	3 01
14	12	14	17	15	15	17	Illinois	5, 612	3, 935, 825	202, 661	5 15	36 11	4 17	0 98
							Seed-leaf district	752	1, 043, 975	87, 036	8 34	115 74	4 61	3 73
							Shipping district	4, 860	2, 891, 850	115, 625	4 00	23 79	4 00	......
15	14	15	12	10	8	14	West Virginia	4, 071	2, 296, 146	170, 374	7 42	41 85	6 00	1 42
16	17	16	18	18	18	11	Arkansas (c)	2, 064	970, 220	41, 547	4 28	20 13	2 70	1 58
24	30	0	1	6	1	8	New Hampshire (d)	88	170, 843	20, 501	12 00	232 97	10 00	2 00
32	29	0	11	1	7	1	Florida (d)	90	21, 182	3, 995	18 86	44 39	7 50	11 36

a Not included in the districts as defined in this report. Very little of this tobacco is marketed, being retained by the growers for home consumption.
b A small amount of seed-leaf is grown.
c Not more than one-half the product of Arkansas is marketed.
d New Hampshire and Florida are introduced into this table as indicating extremes of price for the one and of yield per acre for the other. The results of tobacco culture in these two states afford a curious study.

The tables on the following pages show the acreage and tobacco crop of the year 1879.

TOBACCO CROP OF THE UNITED STATES, BY COUNTIES (CENSUS OF 1880).

ALABAMA.

County.	Acres.	Pounds.	County.	Acres.	Pounds.	County.	Acres.	Pounds.
Total	2, 197	452, 426	Crenshaw	33	9, 256	Macon	6	680
Autauga	8	1, 844	Cullman	41	8, 888	Madison	224	86, 356
Baldwin	1	350	Dale	2	250	Marengo	43	7, 479
Barbour	22	3, 512	Dallas	13	1, 678	Marion	44	8, 285
Bibb	36	5, 248	De Kalb	19	4, 322	Marshall	48	9, 710
Blount	48	9, 912	Elmore	12	2, 585	Monroe	11	2, 496
Bullock	3	833	Etowah	47	11, 333	Montgomery	2	318
Butler	7	2, 559	Fayette	37	7, 184	Morgan	52	17, 795
Calhoun	29	6, 592	Franklin	17	3, 087	Perry	24	4, 522
Chambers	39	8, 055	Geneva	4	948	Pickens	51	8, 637
Cherokee	82	14, 318	Greene	41	6, 829	Pike	5	764
Chilton	4	537	Hale	16	5, 540	Randolph	44	11, 521
Choctaw	23	4, 322	Henry	24	4, 490	Russell	2	303
Clarke	19	2, 849	Jackson	99	17, 127	Saint Clair	53	11, 208
Clay	85	13, 468	Jefferson	55	17, 649	Shelby	10	2, 208
Cleburne	85	15, 113	Lamar	46	10, 420	Sumter	18	2, 627
Coffee	5	1, 403	Lauderdale	105	19, 870	Talladega	30	5, 520
Colbert	34	8, 026	Lawrence	105	27, 276	Tallapoosa	21	5, 350
Conecuh	7	1, 210	Lee	11	1, 766	Tuscaloosa	20	5, 568
Coosa	28	5, 258	Limestone	107	32, 084	Walker	69	10, 900
Covington	8	1, 764				Wilcox	15	2, 695
						Winston	3	571

ARIZONA.

Pima	1	600						

ARKANSAS.

County.	Acres.	Pounds.	County.	Acres.	Pounds.	County.	Acres.	Pounds.
Total	2, 064	970, 220	Greene	8	5, 785	Perry	14	5, 910
Arkansas	15	5, 052	Hempstead	12	3, 600	Phillips	12	11, 172
Ashley	15	4, 194	Hot Spring	28	5, 828	Pike	16	4, 899
Baxter	13	6, 470	Howard	23	7, 749	Poinsett	4	2, 470
Benton	547	395, 982	Independence	44	21, 726	Polk	10	2, 640
Boone	81	34, 089	Izard	31	13, 212	Pope	38	12, 570
Bradley	23	1, 433	Jackson	11	4, 790	Prairie	9	4, 860
Calhoun	8	1, 470	Jefferson	2	250	Pulaski	13	4, 965
Carroll	28	16, 540	Johnson	27	7, 941	Randolph	27	13, 348
Clark	18	3, 782	La Fayette	10	3, 217	Saint Francis	21	9, 276
Clay	21	11, 890	Lawrence	8	4, 600	Saline	24	9, 418
Columbia	40	13, 833	Lee	12	2, 962	Scott	13	5, 806
Conway	24	8, 591	Lincoln	9	3, 276	Searcy	18	9, 984
Craighead	44	24, 942	Little River	10	2, 747	Sebastian	27	8, 576
Crawford	13	1, 912	Logan	98	18, 977	Sevier	23	6, 284
Crittenden	13	6, 105	Lonoke	17	6, 107	Sharp	33	10, 07[illegible]
Cross	19	4, 406	Madison	45	25, 156	Stone	11	5, 4[illegible]0
Dallas	19	8, 410	Marion	11	3, 821	Union	49	10, [illegible]15
Desha	9	3, 057	Miller	4	1, 335	Van Buren	27	10, 469
Dorsey	18	4, 421	Mississippi	4	1, 587	Washington	51	26, 857
Drew	12	5, 608	Monroe	5	2, 590	White	48	28, 184
Faulkner	44	11, 974	Montgomery	13	2, 685	Woodruff	5	2, 485
Franklin	9	2, 404	Nevada	6	1, 997	Yell	16	4, 070
Fulton	4	3, 400	Newton	34	12, 466			
Garland	21	4, 751	Ouachita	13	3, 588			
Grant	22	9, 310						

CALIFORNIA.

County.	Acres.	Pounds.	County.	Acres.	Pounds.	County.	Acres.	Pounds.
Total	84	78, 317	Humboldt	1	850	Nevada	1	1, 000
Butte	1	200	Los Angeles	10	8, 200	San Benito	64	59, 100
Calaveras	1	500	Mendocino	1	360	San Joaquin	2	900
Del Norte	1	1, 040	Merced	1	500	Sonoma	1	667

CONNECTICUT.

County.	Acres.	Pounds.	County.	Acres.	Pounds.	County.	Acres.	Pounds.
Total	8,606	14,044,652	Litchfield	1,586	2,211,151	New London	10	29,623
			Middlesex	573	906,753	Tolland	405	600,634
Fairfield	802	973,933	New Haven	167	215,195	Windham	2	1,850
Hartford	5,112	9,039,514						

DAKOTA.

Total	5	1,897	Bonhomme	3	1,057	Clay	2	840

DELAWARE.

Total	4	1,278	Kent	3	740	New Castle	1	538

DISTRICT OF COLUMBIA.

Washington	2	1,400						

FLORIDA.

Total	90	21,182	Jackson	4	834	Orange	1	500
			Jefferson	5	507	Santa Rosa	7	910
Alachua	11	980	Lafayette	4	1,180	Sumter	1	290
Calhoun	3	915	Leon	10	3,095	Suwannee	2	715
Clay	1	300	Madison	5	1,045	Walton	3	407
Columbia	3	785	Marion	18	1,258	Washington	2	415
Gadsden	14	6,677	Monroe	1	300			

GEORGIA.

Total	971	228,590	Floyd	20	5,069	Murray	10	2,375
			Forsyth	26	7,570	Newton	1	235
Appling	7	1,089	Franklin	22	4,266	Oconee	3	995
Baldwin	1	420	Fulton	5	1,590	Paulding	34	7,286
Bartow	30	9,744	Gilmer	7	2,302	Pickens	22	6,640
Bulloch	6	380	Gordon	14	4,653			
Calhoun	2	311	Greene	7	1,940	Pike	6	1,339
			Gwinnett	40	11,588	Polk	22	6,130
Carroll	15	2,792	Habersham	10	2,968	Rabun	18	3,643
Catoosa	7	2,337	Hall	45	8,201	Spalding	3	589
Chattahoochee	3	510	Hancock	7	1,029	Stewart	1	390
Chattooga	4	980	Haralson	35	10,138			
Cherokee	35	17,900	Harris	5	1,108	Sumter	1	470
			Hart	29	5,204	Talbot	4	719
Clarke	1	445	Heard	11	1,630	Taliaferro	1	205
Clinch	1	275	Henry	2	420	Taylor	3	1,000
Cobb	4	740	Houston	3	374	Telfair	1	215
Coffee	5	1,093	Jackson	14	4,088			
Colquitt	5	1,166	Jasper	1	277	Thomas	2	659
			Jones	5	1,923	Towns	46	3,127
Coweta	18	2,454	Lincoln	10	4,030	Troup	5	2,135
Crawford	3	766	Lumpkin	46	10,921	Union	43	7,707
Dade	3	435	McDuffie	2	355	Upson	3	311
Dawson	19	3,902	Macon	1	355			
Decatur	2	863	Madison	1	480	Walker	7	2,377
			Marion	3	645	Walton	5	1,957
De Kalb	6	1,676	Meriwether	23	5,372	Ware	1	235
Dooly	2	387	Milton	6	975	White	24	4,738
Elbert	5	1,020	Monroe	4	1,009	Whitfield	20	5,207
Fannin	53	9,807	Montgomery	5	500			
Fayette	11	2,537				Worth	9	1,780

IDAHO.

Nez Percé	2	400						

ILLINOIS.

County.	Acres.	Pounds.	County.	Acres	Pounds.	County.	Acres.	Pounds.
Total	5,612	3,935,825	Hancock	6	1,655	Moultrie	11	4,430
Adams	17	8,320	Hardin	4	2,810	Ogle	2	1,335
Alexander	13	2,150	Henry	2	795	Peoria	3	1,219
Bond	14	4,660	Iroquois	30	9,825	Perry	13	6,705
Boone	1	1,050	Jackson	19	6,770	Piatt	2	1,580
Brown	8	3,137	Jasper	77	37,317	Pike	10	12,053
Bureau	1	460	Jefferson	43	22,101	Pope	102	63,013
Calhoun	5	3,150	Jersey	15	5,649	Pulaski	76	46,800
Carroll	24	33,505	Jo Daviess	462	636,539	Randolph	8	3,001
Cass	9	4,460	Johnson	366	188,294	Richland	16	8,114
Champaign	10	4,070	Kankakee	3	1,550	Rock Island	1	510
Christian	11	5,060	Knox	3	1,778	Saint Clair	1	485
Clark	44	19,321	La Salle	3	955	Saline	1,070	785,897
Clay	42	21,085	Lawrence	15	10,985	Sangamon	4	2,652
Clinton	12	4,657	Lee	7	2,414	Schuyler	4	1,665
Coles	36	13,850	Livingston	2	685	Scott	6	3,043
Cook	21	20,100	Logan	2	710	Shelby	56	25,022
Crawford	83	65,213	McDonough	17	8,491	Stephenson	266	378,931
Cumberland	30	15,464	McHenry	4	3,160	Tazewell	5	2,575
De Witt	6	3,490	McLean	2	845	Union	6	2,155
Douglas	7	3,840	Macon	6	2,140	Vermilion	18	8,405
Edgar	35	15,326	Macoupin	22	9,742	Wabash	15	6,040
Edwards	1	425	Madison	11	6,825	Warren	1	450
Effingham	31	14,078	Marion	38	20,117	Washington	9	4,920
Fayette	29	14,156	Marshall	2	1,075	Wayne	42	28,865
Franklin	134	98,072	Massac	120	89,280	White	47	37,780
Fulton	25	18,269	Menard	2	620	Williamson	1,368	752,904
Gallatin	35	10,330	Mercer	1	345	Woodford	2	1,030
Greene	14	6,538	Montgomery	21	8,625			
Grundy	3	880	Morgan	6	2,214			
Hamilton	382	244,600						

INDIANA.

County.	Acres.	Pounds.	County.	Acres.	Pounds.	County.	Acres.	Pounds.
Total	11,955	8,872,842	Hendricks	12	5,826	Pike	974	687,674
Adams	7	2,635	Henry	13	11,225	Porter	3	1,417
Allen	19	17,093	Howard	11	6,670	Posey	43	25,935
Bartholomew	40	37,304	Huntington	6	3,035	Pulaski	11	6,060
Blackford	3	1,100	Jackson	19	10,602	Putnam	20	11,024
Boone	25	16,912	Jasper	7	4,627	Randolph	21	8,601
Brown	251	190,265	Jay	4	2,110	Ripley	20	11,340
Carroll	10	5,159	Jefferson	33	23,821	Rush	2	1,110
Cass	3	483	Jennings	21	10,585	Saint Joseph	2	925
Clark	37	24,165	Johnson	5	3,935	Scott	14	4,780
Clay	13	5,800	Knox	7	4,945	Shelby	47	40,791
Clinton	15	7,979	Kosciusko	6	3,302	Spencer	3,355	2,593,559
Crawford	20	10,920	Lagrange	1	610	Starke	2	1,357
Daviess	35	20,280	La Porte	2	735	Steuben	1	360
Dearborn	1	200	Lawrence	20	11,542	Sullivan	48	22,125
Decatur	7	2,347	Madison	9	4,745	Switzerland	79	79,298
De Kalb	1	387	Marion	5	2,256	Tippecanoe	7	3,045
Delaware	5	2,231	Marshall	8	2,624	Tipton	21	9,821
Dubois	1,144	776,024	Martin	20	10,671	Union	4	2,325
Elkhart	3	1,075	Miami	4	1,630	Vanderburgh	9	4,355
Fayette	9	6,450	Monroe	28	16,237	Vermillion	10	5,565
Floyd	1	205	Montgomery	13	6,249	Vigo	8	4,245
Fountain	25	8,404	Morgan	14	6,499	Wabash	29	20,280
Franklin	5	1,097	Newton	2	850	Warren	13	5,850
Fulton	5	1,814	Noble	2	863	Warrick	4,273	3,253,323
Gibson	123	91,615	Ohio	1	1,000	Washington	76	50,606
Grant	4	1,775	Orange	57	41,830	Wayne	248	268,024
Greene	125	92,350	Owen	42	21,090	Wells	9	6,402
Hamilton	9	4,579	Parke	26	11,582	White	6	4,215
Hancock	6	3,110	Perry	232	164,480	Whitley	1	800
Harrison	10	6,536						

IOWA.

County.	Acres.	Pounds.	County.	Acres.	Pounds.	County.	Acres.	Pounds.
Total	692	420,477	Delaware	7	3,954	Marion	9	7,250
			Des Moines	3	1,427	Marshall	24	22,875
Adair	2	1,126	Dubuque	10	7,020	Mills	3	1,315
Adams	4	2,486	Fayette	7	3,404	Mitchell	3	1,534
Allamakee	8	4,531	Floyd	4	1,920	Monona	4	1,630
Appanoose	12	6,841	Franklin	4	2,630	Monroe	4	1,855
Audubon	3	1,542	Fremont	11	6,699	Montgomery	3	1,265
			Greene	1	631	Muscatine	2	899
Benton	3	1,590	Grundy	22	32,525	O'Brien	1	704
Black Hawk	3	1,280	Guthrie	6	3,210	Page	6	3,885
Boone	6	4,197	Hamilton	3	1,584	Palo Alto	1	425
Bremer	2	571	Hancock	1	263	Polk	3	1,725
Buchanan	3	1,952	Hardin	2	555	Pottawattamie	4	2,485
			Harrison	5	2,805	Poweshiek	7	3,430
Buena Vista	1	550	Henry	12	7,396	Ringgold	11	6,026
Butler	10	7,875	Howard	4	1,709	Sac	1	550
Calhoun	1	700	Iowa	8	4,746	Shelby	8	3,171
Cass	1	870	Jackson	8	3,222	Story	13	4,599
Cedar	4	3,468	Jasper	12	6,228	Tama	18	3,854
			Jefferson	17	8,155	Taylor	4	1,765
Cerro Gordo	8	5,520	Johnson	5	3,470	Union	5	1,620
Cherokee	8	5,000	Jones	31	31,507	Van Buren	22	9,173
Chickasaw	12	7,666	Keokuk	13	8,220	Wapello	8	5,175
Clarke	14	8,655	Kossuth	2	1,237	Warren	7	3,402
Clayton	10	4,135	Lee	15	4,256	Washington	5	3,040
Clinton	1	250	Linn	8	4,277	Wayne	31	19,835
Crawford	1	982	Louisa	3	1,070	Webster	7	1,462
Dallas	6	4,556	Lucas	11	7,000	Winnebago	7	9,692
Davis	10	12,186	Madison	37	14,175	Winneshiek	3	1,513
Decatur	47	27,288	Mahaska	11	5,705	Worth	6	2,816

KANSAS.

County.	Acres.	Pounds.	County.	Acres.	Pounds.	County.	Acres.	Pounds.
Total	333	191,669	Ellis	6	4,505	Montgomery	4	2,010
			Franklin	15	11,670	Morris	1	770
Allen	5	1,886	Greenwood	4	3,050	Nemaha	4	1,892
Anderson	3	1,425	Harper	1	300	Neosho	12	7,250
Atchison	10	6,088	Harvey	3	1,625	Osage	6	2,651
Barton	1	610				Osborne	1	585
Bourbon	8	2,055	Jackson	5	2,890	Ottawa	1	805
Brown	2	830	Jefferson	8	5,145	Phillips	2	1,458
Butler	7	4,785	Jewell	6	3,120	Pottawatomie	9	5,040
Chase	1	360	Johnson	5	2,460	Republic	12	7,096
Chautauqua	20	11,345	Kingman	4	5,000	Riley	2	235
Cherokee	7	2,285	Labette	8	4,837	Rush	9	5,575
Clay	4	1,700	Leavenworth	6	3,785	Sedgwick	1	320
Cloud	7	4,415	Lincoln	1	266	Shawnee	2	850
Coffey	4	2,505	Linn	6	5,500	Smith	3	2,412
Cowley	3	960	Lyon	6	2,925	Sumner	1	540
Crawford	7	4,580				Wabaunsee	3	1,495
Davis	1	705	McPherson	1	600	Washington	11	5,060
Dickinson	1	500	Marion	2	800	Wilson	7	4,005
Doniphan	9	8,835	Marshall	6	2,070	Woodson	5	3,045
Douglas	11	2,718	Miami	14	6,600	Wyandotte	8	5,150
Elk	9	5,216	Mitchell	2	675			

KENTUCKY.

County.	Acres.	Pounds.	County.	Acres.	Pounds.	County.	Acres.	Pounds.
Total	226,120	171,120,784	Bath	112	70,319	Boyle	18	6,262
Adair	1,142	696,748	Bell	24	4,567	Bracken	7,150	6,126,635
Allen	283	160,355	Boone	1,706	1,770,058	Breathitt	54	8,160
Anderson	43	22,436	Bourbon	19	17,601	Breckinridge	5,444	3,932,565
Ballard	5,195	3,760,743	Boyd	42	19,711	Bullitt	28	8,508
Barren	3,120	2,305,586						

KENTUCKY—Continued.

County.	Acres.	Pounds.	County.	Acres.	Pounds.	County.	Acres.	Pounds.
Butler	1,652	1,030,029	Henry	4,371	4,015,708	Muhlenburgh	3,856	2,731,716
Caldwell	4,272	3,215,002	Hickman	658	461,946	Nelson	14	4,722
Calloway	5,035	3,477,520	Hopkins	6,744	5,028,435	Nicholas	938	750,115
Campbell	801	704,527	Jackson	41	9,288	Ohio	4,707	3,187,999
Carroll	2,789	2,584,115	Jefferson	26	11,632	Oldham	365	205,860
Carter	59	22,403	Jessamine	6	1,355	Owen	7,097	5,765,351
Casey	125	67,449	Johnson	50	12,566	Owsley	20	9,005
Christian	18,475	12,577,574	Kenton	2,858	2,322,771	Pendleton	5,302	4,072,201
Clark	38	17,187	Knox	37	16,068	Pike	100	18,048
Clay	51	12,274	La Rue	593	350,850	Powell	38	8,543
Clinton	143	77,408	Laurel	68	23,202	Pulaski	106	80,516
Crittenden	2,368	1,647,936	Lawrence	101	23,392	Robertson	2,305	1,722,398
Cumberland	885	671,070	Lee	29	10,679	Rockcastle	52	17,181
Daviess	12,260	9,523,451	Leslie	11	2,956	Rowan	41	24,430
Edmonson	727	450,676	Letcher	23	2,907	Russell	119	75,469
Elliott	112	35,083	Lewis	1,516	1,036,996	Scott	210	160,535
Estill	58	18,386	Lincoln	97	35,214	Shelby	661	620,262
Fayette	2	702	Livingston	1,127	769,578	Simpson	2,240	1,668,055
Fleming	1,548	1,366,855	Logan	8,104	6,039,983	Spencer	41	28,185
Floyd	73	12,845	Lyon	1,855	980,403	Taylor	1,526	932,020
Franklin	1,208	880,361	McCracken	3,377	2,419,825	Todd	8,456	5,808,425
Fulton	537	410,337	McLean	4,934	3,729,616	Trigg	8,481	5,667,143
Gallatin	1,249	1,265,367	Madison	82	30,173	Trimble	2,070	1,658,307
Garrard	80	45,612	Magoffin	73	11,464	Union	3,634	2,996,203
Grant	2,436	2,130,215	Marion	171	101,980	Warren	3,565	2,605,388
Graves	11,318	8,901,434	Marshall	2,085	1,411,692	Washington	87	43,800
Grayson	1,779	1,065,244	Martin	30	6,484	Wayne	50	20,264
Green	2,345	1,417,070	Mason	5,405	6,261,385	Webster	6,447	4,740,082
Greenup	42	21,693	Meade	694	488,256	Whitley	10	3,408
Hancock	3,037	2,155,180	Menifee	30	18,368	Wolfe	50	29,520
Hardin	540	374,302	Mercer	20	14,360	Woodford	1	580
Harlan	2	790	Metcalfe	942	614,577			
Harrison	1,657	1,201,972	Monroe	332	187,141			
Hart	3,027	2,220,626	Montgomery	123	123,472			
Henderson	12,468	10,812,631	Morgan	60	9,981			

LOUISIANA.

Parish.	Acres.	Pounds.	Parish.	Acres.	Pounds.	Parish.	Acres.	Pounds.
Total	253	55,954	Iberia	2	516	Sabine	12	2,389
PARISH.			Jackson	9	2,480	Saint Helena	1	225
Avoyelles	30	5,262	La Fayette	24	2,384	Saint James	64	14,080
Bossier	4	1,005	Lincoln	6	2,060	Saint Landry	7	1,262
Caddo	3	1,268	Livingston	3	835	Saint Martin	7	775
Calcasieu	9	2,910				Tangipahoa	2	275
Caldwell	8	1,780				Union	2	665
Catahoula	1	370	Morehouse	1	380	Vermillion	5	1,112
De Soto	14	4,286	Natchitoches	1	405	Vernon	1	210
East Baton Rouge	1	400	Ouachita	1	445	Webster	8	1,155
Franklin	2	585	Point Coupée	1	500			
Grant	1	220	Red River	1	375	Winn	22	4,846

MAINE.

Sagadahoc	1	250						

MARYLAND.

County.	Acres.	Pounds.	County.	Acres.	Pounds.	County.	Acres.	Pounds.
Total	38,174	26,082,147	Carroll	162	137,171	Montgomery	1,053	806,036
COUNTY.			Cecil	43	59,036	Prince George's	9,637	6,575,246
Allegany	2	1,115	Charles	7,013	5,145,500	Saint Mary's	5,528	4,420,316
Anne Arundel	6,271	4,441,010	Frederick	429	370,840	Somerset	2	1,355
Baltimore	12	9,601	Garrett	4	1,927	Washington	5	7,050
Calvert	6,848	3,886,845	Harford	52	68,085	Wicomico	3	1,388
Caroline	1	1,422	Howard	208	138,930	Worcester	1	265

MASSACHUSETTS.

County.	Acres.	Pounds.	County.	Acres.	Pounds.	County.	Acres.	Pounds.
Total	3,858	5,369,436	Franklin	1,211	1,926,233	Hampshire	1,448	2,305,442
Berkshire	60	85,747	Hampden	638	1,051,474	Norfolk	1	540

MICHIGAN.

County.	Acres.	Pounds.	County.	Acres.	Pounds.	County.	Acres.	Pounds.
Total	170	83,969	Ingham	2	768	Muskegon	1	240
Allegan	4	1,983	Ionia	2	1,136	Newaygo	2	1,354
Antrim	3	1,925	Isabella	1	425	Oakland	2	345
Barry	3	2,160	Jackson	5	3,171	Oceana	3	1,735
Bay	1	286	Kalamazoo	1	485	Ottawa	3	1,378
Benzie	1	965	Kent	4	3,147	Saginaw	4	1,873
Berrien	6	2,126	Lapeer	5	2,608	Saint Clair	7	2,908
Branch	4	2,213	Leelanaw	5	1,937	Saint Joseph	2	1,376
Calhoun	3	730	Lenawee	10	6,863	Sanilac	4	2,257
Cass	6	3,460	Macomb	8	1,385	Shiawassee	8	2,225
Eaton	5	2,850	Manistee	1	287	Tuscola	8	5,303
Emmet	3	2,080	Manitou	2	322	Van Buren	9	4,586
Genesee	2	540	Midland	1	230	Washtenaw	2	963
Gratiot	4	1,537	Monroe	11	5,757	Wayne	3	1,750
Hillsdale	9	2,189	Montcalm	1	550			
Huron	4	1,554						

MINNESOTA.

County.	Acres.	Pounds.	County.	Acres.	Pounds.	County.	Acres.	Pounds.
Total	163	69,922	Goodhue	2	405	Ramsey	2	1,320
Anoka	3	1,025	Hennepin	3	966	Redwood	1	310
Becker	1	383	Houston	12	6,253	Renville	2	377
Benton	3	639	Isanti	3	2,090	Rice	7	2,496
Blue Earth	2	600	Kandiyohi	4	2,010	Saint Louis	3	1,930
Brown	3	936	Le Sueur	6	3,401	Scott	4	2,480
Carver	3	2,661	Lincoln	1	212	Sherburne	5	2,817
Chippewa	2	1,276	McLeod	4	1,573	Sibley	3	530
Chisago	1	442	Meeker	12	6,403	Stearns	6	3,265
Cottonwood	2	610	Morrison	4	1,071	Steele	3	1,050
Dakota	1	390	Mower	4	1,975	Swift	2	1,025
Dodge	2	1,070	Nicollet	4	545	Todd	1	706
Douglas	6	2,305	Olmsted	1	355	Waseca	3	1,512
Faribault	1	300	Otter Tail	4	1,965	Washington	1	930
Fillmore	7	2,525	Polk	1	210	Watonwan	1	430
Freeborn	2	575				Winona	2	690
						Wright	8	2,237

MISSISSIPPI.

County.	Acres.	Pounds.	County.	Acres.	Pounds.	County.	Acres.	Pounds.
Total	1,471	414,663	Itawamba	32	7,520	Noxubee	30	8,249
Adams	5	1,264	Jasper	17	3,649	Oktibbeha	15	2,700
Alcorn	40	14,852	Jefferson	9	2,027	Panola	19	3,347
Amite	16	3,230	Jones	17	4,683	Pike	1	400
Attala	32	10,711	Kemper	16	6,716	Pontotoc	41	15,207
Benton	33	10,634	La Fayette	21	5,803	Prentiss	38	13,406
Bolivar	1	600	Lauderdale	27	7,586	Rankin	20	5,708
Calhoun	27	7,926	Lawrence	35	5,288	Scott	34	11,044
Carroll	7	2,460	Leake	56	13,680	Simpson	4	1,320
Chickasaw	83	10,926	Lee	45	11,100	Smith	20	10,492
Choctaw	38	12,300	Le Flore	3	907	Sumner	27	5,732
Claiborne	3	1,010	Lincoln	32	5,442	Tallahatchie	9	1,924
Clarke	28	8,870	Lowndes	6	1,734	Tate	6	1,030
Clay	29	11,750	Madison	28	10,966	Tippah	71	25,127
Copiah	22	5,440	Marion	2	437	Tishomingo	44	13,526
Covington	18	4,743	Marshall	33	9,783	Union	25	7,578
De Soto	27	12,026	Monroe	90	16,864	Warren	1	207
Franklin	13	3,082	Montgomery	26	6,853	Wayne	12	8,204
Grenada	7	2,113	Neshoba	27	6,091	Wilkinson	2	628
Hinds	17	3,568	Newton	20	8,525	Winston	27	9,489
Holmes	11	4,321				Yalobusha	14	5,323
						Yazoo	2	1,300

MISSOURI.

County.	Acres.	Pounds.
Total	15,521	12,015,657
Adair	37	26,838
Andrew	16	12,257
Atchison	18	12,098
Audrain	34	20,477
Barry	63	42,500
Barton	16	10,135
Bates	28	15,649
Benton	19	10,390
Bollinger	20	9,189
Boone	66	40,956
Buchanan	23	12,035
Butler	28	12,530
Caldwell	4	1,939
Callaway	1,175	570,231
Camden	11	4,838
Cape Girardeau	33	17,222
Carroll	670	639,325
Carter	5	3,595
Cass	7	2,810
Cedar	53	36,683
Chariton	4,674	4,384,924
Christian	11	7,601
Clark	13	6,278
Clay	3	1,243
Clinton	20	13,972
Cole	11	5,430
Cooper	20	21,252
Crawford	18	7,400
Dade	10	5,422
Dallas	18	11,219
Daviess	25	13,330
De Kalb	10	6,550
Dent	14	9,075
Douglas	28	18,189
Dunklin	26	14,051
Franklin	147	94,154
Gasconade	16	8,624
Gentry	23	16,800
Greene	40	16,528
Grundy	24	11,755
Harrison	74	42,952
Henry	20	9,543
Hickory	13	4,562
Holt	28	18,337
Howard	795	604,704
Howell	18	9,904
Iron	7	2,021
Jackson	56	41,986
Jasper	4	2,420
Jefferson	9	5,861
Johnson	25	13,625
Knox	42	20,983
Laclede	17	8,533
La Fayette	22	16,060
Lawrence	19	10,305
Lewis	8	4,330
Lincoln	498	308,000
Linn	420	382,133
Livingston	322	305,078
McDonald	23	11,045
Macon	865	728,584
Madison	27	10,640
Maries	7	4,135
Marion	51	40,960
Mercer	57	29,770
Miller	27	13,543
Mississippi	23	21,010
Moniteau	17	7,810
Monroe	527	421,232
Montgomery	283	181,761
Morgan	32	8,660
New Madrid	29	14,243
Newton	20	13,404
Nodaway	45	23,874
Oregon	51	19,530
Osage	66	52,010
Ozark	29	19,577
Pemiscot	3	2,190
Perry	16	6,694
Pettis	26	13,719
Phelps	40	18,706
Pike	653	408,473
Platte	11	6,200
Polk	44	24,575
Pulaski	22	10,910
Putnam	57	34,143
Ralls	12	6,083
Randolph	889	701,052
Ray	41	22,844
Reynolds	14	6,867
Ripley	20	8,957
Saint Charles	90	52,452
Saint Clair	22	12,101
Saint François	36	15,088
Sainte Genevieve	18	7,320
Saint Louis	4	1,388
Saline	633	540,175
Schuyler	48	32,252
Scotland	26	15,284
Scott	30	16,846
Shannon	9	3,370
Shelby	148	126,567
Stoddard	79	54,183
Stone	25	5,626
Sullivan	59	30,290
Taney	8	3,685
Texas	20	10,745
Vernon	20	12,122
Warren	155	86,672
Washington	34	8,995
Wayne	33	14,005
Webster	42	38,885
Worth	7	3,909
Wright	57	40,588

NEBRASKA.

County.	Acres.	Pounds.
Total	101	57,070
Antelope	1	340
Boone	2	1,380
Burt	4	1,835
Cass	9	8,925
Cedar	1	380
Clay	2	890
Cuming	2	600
Custer	1	425
Dawson	6	2,600
Dixon	1	300
Douglas	2	1,700
Fillmore	1	248
Franklin	1	750
Furnas	1	445
Gage	4	2,740
Hamilton	2	1,475
Harlan	1	670
Holt	5	2,540
Jefferson	2	1,145
Johnson	1	510
Kearney	1	446
Lancaster	3	1,287
Merrick	1	575
Nemaha	4	2,100
Nuckolls	1	480
Otoe	11	10,065
Pawnee	3	1,455
Platte	1	270
Red Willow	1	225
Richardson	9	4,861
Saline	4	2,467
Saunders	3	1,110
Sherman	1	620
Thayer	1	400
Washington	1	944
Webster	5	3,886
York	2	1,800

NEVADA.

County.	Acres.	Pounds.
Washoe	2	1,500

NEW HAMPSHIRE.

County.	Acres.	Pounds.
Total	88	170,843
Cheshire	72	141,218
Coos	1	1,000
Sullivan	15	28,625

NEW JERSEY.

County.	Acres.	Pounds.	County.	Acres.	Pounds.	County.	Acres.	Pounds.
Total	152	172, 315	Gloucester	2	570	Passaic	1	318
			Hunterdon	2	590	Salem	1	580
Bergen	1	250	Mercer	60	60, 810	Sussex	1	400
Burlington	76	94, 487	Morris	2	1, 700	Warren	1	330
Essex	5	3, 300						

NEW MEXICO.

County.	Acres.	Pounds.	County.	Acres.	Pounds.	County.	Acres.	Pounds.
Taos	7	800						

NEW YORK.

County.	Acres.	Pounds.	County.	Acres.	Pounds.	County.	Acres.	Pounds.
Total	4, 937	6, 481, 431	Greene	1	355	Otsego	3	2, 183
			Hamilton	2	710	Putnam	42	55, 299
Allegany	2	800	Herkimer	1	340	Saint Lawrence	4	1, 649
Broome	53	67, 510	Jefferson	5	1, 850	Saratoga	2	840
Cattaraugus	2	823	Lewis	3	1, 072	Schenectady	6	0, 850
Cayuga	290	407, 760				Schoharie	2	1, 014
Chautauqua	4	1, 783	Livingston	1	457	Schuyler	7	8, 250
Chemung	1, 102	1, 571, 885	Madison	53	50, 064	Steuben	698	904, 125
Chenango	16	12, 049	Monroe	12	20, 250	Suffolk	2	495
Clinton	20	7, 430	Niagara	5	2, 705	Sullivan	3	1, 099
Columbia	4	5, 670	Oneida	8	1, 692	Tioga	25	20, 433
Cortland	1	283				Tompkins	102	115, 771
Delaware	3	1, 612	Onondaga	1, 769	2, 346, 257	Ulster	1	500
Duchess	279	407, 156	Ontario	1	587	Warren	1	615
Erie	2	1, 212	Orange	9	5, 850	Wayne	13	14, 710
Essex	1	684	Orleans	98	110, 385	Westchester	3	1, 825
Franklin	10	4, 084	Oswego	256	812, 341	Yates	1	418

NORTH CAROLINA.

County.	Acres.	Pounds.	County.	Acres.	Pounds.	County.	Acres.	Pounds.
Total	57, 208	26, 986, 213	Gates	3	620	Pender	3	690
			Graham	4	1, 095	Perquimans	1	400
Alamance	1, 088	695, 013	Granville	8, 941	4, 006, 358	Person	5, 808	3, 012, 387
Alexander	28	11, 799	Greene	8	1, 955	Pitt	3	598
Alleghany	8	2, 049	Guilford	910	422, 716	Polk	4	931
Anson	11	4, 880						
Ashe	60	11, 064	Halifax	21	8, 487	Randolph	45	11, 101
Beaufort	17	5, 263	Harnett	32	9, 510	Richmond	6	1, 305
Bertie	2	554	Haywood	100	39, 516	Robeson	2	577
Bladen	6	1, 040	Henderson	29	4, 087	Rockingham	9, 332	4, 341, 259
Brunswick	7	2, 502	Hertford	7	2, 160	Rowan	216	115, 251
Buncombe	947	475, 428	Hyde	4	517			
Burke	58	20, 079	Iredell	405	242, 714	Rutherford	38	12, 908
Cabarrus	12	3, 239	Jackson	21	4, 801	Sampson	28	14, 352
Caldwell	75	25, 384	Johnston	36	12, 881	Stanley	8	1, 735
Carteret	1	303	Jones	1	250	Stokes	4, 690	2, 131, 161
Caswell	10, 174	4, 336, 664				Surry	2, 136	905, 250
Catawba	49	26, 380	Lenoir	45	13, 500			
Chatham	141	49, 837	Lincoln	15	6, 085	Swain	11	1, 166
Cherokee	42	8, 411	McDowell	100	30, 541	Transylvania	10	3, 853
Chowan	1	398	Macon	46	9, 154	Union	9	3, 467
Clay	25	5, 771	Madison	1, 626	807, 911	Wake	230	94, 354
Cleaveland	28	5, 122	Martin	1	211	Warren	1, 759	992, 256
Columbus	15	3, 866	Mecklenburg	10	2, 201			
Craven	6	2, 732	Mitchell	77	29, 647	Washington	4	685
Davidson	484	260, 538	Montgomery	54	14, 370	Watauga	23	7, 210
Davie	1, 205	633, 339	Moore	70	15, 724	Wayne	198	102, 979
Duplin	16	4, 655	Nash	27	7, 562	Wilkes	110	93, 211
Edgecombe	3	550	Northampton	36	20, 484	Wilson	17	8, 745
Forsyth	1, 693	822, 788	Onslow	2	730			
Franklin	118	58, 932	Orange	2, 323	1, 178, 782	Yadkin	425	177, 593
Gaston	7	2, 180	Pamlico	12	1, 520	Yancey	84	33, 898

OHIO.

County.	Acres.	Pounds.
Total	34,676	34,735,235
Adams	1,179	1,054,076
Allen	4	5,125
Ashland	5	6,450
Ashtabula	11	12,325
Athens	167	140,812
Auglaize	13	8,751
Belmont	1,206	1,047,926
Brown	6,181	6,244,956
Butler	500	554,275
Carroll	1	535
Champaign	11	2,347
Clarke	45	64,642
Clermont	[illegible]	3,524,151
Clinton	36	33,098
Columbiana	21	1,850
Coshocton	6	2,374
Crawford	6	1,985
Cuyahoga	1	254
Darke	1,778	2,244,576
Defiance	145	151,270
Delaware	4	2,464
Fairfield	4	1,205
Fayette	6	3,631
Franklin	4	640
Fulton	3	2,121
Gallia	163	99,170
Geauga	4	2,405
Greene	538	591,748
Guernsey	435	372,309
Hamilton	21	15,200
Hancock	2	1,255
Hardin	7	2,302
Harrison	11	14,180
Henry	12	10,625
Highland	119	95,899
Hocking	10	4,125
Holmes	3	1,103
Jackson	6	2,425
Jefferson	1	650
Knox	2	2,601
Lake	15	21,500
Lawrence	36	23,906
Licking	7	3,075
Logan	4	2,835
Lorain	1	510
Lucas	1	551
Madison	4	849
Mahoning	2	1,380
Marion	1	580
Medina	44	55,502
Meigs	6	3,729
Mercer	13	7,900
Miami	409	640,223
Monroe	2,037	1,571,008
Montgomery	8,604	9,314,872
Morgan	872	706,872
Morrow	6	2,347
Muskingum	3	1,067
Noble	1,957	1,655,156
Paulding	15	7,611
Perry	23	12,871
Pickaway	9	5,180
Pike	14	8,588
Preble	1,895	2,225,861
Putnam	4	1,077
Richland	1	750
Ross	10	3,670
Scioto	20	10,633
Seneca	1	1,283
Shelby	110	83,130
Stark	6	9,200
Summit	1	2,472
Trumbull	1	770
Tuscarawas	1	448
Union	5	4,111
Van Wert	9	6,770
Vinton	77	62,627
Warren	1,001	1,125,254
Washington	733	751,744
Wayne	52	65,344
Williams	2	932
Wood	1	450
Wyandot	4	3,165

OREGON.

County.	Acres.	Pounds.
Total	43	17,325
Benton	1	870
Clackamas	8	2,640
Clatsop	1	275
Coos	1	671
Douglas	2	785
Jackson	6	3,625
Josephine	1	1,075
Lane	17	5,149
Linn	3	1,389
Tillamook	2	805
Yam Hill	1	942

PENNSYLVANIA.

County.	Acres.	Pounds.
Total	27,566	36,943,272
Adams	58	56,107
Allegheny	6	2,860
Armstrong	5	2,730
Beaver	5	2,627
Bedford	4	2,793
Berks	220	240,027
Bradford	132	173,142
Bucks	934	1,160,970
Butler	5	4,224
Cambria	5	2,454
Cameron	7	6,550
Centre	22	27,733
Chester	487	633,632
Clarion	1	454
Clearfield	1	490
Clinton	680	993,401
Columbia	21	8,196
Crawford	6	3,297
Cumberland	346	448,118
Dauphin	544	614,362
Delaware	11	12,347
Elk	2	1,347
Erie	4	2,730
Fayette	8	5,575
Forest	1	283
Franklin	77	68,005
Fulton	4	3,172
Greene	12	7,333
Huntingdon	12	14,045
Indiana	15	10,181
Jefferson	2	1,378
Juniata	78	80,609
Lackawanna	2	563
Lancaster	16,992	23,946,326
Lawrence	3	1,080
Lebanon	624	703,488
Lehigh	31	35,620
Luzerne	29	35,736
Lycoming	310	463,086
McKean	1	335
Mercer	9	4,110
Mifflin	49	55,025
Monroe	1	425
Montgomery	16	20,930
Montour	61	58,179
Northampton	8	4,073
Northumberland	488	530,541
Perry	52	49,120
Philadelphia	52	49,000
Pike	2	513
Potter	4	2,872
Schuylkill	9	6,704
Snyder	98	115,900
Somerset	2	906
Sullivan	1	470
Susquehanna	2	1,530
Tioga	234	292,198
Union	90	109,414
Venango	1	421
Warren	1	730
Washington	3	2,065
Wayne	2	783
Westmoreland	54	62,096
Wyoming	35	39,875
York	4,567	5,753,760

RHODE ISLAND.

County.	Acres.	Pounds.	County.	Acres.	Pounds.	County.	Acres.	Pounds.
Providence	2	785						

SOUTH CAROLINA.

County.	Acres.	Pounds.	County.	Acres.	Pounds.	County.	Acres.	Pounds.
Total	169	45,079	Edgefield	9	1,708	Oconee	13	4,775
			Greenville	33	9,638	Orangeburgh	1	310
Abbeville	16	3,280	Horry	19	7,251	Pickens	10	2,400
Aiken	3	800	Lancaster	2	208	Spartanburgh	12	2,153
Anderson	14	3,530	Laurens	8	2,709	Sumter	1	352
Charleston	1	250	Marion	7	1,085	Union	9	1,949
Darlington	2	929	Newberry	2	645	York	7	1,539

TENNESSEE.

County.	Acres.	Pounds.	County.	Acres.	Pounds.	County.	Acres.	Pounds.
Total	41,532	29,365,052	Hamblen	81	34,930	Meigs	13	4,159
Anderson	26	7,878	Hamilton	12	4,045	Monroe	35	11,810
Bedford	51	21,649	Hancock	51	7,541	Montgomery	11,591	8,206,461
Benton	380	278,721	Hardeman	84	23,102	Moore	17	7,425
Bledsoe	16	5,373	Hardin	88	26,300	Morgan	20	6,537
Blount	21	4,362	Hawkins	100	42,781	Obion	1,432	1,183,472
Bradley	23	6,110	Haywood	62	32,991	Overton	64	42,947
Campbell	23	6,077	Henderson	123	43,446	Perry	20	8,981
Cannon	43	19,808	Henry	2,726	1,902,979	Polk	26	5,295
Carroll	100	60,167	Hickman	51	21,858	Putnam	94	75,384
Carter	37	12,932	Houston	306	206,026	Rhea	17	5,347
Cheatham	1,343	950,352	Humphreys	33	21,326	Roane	22	6,165
Claiborne	43	12,736	Jackson	201	233,072	Robertson	6,016	4,342,588
Clay	108	67,776	James	9	2,190	Rutherford	47	24,199
Cocke	45	13,161	Jefferson	10	6,045	Scott	35	5,935
Coffee	48	21,190	Johnson	26	9,935	Sequatchie	8	2,149
Crockett	35	16,099	Knox	45	16,366	Sevier	30	9,810
Cumberland	15	2,535	Lake	5	1,750	Shelby	41	15,178
Davidson	41	19,690	Lauderdale	58	33,952	Smith	1,810	1,799,981
Decatur	50	31,759	Lawrence	31	15,169	Stewart	2,848	1,876,773
De Kalb	55	26,514	Lewis	7	3,870	Sullivan	207	70,069
Dickson	775	494,428	Lincoln	39	17,948	Sumner	405	280,326
Dyer	364	313,365	Loudon	24	9,517	Tipton	40	16,139
Fayette	66	20,901	McMinn	2	615	Trousdale	1,041	882,895
Fentress	23	7,807	McNairy	95	34,803	Unicoi	65	23,022
Franklin	61	25,061	Macon	1,212	893,592	Union	15	4,026
Gibson	56	32,036	Madison	67	32,410	Van Buren	14	9,470
Giles	66	26,814	Marion	22	6,344	Warren	77	28,456
Grainger	48	13,121	Marshall	47	24,583	Washington	49	27,312
Greene	77	26,192	Maury	72	36,384	Wayne	63	16,844
Grundy	2	430				Weakley	4,770	3,506,707
						White	72	31,064
						Williamson	107	134,196
						Wilson	361	300,479

TEXAS.

County.	Acres.	Pounds.	County.	Acres.	Pounds.	County.	Acres.	Pounds.
Total	685	221,283	Camp	3	635	Freestone	16	5,943
			Cass	9	2,219	Gillespie	1	217
Anderson	13	5,140	Cherokee	13	4,715	Gonzales	1	280
Angelina	23	6,495	Collin	1	270	Grayson	29	7,655
Austin	8	2,049	Colorado	4	631	Gregg	5	905
Bastrop	5	1,287	Comal	2	505	Grimes	7	2,297
Bowie	12	3,798	Cooke	8	3,500	Guadalupe	1	350
			Delta	8	4,085	Hardin	3	795
			Denton	1	255	Harris	5	1,584
			De Witt	3	700	Harrison	9	3,091
Brazoria	2	610	El Paso	1	225	Hayes	1	200
Brazos	4	1,865	Falls	4	1,142	Henderson	14	3,800
Burleson	4	1,510	Fannin	23	8,495	Hopkins	25	9,057
Burnet	1	200	Fayette	4	1,720	Houston	14	4,808
Calhoun	3	450	Franklin	2	1,165	Hunt	11	4,044

TEXAS—Continued.

County.	Acres.	Pounds.	County.	Acres.	Pounds.	County.	Acres.	Pounds.
Jasper	30	2,800	Nacogdoches	24	8,124	Smith	12	5,059
Kaufman	2	700	Newton	9	2,622	Tarrant	1	480
Kendall	2	755	Panola	9	3,000	Titus	6	2,410
Lamar	29	15,003	Polk	1	707	Trinity	18	5,273
Lavaca	8	3,632	Rains	11	4,646	Tyler	10	1,590
Leon	2	932	Red River	7	1,945	Upshur	23	5,822
Liberty	2	690	Robertson	4	1,502	Van Zandt	14	3,217
Limestone	12	6,869	Rusk	7	1,835	Victoria	3	350
Madison	6	900	Sabine	4	1,105	Walker	8	2,756
Marion	3	520	San Augustine	21	4,231	Waller	1	600
Matagorda	2	1,162	San Jacinto	5	1,406	Washington	7	4,134
Montgomery	13	2,635	Shelby	83	9,313	Wharton	2	650
Morris	7	2,712				Wood	24	9,025

VERMONT.

County.	Acres.	Pounds.	County.	Acres.	Pounds.	County.	Acres.	Pounds.
Total	84	131,432	Chittenden	2	886	Washington	1	206
			Franklin	1	393	Windham	74	127,219
Addison	1	440	Lamoille	1	1,025	Windsor	1	200
Bennington	1	303	Rutland	2	760			

VIRGINIA.

County.	Acres.	Pounds.	County.	Acres.	Pounds.	County.	Acres.	Pounds.
Total	140,701	79,988,808	Giles	190	122,056	Page	8	5,237
			Gloucester	25	13,829	Patrick	1,645	714,073
Albemarle	3,216	2,460,972	Goochland	1,052	656,624	Pittsylvania	22,680	12,271,583
Alleghany	11	6,862	Grayson	32	10,485	Powhatan	1,479	914,132
Amelia	3,524	1,726,317	Greene	520	382,402	Prince Edward	4,357	2,402,326
Amherst	4,610	3,111,801	Greensville	11	5,075	Prince George	27	20,500
Appomattox	3,198	1,965,937	Halifax	15,042	7,653,842	Prince William	5	1,292
Augusta	4	1,827	Hanover	1,489	1,064,735	Pulaski	211	122,776
Bath	8	5,815	Henrico	106	101,155	Rappahannock	12	8,330
Bedford	9,174	5,315,500	Henry	6,336	2,955,036	Richmond	14	7,322
Bland	10	4,164	Highland	1	507	Roanoke	1,022	585,410
Botetourt	1,187	742,953	Isle of Wight	5	420	Rockbridge	517	360,005
Brunswick	2,734	1,538,161	King and Queen	30	14,711	Rockingham	14	9,564
Buchanan	10	2,186	King George	20	9,775	Russell	34	11,405
Buckingham	3,973	2,136,520	King William	97	63,065	Scott	135	49,659
Campbell	6,446	3,927,333	Lee	54	15,286	Shenandoah	5	3,106
Caroline	1,264	991,487	Loudoun	6	2,454	Smyth	40	17,850
Carroll	83	29,875	Louisa	2,978	1,921,488	Southampton	5	775
Charlotte	5,922	3,220,448	Lunenburg	3,400	1,976,265	Spotsylvania	554	396,668
Chesterfield	804	523,606	Madison	132	101,697	Stafford	7	4,280
Clarke	10	9,555	Mecklenburg	6,439	3,436,408	Sussex	5	4,715
Craig	58	38,540	Middlesex	4	1,512	Tazewell	48	18,357
Culpeper	6	2,470	Montgomery	1,333	654,496	Warren	2	2,303
Cumberland	2,979	1,814,674	Nansemond	1	215	Washington	679	353,457
Dinwiddie	2,752	1,540,395	Nelson	3,497	2,660,295	Westmoreland	14	13,450
Essex	13	5,015	New Kent	14	11,860	Wise	6	3,308
Fairfax	4	5,370	Northampton	12	1,740	Wythe	16	7,983
Fauquier	17	6,077	Northumberland	11	6,745	York	5	1,061
Floyd	827	342,250	Nottaway	2,911	1,582,670			
Fluvanna	1,391	917,561	Orange	372	260,715			
Franklin	6,862	3,529,833						
Frederick	1	705						

WASHINGTON TERRITORY.

County.	Acres.	Pounds.	County.	Acres.	Pounds.	County.	Acres.	Pounds.
Total	8	6,930	Pierce	6	6,165	Whatcom	1	355
King	1	410						

WEST VIRGINIA.

County.	Acres.	Pounds.	County.	Acres.	Pounds.	County.	Acres.	Pounds.
Total	4,071	2,296,146	Harrison	18	10,131	Preston	10	5,255
			Jackson	259	103,146	Putnam	322	103,864
			Jefferson	2	510	Raleigh	32	10,705
Barbour	25	10,737	Kanawha	329	186,713	Randolph	22	5,738
Berkeley	2	1,471	Lewis	26	8,445	Ritchie	185	138,461
Boone	26	6,057	Lincoln	231	128,417			
Braxton	13	5,620	Logan	78	7,813	Roane	30	11,967
Brooke	1	700	McDowell	21	5,342	Summers	230	120,015
			Marion	25	5,250	Taylor	4	1,008
Cabell	140	89,757	Marshall	12	4,713	Tyler	207	147,096
Calhoun	22	9,222	Mason	54	25,685	Tucker	7	2,001
Clay	20	5,640	Mercer	356	150,813			
Doddridge	30	18,608	Mineral	3	1,826	Upshur	22	7,300
Fayette	397	253,460	Monongalia	22	11,330	Wayne	135	70,559
			Monroe	154	70,590	Webster	9	2,751
Gilmer	43	23,138	Morgan	1	515	Wetzel	107	136,781
Grant	4	1,723	Nicholas	46	15,610	Wirt	108	74,078
Greenbrier	12	5,936	Pendleton	5	1,741			
Hampshire	11	6,787	Pleasants	18	14,562	Wood	103	72,062
Hardy	8	1,555	Pocahontas	8	4,095	Wyoming	31	7,502

WISCONSIN.

County.	Acres.	Pounds.	County.	Acres.	Pounds.	County.	Acres.	Pounds.
Total	8,810	10,608,423	Grant	37	34,350	Polk	12	8,694
			Green	122	117,571	Portage	2	692
			Green Lake	6	2,249	Richland	10	11,814
Adams	13	9,685	Iowa	6	3,127	Rock	8,803	4,649,870
Barron	7	3,565	Jackson	4	1,904	Saint Croix	4	742
Brown	5	1,728	Jefferson	209	262,501			
Buffalo	5	1,393	Juneau	9	4,734	Sauk	5	2,316
Burnett	2	359	Kewaunee	4	2,096	Shawano	3	810
			La Crosse	1	800	Sheboygan	2	455
Calumet	1	225	La Fayette	10	13,800	Taylor	2	875
Chippewa	7	4,002	Langlade	1	480	Trempealeau	9	4,847
Clark	5	2,575	Lincoln	1	344			
Columbia	5	2,630	Marathon	7	2,984	Vernon	80	35,170
Crawford	28	14,645	Marinette	2	836	Walworth	18	9,360
			Marquette	5	2,612	Washington	8	447
						Waukesha	2	2,000
Dane	4,331	5,871,242	Monsco	4	1,872	Waupaca	8	5,290
Dodge	18	6,440	Oconto	3	1,524			
Dunn	5	3,183	Outagamie	2	868	Waushara	3	1,000
Eau Claire	3	1,135	Pepin	9	2,878	Winnebago	3	2,271
Fond du Lac	1	441	Pierce	3	752	Wood	2	1,135

RECAPITULATION BY STATES.

The United States	638,841	472,661,158	Kentucky	226,120	171,120,784	North Carolina	57,208	26,986,213
			Louisiana	253	55,954	Ohio	34,676	34,735,235
Alabama	2,107	452,426	Maine	1	250	Oregon	43	17,325
Arizona	1	600	Maryland	38,174	26,082,147	Pennsylvania	27,566	36,943,272
Arkansas	2,004	970,220	Massachusetts	3,358	5,369,436	Rhode Island	2	785
California	84	73,317						
Connecticut	8,666	14,044,652	Michigan	170	83,969			
Dakota	5	1,897	Minnesota	163	69,922	South Carolina	169	45,679
Delaware	4	1,278	Mississippi	1,471	414,663	Tennessee	41,532	29,365,052
District of Columbia	2	1,400	Missouri	15,521	12,015,657	Texas	685	221,283
Florida	90	21,182	Nebraska	101	57,979	Vermont	84	131,432
Georgia	971	228,590				Virginia	140,791	79,988,868
Idaho	2	400	Nevada	2	1,560			
Illinois	5,612	3,935,825	New Hampshire	88	170,843			
Indiana	11,055	8,872,842	New Jersey	152	172,315	Washington	8	6,930
Iowa	692	420,477	New Mexico	7	890	West Virginia	4,071	2,296,146
Kansas	833	191,669	New York	4,937	6,481,431	Wisconsin	8,810	10,608,423

CHAPTER II.

CLASSIFICATION—TYPE MAPS—VARIETIES OF THE TOBACCO PLANT.

CLASSIFICATION.

The various types of tobacco produced in different sections are treated locally in the districts in which they are severally grown. They are here grouped into a distinct classification, according to differences in character and use, the modes and forms of manufacture, and of consumption. While each distinct soil formation gives peculiar qualities to the plant as to texture, color, flavor, and general structure, these may be modified by culture and curing into still greater variations of character. A knowledge of what quality or property is wanting may enable the grower so to apply his fertilizers, or to manage the curing process, as greatly to enhance the value of the product; and a want of this knowledge may also cause the grower to destroy, by imperfect cultivation or curing, the very quality which gives the product its highest value.

Commercial circles recognize classes, types, and grades. The basis of a class is its adaptation to a certain purpose; the basis of a type is the combination of certain qualities or properties in the leaf, as color, strength, elasticity, body, flavor, etc., or in the methods of curing, as sun-cured, air-cured, flue-cured, etc. Grades represent the different degrees of excellence in a type, as low, medium, good, or fillers, binders, and wrappers. In the yellow fancy type there may be ten or twelve of these grades, while in some heavy, coarse shipping tobacco only two are made, leaf and lugs. A district may produce only one type, which may be referred to several classes. The yellow tobacco, for instance, is one type, yet it is used both for smoking and for chewing, and is therefore put into two classes; if exported, it would be put into three classes. A district may also produce many types of the same class, as in New England, where several types of seed-leaf and Havana seed are produced, yet they all belong to cigar tobacco, and are used solely for that purpose. Again, a locality may produce one type of one class.

In the following schedule of classification no attempt is made to divide into separate classes that portion of the crop taken for exportation. All this is thrown together into one class, called export tobacco, though the types suited for the different countries are given.

CLASSES, TYPES, AND SUB-TYPES.

CLASS I.—DOMESTIC CIGAR TOBACCO AND SMOKERS.

Seed-leaf and Havana seed.

Connecticut Seed-Leaf.
"New England" Seed-Leaf.
Pennsylvania Seed-Leaf.
New York Seed-Leaf.
Ohio Seed-Leaf.
Wisconsin and Illinois Seed-Leaf.
Florida Seed-Leaf.

Other cigar and smoking tobacco.

White Burley lugs.
American-grown Havana.
Perique.
Common Virginia, North Carolina, Missouri, Eastern Ohio, Maryland, Tennessee, Kentucky, Indiana, and Illinois lugs.
Kentucky and Indiana cheroot and stogie wrappers and fillers.
Fine-fibered Clarksville wrappers.
Indiana Kite-Foot.

CLASS II.—CHEWING TOBACCO.

Fine-cut and plug fillers.

Fine-cut Burley.
Fine-cut Mason county.
White Burley fillers.
Red Burley fillers.
Virginia sun- and air-cured fillers.
Virginia flue-cured fillers.
Missouri air-cured fillers.
Kentucky, Indiana, Tennessee, Virginia, Maryland, and West Virginia fire-cured fillers.
Tennessee and Kentucky air-cured fillers.

Plug wrappers.

Virginia yellow and mahogany.
North Carolina yellow and mahogany.
Western Kentucky yellow.
Hart county (Kentucky) bright and yellow.
Henry county (Tennessee) yellow.
Missouri and Arkansas yellow.
West Virginia yellow.
Clarksville and Missouri dark and red.
Mason county (Kentucky) Burley.

CLASS III.—EXPORT TOBACCO.

English shippers.

Bird's-eye cutting leaf.
Brown roll wrapper.
Spinning leaf.
Shag—a heavy cutter.
Plug wrapper.
Plug fillers.
Navy leaf.
Irish filler.
Scotch Elder.
Scotch and Irish spinners.
Strips—used for same purposes as above.

Continental shippers.

French Regie—A, B, and C.
Italian Regie—A, B, and C.
Austrian Regie.
Spanish Regie.
Snuff-leaf and lugs.
Germany:
- German saucer.
- German spinner.
- Ohio, Maryland, and West Virginia spangled.
- Smokers—fat lugs.

Switzerland:
- Swiss wrappers.
- Swiss fillers.

Holland:
- Dutch saucer.

Belgium:
- Belgian cutter.

Denmark, Norway, and Sweden:
- Heavy Kentucky and Tennessee types

African shippers.

Liverpool African.
Boston African.
Gibraltar African.

Mexico, South America, and West Indies.

Baling wrapper.
Baling filler.

CLASS I.—CIGAR AND SMOKING TOBACCO.

SEED-LEAF AND HAVANA SEED.

CONNECTICUT SEED-LEAF.—This includes both the seed-leaf and the Havana seed. The seed-leaf of Connecticut valley is a very large, fine-fibered, light-colored leaf, sweetish to the taste, soft, and silky, and when light tobacco was fashionable it outstripped all rivals. It burns with a solid, yellowish ash, a little reduced from the original size, the ash having a beautifully granulated or oölitic surface. Havana seed, grown from seed acclimated for four years, has a thin leaf, fine in texture and delicate in flavor, and very glossy and silky. The seed-leaf in Housatonic valley grows darker in color and has more body than that grown in Connecticut valley. It burns well, and is stronger than the Connecticut-valley tobacco, having a larger content of nicotine. Altogether, this is probably the most valuable seed-leaf grown. The whole product of Connecticut sweats well, that in Housatonic valley coming out of that process greatly improved in color, having a very dark chestnut-brown hue. This tobacco burns probably better than any other seed-leaf, but not with so white an ash as many other kinds. The soils are abundantly supplied with salts whose base is potash, which renders the carbon in burning porous, and causes it to burn well. Connecticut seed-leaf will make five thousand cigar wrappers to the one hundred pounds.

NEW ENGLAND SEED-LEAF is the name given to the product of Massachusetts, New Hampshire, and Vermont. It differs from the growth of Connecticut in being coarser in texture and heavier in body, and therefore is not so well suited for wrappers as the Connecticut Seed-Leaf. It is deficient in oily substance, and does not sweat to a good rich color; nor are the burning qualities so good. The ash is not so firm or light, but appears to be more humid. A large proportion of the crop grown in the last-named states is of the variety known as Havana seed, which, though not so large, makes far better fillers for cigars than the seed-leaf varieties.

PENNSYLVANIA SEED-LEAF is of a dark-brown color, has a rich leaf, and gives from six to eight thousand wrappers to the hundred pounds. The flavor is not so good as that of Connecticut Seed-Leaf, and it has an acrid taste, leaving a disagreeable bitter in the mouth after smoking. It sweats to a beautiful brown color, and burns with a white ash, which, however, splits and falls like snowflakes; is very oily and elastic, strong and smooth, and is in great demand by cigar-makers. It rarely suffers injury from sweating, and its strength of tissue enables it to bear the strain required in wrapping cigars.

NEW YORK SEED-LEAF.—This type does not rank as high as those of Pennsylvania and Connecticut. The flavor is excellent, and some of the very best wrappers are made from Wilson's hybrid and one or two other varieties. It burns compactly, with a white ash, except when raised on swamp muck or heavy clay soils, when it is liable to burn black and to curl and roll in burning. This defect in a portion of the crop has kept the standard low. Considerable quantities are exported to Bremen, and some to other foreign markets. The product shrinks about 10 per cent. in sweating. Two types are recognized in New York: Big Flats and Onondaga. The first is of a large growth, is at times very popular, and stands sweating well. Onondaga is short, very substantial, and makes excellent fillers.

OHIO SEED-LEAF is noted for its exceeding dryness. It is a leafy product, and is in more demand for exportation than any other seed-leaf. It burns well, with a white chalky ash, which is sometimes a little flaky; has usually a good dark-brown color, and the type is more uniform in character than that of Pennsylvania. The handsomest seed-leaf produced in Ohio is grown in Medina and Wayne counties. It is large, fine, and very much resembles that grown in Connecticut, but is rather light in color. Generally, the Ohio seed-leaf ranks third as to quality among the seed-leaf products of the United States. While its color is not equal to that of Pennsylvania, nor its texture so fine as that of Connecticut, in burning qualities that from the Miami valley is superior to both, burning with an ash as white as that of Pennsylvania and with a solidity equal to that of Connecticut.

LITTLE DUTCH, a very sweet variety, is grown to some extent in Miami valley. It has a sleek, glossy surface, silky fiber, dark-brown in color, is very highly prized by cigar manufacturers on account of its delicate flavor, and burns well; but having a very thin, fine leaf, it is very sensitive to fermentation, and is easily injured during that process. If put in boxes before the stems are thoroughly cured it "butt-rots" and injures very rapidly. It has a decided tendency to produce white veins, but, being mainly used for fillers and binders, these veins are not so objectionable as in the ordinary seed-leaf. In the market this variety ordinarily brings double the price of the same grades of seed-leaf. Indiana grows some seed-leaf around Richmond, which is classed with the Ohio product.

WISCONSIN AND ILLINOIS SEED-LEAF is noted for its capacity for absorbing and retaining water, being always limp, even in the dry, cold weather of winter. It has a thin leaf, is the most tender of all the seed-leaf products, and requires to be handled with great care. In consequence of its tenderness and the careless manner in which it is generally handled it does not stand high in the estimation of manufacturers. Much of this type is injured on passing through the sweat, by which process it loses about 20 per cent. in weight, while other types of seed-leaf lose from 9 to 12 per cent. The product of Wisconsin and Illinois has great uniformity of color, and in this respect is a superior type. It resembles the Connecticut seed-leaf, and when resweated has a fine finish; burns with a solid ash, especially after it has been resweated, and contains very little nicotine.

FLORIDA SEED-LEAF.—This type is distinguished by the large number of white specks which cover the leaf. These specks, though the result of disease and blemish, are a sure indication of fineness of texture. The color is rather light for the present requirements of the manufacturer. At one time it was exceedingly popular, and commanded very high prices, both in this country and in Germany. When thoroughly sweated it burns well. The Havana sorts have a great delicacy of flavor and fineness of leaf, much like the tobacco grown in Cuba.

Havana seed is a type intermediate between the seed-leaf and that grown from imported Havana seed. It is smaller in size, richer in glossiness, finer in texture, and sweeter in flavor than the seed-leaf proper, and though yielding a third less per acre, the higher prices paid for it seem to make it equally as profitable to cultivate as the seed-leaf. In the West it is called Spanish or Sweet-scented, and in Connecticut, New York, and Pennsylvania it is called Havana seed. It is very valuable, because it furnishes a large percentage of wrappers, while the lower grades make very sweet cigar fillers, second in quality only to the Little Dutch and Havana tobacco. This type may be grown on thin, poor soil, and made profitable when the larger varieties of seed-leaf grown upon such soils would entail loss to the producer.

OTHER CIGAR AND SMOKING TOBACCO.

WHITE BURLEY LUGS.—This sub-type is fine, bright, of good flavor, thin in leaf, light or yellowish brown in color, inclined to be trashy and chaffy, and makes, with the North Carolina and Virginia bright lugs, the finest grades of smoking-tobacco for pipes. It is very popular on account of its mildness, and is composed of the lower leaves of the plant and those badly mutilated by worm-cuts. Some of this sub-type, of a bright, thin character, is granulated for making cigarettes.

AMERICAN-GROWN HAVANA.—Experiments have been made in almost every part of the country with tobacco grown from seed imported from Cuba. The first year the product is small, and emits, even while growing, a strong, sweet flavor, and the leaves rarely attain a length of over ten or twelve inches. It cures up a dark-brown color when grown upon heavy clay soils; but, grown upon sandy soils, the color is a lighter hue, and the flavor is thought to be superior in not having so much rankness. Florida produces a small quantity for market, and little patches are common in every part of the country for domestic use. It deteriorates rapidly in flavor when grown successively from seed matured in this country, but increases in size and usefulness as a wrapper. Its deterioration in aroma is not so rapid in the extreme southern states as in the more northerly ones. Some experiments in cultivating and curing this type are given at the close of the chapter on Tennessee.

PERIQUE.—This type is grown in Louisiana, and is cured in its juices under heavy pressure. It is very black and glossy in appearance, emits a strong spirituous flavor, makes a very strong smoking-tobacco, and is not popular except with those habituated to its use. Some of the product of Louisiana is air-cured, and is used in making very strong cigars, as further detailed in the chapter on Louisiana.

COMMON LUGS FROM THE HEAVY TOBACCO DISTRICTS.—This sub-class is made up from the lower grades of many types. It is trashy, earth-burned, of every conceivable color, deficient in body and weight of leaf, and milder than the better grades of the types from which it comes. By a due admixture of colors and strength of leaf many brands of smoking-tobacco are made, as bright and dark, brown and red, spangled and yellow, mild and strong. Some air-cured lugs of this sub-class are granulated for cigarettes, the stock being furnished from light, thin products from Kentucky, Tennessee, Indiana, Illinois, Missouri, Eastern Ohio, and Maryland. The lugs selected for this purpose are as light in color as possible.

STOGIE WRAPPERS AND FILLERS.—For stogie wrappers a short western leaf of full breadth and light body, fine fiber, and uniformly dark color is selected. To a very small extent a red or cinnamon color is required. It must be air-cured or entirely free from any flavor imparted by fire, and it is necessary that it shall have passed through the sweat and become somewhat soured in flavor. This particular style of leaf is used at Pittsburgh and at Wheeling—very largely at the latter point—for wrappers in the manufacture of a specific class of common cigars, technically called stogie cigars. A stogie filler consists of a leaf of the same quality as the wrapper, but is of lower grade, too narrow or otherwise unfitted for wrappers. What are technically called "self-workers" are largely used in this trade. They consist of packages or casks with a proper proportion of wrappers and fillers packed in them, each for working the other.

FINE-FIBERED CLARKSVILLE WRAPPER.—This type has great smoothness and delicacy of general structure, great elasticity and strength, with a moderate supply of oily substances, good breadth of leaf, and is of a port-wine color. It is used largely in the United States and in Canada, in connection with the red wrapper, in the manufacture of plug tobacco for smoking as well as for chewing. A large proportion of these wrappers is exported. They are not popular for making cigars in the United States, because they impart a rank flavor to the cigar. Wrappers of the same character are produced in Virginia and are used for like purposes. A few are taken for the manufacture of stogie cigars.

INDIANA KITE-FOOT.—This is a broad, short leaf, grown in Owen and Clark counties, Indiana. It is cured with fire, and the color is generally brown, sprinkled with yellow spots. The fibers are small, and the leaves are very elastic. It is employed for making common cigars.

CLASS II.—CHEWING-TOBACCO.

FINE-CUT AND PLUG FILLERS.

WHITE BURLEY.—This is the product of a new variety which within the past decade has come into profitable and extensive cultivation. It is bright brown or golden in color, of thin tissue, good breadth and length of leaf, comparatively free from gums and oils, possessed of great absorptive capacity, and is of a mild and pleasant flavor. It is exceedingly popular with the manufacturers of plug and cutting tobacco. There are two sub-types of the White Burley, known as cutters and fillers. Cutters are almost entirely destitute of gums and oils, and therefore are stiff and harsh. Fillers have more body and more gum than the cutters, and are, consequently, softer and more elastic. Their popularity with manufacturers arises from their capacity to absorb a very large percentage of the sauces with which they are treated. Dr. Moore reports that the Owen county (Kentucky) plug fillers will absorb over two and a half times their weight of water without dripping when done up in a roll. The product is popular with consumers when manufactured into plug or fine-cut, because it is very mild, and can be used without producing the nervous irritation consequent on the use of stronger tobacco. It is not so sweet naturally as the flue- and sun-cured tobacco of Virginia, or of the air-cured product of Missouri. The chapters on Ohio and Kentucky give further details.

FINE-CUT MASON COUNTY.—This type only differs from the White Burley grown in other districts in having very little gum, less body and elasticity, and is used for a cutting leaf mainly.

RED BURLEY FILLERS.—These differ from the White Burley fillers only in not having such bright colors, the color being rather a dark cinnamon. The product of the Red Burley is also of a somewhat lighter and more flimsy character when grown upon similar soils.

VIRGINIA SUN- AND AIR-CURED FILLERS.—These are made chiefly in Caroline, Hanover, Louisa, and Spotsylvania counties, Virginia. The product is of medium size as to leaf, light-brown as to color, very sweet and fragrant, with a fair proportion of gums and oils, and popular as a chewing-tobacco. The air-cured fillers of Missouri approximate those of Virginia in the qualities of sweetness and fragrance.

VIRGINIA FLUE-CURED FILLERS.—These are of medium size, brown or mahogany in color, oily and elastic, fine in texture, delicate in fiber, and have a liveliness of appearance not observable in the White Burley product. They are made principally in Henry county, Virginia, and command very high prices on account of their exceeding natural sweetness.

MISSOURI AIR-CURED FILLERS.—These are distinguished chiefly on account of their sweetness, and are frequently mixed with the product of other states to give a pleasant taste to the manufactured article. They also make a very tough "chew".

FIRE-CURED FILLERS OF THE HEAVY TOBACCO DISTRICTS.—These are employed in making a coarse, strong chewing-tobacco for the consumption of miners, sailors, and lumbermen, who prefer an article with a rank tobacco taste, strong in nicotine, and of great toughness of leaf.

TENNESSEE AND KENTUCKY AIR-CURED FILLERS.—This type is of light to medium weight, free of coarseness in texture and fiber, not gummy or waxy, of sweet and mild natural flavor, clear of any bitterness, generally porous in structure, and of bright or pale-red color. It is entirely air-cured. Its natural absorbing capacity is fully preserved by air-curing. Curing by artificial heat would not only impair its flavor, but impart a highly injurious odor of smoke. Length or breadth of leaf is not an essential. This product is generally grown upon the sandstone lands or siliceous soils, and is distinguished from the White Burley fillers by having heavier body, less delicacy of structure, and by being less colored.

PLUG WRAPPERS.

NORTH CAROLINA AND VIRGINIA YELLOW AND MAHOGANY.—The yellow and mahogany wrappers may be considered grades of the yellow type. The highest grade is small in size, with a lemon-yellow color, soft and silky, and has a surface which sparkles in the sunlight, the minute golden grains scattered over the upper portions of the leaf adding to the brilliancy of its appearance. Other grades follow this, such as orange, dull yellow, and on by imperceptible gradations to the mahogany. The lemon-yellow leaf stands at the head as a wrapper for plug. The chief distinguishing characteristic of the yellow leaf of North Carolina and Virginia is that it will not blacken under pressure when subjected to the processes of manufacturing, but retains its golden luster. The mahogany wrapper is larger than the yellow leaf, displaying a ground of yellow, spotted with red or brown. It usually has more oily substances in its composition, and therefore blackens more under pressure. Western Kentucky, Hart county, Kentucky, and Henry county, Tennessee, produce a leaf unexcelled in the beauty of its yellow color. It is generally larger than the North Carolina and Virginia yellow tobacco, but will not maintain its color in the manufacturing process. The yellow tobacco of Ohio and West Virginia is intermediate in character between that of North Carolina and the West, the former having more oil in its composition than the latter. The yellow tobacco of Missouri and Arkansas very much resembles that grown in Kentucky. It has a brilliant hue, but is open to the objection of blackening under pressure. The yellow wrappers stand very high in absorptive capacity.

CLARKSVILLE AND MISSOURI DARK AND RED.—This type is found in leaf of full weight of body, strong and elastic texture, with good supply of oils and "fat", soft, smooth, and flexible in structure, of fine stem and fiber, and the dark wrapper has a port-wine color. The leaf must be of good width, of well-rounded proportions, and free of all blemish, such as spot and worm-cut. Length of leaf has no specific standard, for some forms of manufacturing full length being required, and for others short length being preferred. The highest value of the type is found in the leaf of full length. Red wrapper has the same essential qualities as those described for dark wrappers, except that of color, which must be a full, deep, and solid red. These wrappers are used largely in Canada.

MASON COUNTY (KENTUCKY) BURLEY WRAPPERS.—For many years the wrappers grown in this county have been noted for their great fineness, softness, silkiness, and elasticity. They are of medium size, running from a reddish yellow in color to a dark brown. The substitution of the White Burley variety for those previously grown has improved rather than impaired the character of the wrappers. They are used both for plug and for cigars.

CLASS III.—EXPORT TOBACCO.

ENGLISH SHIPPERS.

ENGLISH SHIPPERS consist of leaf and strips, which are used, with a single exception, for identical purposes. Until within a short period the larger consumption was of strips or stemmed tobacco, the stem being removed as a special preparation to avoid the payment of duty on it. Recently, however, the consumption of leaf has increased in the United Kingdom, under an arrangement by which the manufacturer is allowed to return the stem into the hands of the proper officers for destruction or for export. In some forms of manufacture, however, the stem is pressed in the leaf into a thin plate and then split, so as to divide the leaf into two parts, as in making strips. For these reasons the consumption of leaf in the different forms of manufacturing in England is increasing.

BIRD'S-EYE CUTTING LEAF.—This is the only type used exclusively in the leaf in English consumption, and consists of a very bright, smooth, thin, and clean leaf, with as little gum and oil as possible. The essential peculiarities of quality are that the color of both the inside and the outside surfaces of the leaf shall be of uniform and similar shades of bright color, and that the stem shall be of a brightish brown color on the outside and white on the inside. Each section into which the stem is cut presents in appearance on its cut surface the eye of a bird. This type was formerly scarce, and was furnished chiefly by the Lower Green River district, in Kentucky; but since the production of light and colored types it has largely increased in the Burley district, and especially in Virginia and North Carolina.

BROWN-ROLL WRAPPER.—This is a bright red or full bright leaf, thin and smooth in texture, of good breadth, resembling in general structure the leaf used for cutting into fine-cut by our domestic manufacturers. It is used in England as a wrapper for spinning brown roll. By filling the wrapper properly with suitable fillers a continuous strand is made and spun of about one inch in diameter, which is packed into a coil, similar to a coil of rope, from which sections are cut for retail. For this purpose it is always stemmed. The brown-roll filler is the material with which the wrapper is filled, and consists of stock of the same type as the wrapper, except that it is of lower grade.

SPINNING-LEAF OR STRIPS.—This type consists of a long, rich, and oily leaf, of full brown color, good weight of body, strong and elastic texture, and of general smoothness in structure. Recently brighter colors have been more in demand for this purpose than formerly. The types used in England for this purpose were of the heavy, oily, and "fatty" descriptions grown in the Clarksville district, until recently these became so much appreciated in value on account of the German demand for them that the heavy but less oily types of the Lower Green River district were substituted. The recent improvements in machinery used in spinning enable manufacturers to use material of a lower grade. The purpose for which this type is used is similar to that for which the brown-roll wrapper is used, except that the strand into which it is spun is of smaller size. This is put up and cut for retail in the same manner as the brown roll. A still smaller strand is spun, called lady's twist, but to much less extent now than formerly. The strand of this twist was not larger than the point of the little finger, and was consumed principally in Scotland, Ireland, and the north of England. The wrapper for this consisted of a smaller and shorter leaf of the same general qualities as those used for the larger strand.

SHAG.—This is a coarsely-cut English manufactured product. The supply is drawn chiefly from Indiana and the Green River district in Kentucky. It has but little gum, yet more than the cutting leaf used in the United States. Shag tobacco is really a heavy cutting leaf, and it finds substitutes from Japan, Java, Paraguay, and the Dutch possessions. The principal requisite is that it shall be low in price, so that manufacturers may sell it for the same price as that obtained before the increase of duty.

PLUG WRAPPERS.—This type consists of a rich, dark-brown leaf, smooth in structure, medium in size, and strong and elastic in texture. Its consumption is very small, as plug tobacco is used to a very limited extent in the United Kingdom.

PLUG FILLERS.—These consist of a short, common, and imperfect leaf of the same type as the wrapper.

NAVY LEAF.—The "navy plug", in quarters, half pounds, and pounds, is a style of tobacco which gained its reputation during and after the war. The best of Green river redried fillers were the material used for its manufacture, but during the past few years the fashion has turned toward White Burley fillers, and they now compose the largest portion of leaf tobacco used for manufacturing "navy plug" in its various sizes.

IRISH FILLER.—To a very limited extent a short, well-ripened, clean, and oily leaf is used in Ireland for fillers. The Bird's-eye and Irish filler are sold in English markets in the leaf for the special consumption to which they are adapted, and all other types either in strips or leaf. If in the latter, the stem is removed from the leaf by the manufacturer in preparation for manufacturing, or so prepared as to be used with the rest of the leaf. The consumption of strips is much larger than that of leaf.

SCOTCH ELDER.—Scotch Elder is a type of great absorptive or drinking qualities, having a leaf of good size, very porous, with but little gum, reddish in color, and with medium texture. Mr. Todd is authority for saying that, since the tax in the United Kingdom has been increased, 100 pounds of tobacco will be so heavily watered as to make 155 pounds when sold to consumers.

SCOTCH AND IRISH SPINNERS.—These are almost or quite identical in type with English spinners, and the description made of the latter may be applied to the former.

CONTINENTAL SHIPPERS.

FRENCH TYPES may be reduced to two distinct lines of classification, as heavy and light, with considerable irregularity as to grade and deficiency in distinctness as to type.

TYPE A.—This consists of a leaf 23 to 25 inches in length, of moderately smooth appearance, dark-brown color, and not of so much weight of body and substance as the Italian Regie.

TYPE B.—Of the same qualities for both light and heavy as type A, except that the length is 22 to 23 inches.

TYPE C.—This consists of good, sound, clear lugs or common leaf, of moderately heavy body, or running from the Clarksville and western Kentucky type of medium weight of body to lower Green river product of medium weight of substance. These types are used for cigar wrappers, fillers, and binders, for the manufacture of snuff, and for cutting into smoking-tobacco. The heavy types are generally taken from the nondescript part of the Clarksville and western Kentucky districts, and the lighter types from nondescript of the Lower Green River district, of Illinois, and of Indiana. The types vary so much in the French orders that in some years the whole of it may be supplied by the product of the latter-named districts. Those made in the orders of 1880 and 1881 do not class, on an average, much, if at all, above the grade and quality required in former years in the lowest type, C. France is taking from good lugs up to medium leaf, but no very fine tobacco, from the United States.

ITALIAN REGIE TYPES.

TYPE A.—This is a large, showy, smooth, and silky leaf, 25 to 26 inches long, of fine fiber and texture, and of solid dark-brown color. Moderate weight only is required in this type, and just enough oil and fat to create elasticity and strength of texture. It is used by the Italian Monopoly Company as wrappers in the manufacture of cigars.

TYPE B.—This type varies between heavy and light tobacco, sometimes the former and sometimes the latter being required by the annual orders of the Monopoly Company. When the former is required, the type consists of leaf of heavy body, dark-brown color, and of more general richness and weight of substance than type A, and 22 to 25 inches in length. This type is used largely in the manufacture of snuff. Type B, light, consists of leaf of second and third grades, of the same length and showy appearance, of light-brown or red color, and of moderate weight of body and substance. This type is used in the manufacture of cigars of milder flavor than those made of the heavier types, and also largely for cutting into smoking-tobacco.

TYPE C.—This consists of choice lugs or short common leaf, 18 to 20 inches in length, and of moderate weight of body, and is used as fillers and binders in the manufacture of cigars. Of these several types, A is chiefly selected from the lighter-bodied and smooth product of the Clarksville district and the western Kentucky district; B heavy, from the heavier-bodied products of these districts; B light, chiefly from the product of moderate weight of substance of the Lower Green River district and Indiana and Illinois; and C from the lighter-bodied lugs and common leaf of the heavy-producing districts and the heavier bodied of the light producing districts.

AUSTRIAN REGIE.

The Austrian Regie takes only one type or grade from the United States. This is a wrapping leaf, very smooth and fine in fiber, of very solid, firm, and glossy texture, above medium heavy body, but not of the heaviest and most fleshy type, and of a perfectly uniform brown color. A very essential quality is toughness and "stretchiness" of texture, and it must be well cured by fire, but not injured in curing. The length of the leaf is not an essential part of the fitness, but good length is much preferred. This type is used in Austria as wrappers in the manufacture of cigars, and is supplied chiefly from Virginia, and in smaller part from the Clarksville district. Large crops of tobacco are raised in Hungary, more than enough to supply Austria with the lower grades.

SPANISH REGIE.

No classification of the tobacco bought by the Spanish Regie is made. It consists of sound and common lugs of all types and districts, except the Burley and bright-producing districts of Kentucky and North Carolina, and of the low and nondescript leaf of light type. The order is generally made for one-third of leaf of low grade and two-thirds of lugs. It is all used for smoking, the better grades for wrappers, binders, and fillers in the manufacture of cigars, and the lower for granulation for the manufacture of cigarettes.

SNUFF LEAF AND LUGS.

Snuff leaf is heavy, very rich and fat, of fine fiber and dark color, and is used for making the finer grades of snuff. The leaf described as German spinner is used partly in Germany for making the best grades of snuff. Snuff lugs are of the same qualities as the leaf, heavy, fat, and dark in color, considerably fermented, and are used for making the common grades of snuff.

GERMAN TYPES.

GERMAN SAUCER.—This is a sweet, fair-bodied leaf, of fine fiber and stem, gummy without fatness, and either clear, cherry-red in color, or mottled with yellow, or what is technically called piebald. It is generally a leaf of good length and weight of body, with gummy surface. It is prepared for consumption in Germany by the application of sauce of a peculiar description. The fiber must be yellow after saucing, and the leaf black. The largest proportion of this type is taken from Virginia.

GERMAN SPINNER.—This consists of leaf of the heaviest body, 24 to 26 inches in length, full in width, of fine fiber and stem, very oily and fat, so that it will sweat supple and strong, tough and elastic in texture, and of a very deep or dark-brown color. This type is used in Germany and the north of Europe for spinning into strand. It is supplied chiefly from the Clarksville district, but in part also from the Upper Green River district, and to a very small extent from the Lower Green River district. German spinning fillers are of the same type as the wrappers used in spinning, but consist of very fat, clean, and heavy-bodied lugs, which are supplied from the Clarksville and Upper Green River districts.

OHIO, MARYLAND, AND WEST VIRGINIA SPANGLED.—This is a leaf of moderate length, full breadth, and small stem. It has a medium strength in texture, is rather deficient in oil, and is in color yellow, yellow spangled with red, red spangled with yellow, and fine red. It is cured with fire, but has a mild, sweet flavor. The fine yellow and yellow spangled goes to Bremen, where it is rehandled, put in lighter casks, and sent to Russia for consumption, a portion, however, being taken to Austria and England, the latter countries taking also the red spangled. England takes, besides, the fine red. Germany takes all grades for consumption except fine yellow and dark brown, which latter are taken by France and Italy, and Spain takes the unsound and nondescript qualities. Scraps of this type are used in this country for smoking-tobacco.

SMOKERS—FAT LUGS.—The very fat, heavy, and oily lugs of the Clarksville and other heavy tobacco-producing districts, beside being used in the manufacture of common snuff in the United States and Germany, for baling fillers, and for spinning fillers, as noted elsewhere, are also taken on the continent for making common cigars.

SWITZERLAND.

SWISS WRAPPER.—This is a long and broad leaf, 26 to 30 inches in length, silky, of fine fiber and stem, and of a dark-brown or chestnut color. It is desirable that the spaces between the small or lateral stems should be broad, and the combination of thin with strong and elastic texture is desired, that a maximum supply of wrapper may be obtained from a given weight of product. It is used in Switzerland as a wrapper in the manufacture of cigars, and is supplied chiefly from the Clarksville district, but to a small extent from other heavy-producing districts.

HOLLAND.

DUTCH SAUCER.—This is similar in all respects to the German saucer, except that it is thinner and more silky in texture. It is exported exclusively to Rotterdam.

BELGIUM.

BELGIAN CUTTER.—This is a short leaf of a mottled or piebald color, and of fair body, without fat or oil. The general quality and structure are such as have been described for German and Dutch saucers, except that the grade is lower than is used for those purposes. It is used in Belgium for cutting.

DENMARK, NORWAY, AND SWEDEN.

A bright, mottled or red, fleshy, sweet leaf, not fat, prepared in Germany from the product usually of Virginia and the Kentucky and Tennessee districts, is a great favorite in Denmark, Norway, and Sweden. In addition to this the heavy Clarksville types, cured with fire, are largely consumed in these countries.

AFRICAN SHIPPERS.

African shippers may be divided into three classes, as follows:

1. Suitable for southern Africa, should be of long, dark leaf, strong body, small tie, put in hogsheads of small size, and prized to weigh about 1,550 pounds gross; neatly handled.
2. Suitable for the intermediate portion of the country, should be of long leaf, medium to light color, fine fibers, handled as class one, and weigh about 1,450 pounds gross.
3. Suitable for the more northern part of Africa, should be of light leaf, not so long as classes one and two, and handled in medium-sized hogsheads, weighing not more than 1,450 pounds gross. It is better that this class should not be overhandled.

During the past few years tobacco has also been packed in boxes for shipment to the coast of Africa. The quality is the same as described above, about 400 pounds going into a box by hard prizing, and the tobacco is more subject to atmospheric influences than when prized in hogsheads.

While most of the tobacco shipped to Africa is first rehandled in this country, still there is a fair proportion of leaf of suitable quality and handling sent to market direct by farmers. This is mainly taken for account of merchants in Boston, Massachusetts, who send cargoes of various articles to the African coast.

MEXICO, SOUTH AMERICA, AND THE WEST INDIES.

BALING WRAPPERS.—This is a heavy leaf, 28 to 30 inches in length, of fair width, very fat and oily, of heavy texture, and of very dark color. A necessary condition of this class is that it should be neatly tied in small bands, neatly and strongly packed in casks, and moderately pressed. It is used as wrappers in preparing stock for the trade of the several markets named, and is packed in bales weighing from 100 to 200 pounds, and covered with cloth, so that two bales may be balanced across the back of a pack mule for transportation across the mountainous regions of the districts in which it is consumed.

BALING FILLERS.—Common rich and heavy leaf and fine lugs of heavy body and full supply of oils and fatness are used for this purpose. Some of the exports to the West Indies are called "black fats", and are made dark by very heavy pressure and by the application of water, clear or tobacco-stained.

Nondescript leaf is incapable of classification. It has the merit of cheapness, and is usually bought and held by speculators, who take advantage of the scarcity of some well-defined type to put a nondescript variety on the market approaching in general qualities the type in demand.

The lowest and commonest grades of lugs are often used in the United States, especially if air-cured, in the manufacture of the cheapest grade of pipe-smoking tobacco. With this product a large proportion of stems is frequently mixed to increase the bulk and to reduce the cost. Some of this low grade is also used in making sheep-wash.

Julius Bien & Co. Lith. N.Y.

Stems or midribs used to be exported in large quantities to Germany for the manufacture of cheap grades of snuff and smoking tobacco, and were also employed as manure or for the protection of fruit trees from the borer and other insect enemies. Since the tax was raised in Germany on tobacco and stems the consumption of the latter, except the finest bright from Virginia leaf, has fallen off considerably, and for a year or two past the article has become almost valueless, stemmers and manufacturers being unable to obtain the cost of prizing and casks. Large quantities of stems, with the trash and sweepings of stemmeries, are now used for manurial purposes.

TYPE MAPS.

In the map which accompanies this chapter the localities in which the leading types are produced are designated by colors. It must not be inferred, however, that no other types than those indicated are made in the districts to which particular types are referred, but only that those types predominate or give character to the district. The types run into each other by such imperceptible gradations that it is often difficult to define with precision the line of separation.

The portions of the maps colored blue indicate that a heavy shipping leaf, either air-cured or fire-cured, is produced. Red indicates a lighter shipping leaf, red and colored, also cured by fire; dark yellow the regions in which the yellow tobacco is grown in greater or smaller quantities. Light yellow shows the main White Burley district, though this variety is grown in many other localities, as in West Virginia, eastern Ohio, Missouri, and Indiana, but was not the prevailing type in 1879. A yellow ground, spangled with red, shows where the spangled tobacco, taken in Germany, Russia, England, and France, is grown—a fine, showy article, with but little gum and body. A neutral tint, or drab color, as is shown in the center of the yellow-tobacco growing region of North Carolina and Virginia, shows where flue- and air-cured fillers are made, probably the most highly prized fillers, on account of sweetness and flavor, produced in the United States. The same kind of fillers, though not so decided in character, is produced in Missouri, as indicated by the color. Green shows the locality of sun- and air-cured sweet fillers. Some of these are also produced in Missouri, along with the flue-cured. Seed-leaf and Havana districts are represented on the maps by a chestnut-brown color. In many places within the limits of the blue air-cured fillers are produced suitable for use in domestic plug, but they do not constitute the predominating type.

It would be impossible to represent by colors the almost infinite varieties of types and sub-types produced in the shipping district, for these types frequently differ in the same township or civil district.

A county is seldom colored unless it produces as much as 100,000 pounds, though there are a few exceptions, as in the case of West Virginia, where a peculiar type is grown over a widely extended district. Strips of other counties that lie contiguous to a well-known tobacco district, as in Wisconsin and in the Miami valley, are frequently colored when the limits of culture are well known.

VARIETIES OF TOBACCO.

More than a hundred varieties of the tobacco plant are named in the schedules returned to this office. Of these more than half are either synonyms or designations descriptive of different peculiarities of the same variety. For instance, the Little Orinoco of Virginia is called Brittle Stem in West Virginia and Missouri and Narrow Leaf in Maryland.

Below are given the names of fifty of the best known varieties, with description of certain marked peculiarities of style, growth, character of leaf, etc., the uses for which they are best adapted, and the states in which they are mainly grown:

Varieties.	Description.	Uses.	Where grown.
Adcock	Wide space between leaves; ripens uniformly from top to bottom.	Wrappers and fillers for plug; excellent fine smokers.	North Carolina.
Baden	Short leaves, light; inclined to be chaffy; cures a fine yellow, but liable to green spots.	Plug wrappers and fillers; smokers	Maryland.
Baltimore Cuba	Long leaf; good body; fine, silky texture; tough; yields well; sweats a uniform color; disseminated by the U. S. Agricultural Department.		Ohio (Miami valley).
Bay	Large, heavy leaf; red spangled and yellow when cured.	Manufacturing and shipping	Maryland.
Beat-all (same as Williams)	Large, spreading leaf; fine fiber; dark, rich, and gummy.	Export to Great Britain and Germany; well cured; makes fine wrappers.	Tennessee, Virginia.
Belknap	Sub-variety of Connecticut Seed-Leaf	Same as Connecticut Seed-Leaf	Connecticut, Massachusetts, New York.
Bull-face	Sub-variety of the Pryor; large, heavy leaf, oval shaped; tough; small stems and fibers; a luxuriant grower.	Heavy shipping; makes good wrappers for plug.	Virginia, North Carolina, Tennessee.
Burley—Red	Thin leaf, narrowing toward the tip from center	Cutting tobacco	Kentucky, Virginia, Ohio.
Burley—White	Long, narrow leaf; white in appearance while growing; grows flat, with points of leaves hanging down.	Fancy wrappers, and for cutting purposes	Ohio, Kentucky, Virginia, Maryland, *Missouri*, *Indiana*.
Clardy	Large, smooth, heavy leaf, extremely broad; stalks long; a hybrid.	Common plug; exported for Swiss wrappers.	Kentucky, Tennessee.
Connecticut Seed-Leaf	Broad leaf; strong, thin, elastic, silky; small fibers.	Cigar wrappers; lower grades for binders and fillers.	Connecticut, New Hampshire, New York, Pennsylvania, Ohio, Wisconsin, Minnesota; also in Indiana, Illinois, and Florida.

Varieties.	Description.	Uses.	Where grown.
Connecticut Broad Leaf	Modification of above; leaves broader in proportion to length; fibers more at right angles to midrib.	Same as above	Connecticut, New York, Wisconsin.
Cuba	Small leaf, grown from imported seed; retains much of the aroma of Cuba-grown tobacco.	Cigar wrappers, fillers, and binders	Pennsylvania, New York, Wisconsin, Florida, Louisiana.
Cunningham	Short, broad leaf; thick and stalky growth	Fillers and smokers	North Carolina.
Duck Island	Broad leaf; fine appearance; full grower; originated from Havana seed.	Cigar work	New York, Pennsylvania.
Flannagan	Similar to Little Orinoco, but broader leaf, finer fiber; silky and tough.	Fancy wrappers; plug fillers	Virginia.
Florida Leaf	Fine texture, silky and elastic; becomes spotted with white when ripening.	Cigar wrappers, binders, and fillers	Florida.
Frederick	Akin to White Stem; rough leaf; heavy and rich; stands up well.	Mainly for export to Europe	Virginia, Tennessee.
Glessner	Large handsome leaf; fine texture; soft and elastic	Cigar wrappers and fillers; smokers	Pennsylvania, New York, Wisconsin.
Gooch	Broad, round leaf; leaves thick on stalk; yellow on hill when ripe; cures easily.	Fancy wrappers and smokers	Virginia, North Carolina.
Gourd Leaf	Broad, short, fine, and silky leaf; yellows on the hill	Plug wrappers and fillers; smokers	Virginia.
Governor Jones	Long, narrow leaf, of good body	Plug wrappers and fillers, and for common smoking.	Kentucky.
Havana Seed	Very thin, fine leaf; fine texture; delicate flavor	Cigar wrappers	Connecticut, Massachusetts, Pennsylvania, Wisconsin.
Hickory Leaf	Fine fiber and texture; cures up very bright	Plug work, smokers, and shipping	West Virginia.
Johnson Green	Said to be a cross of Orinoco and White Stem; large, heavy leaf; strong flavor.	Strips and shipping leaf	Virginia.
Kite-Foot	Rather short, wide leaf; thin; apt to cure a greenish color unless fully ripe.	For very common cigars; culture decreasing.	Indiana.
Little Dutch	Narrow leaf, small and short; in flavor resembling Yara tobacco.	For binders and fillers for cigars; very popular.	Ohio (Miami valley).
Long Green	Coarse and heavy; vigorous grower	Heavy shipping leaf	Virginia.
Lancaster Broad Leaf	Upright grower; delicate silky fiber	Cigar wrappers, binders, and fillers; smokers.	Pennsylvania, Wisconsin.
Lovelady	Long, dark, narrow leaf; very heavy	Export; grown for African shippers	Virginia, Tennessee, Indiana.
Mann	Leaf of good body; heavy and gummy	Plug wrappers and fillers; export	North Carolina.
Orinoco	Short, broad leaf; upright growth and open habit; light colored; much ruffled.	Plug wrappers and fillers; for strips and for export leaf.	Virginia, Missouri.
Orinoco—Big	Short, broad leaf; doubtless same as last named	Sweet plug wrappers and fillers; export	Virginia, Missouri, North Carolina, Tennessee, West Virginia.
Orinoco—Little	Long, narrow, tapering leaf; fine texture; stands up well.	Principally for plug work and smokers; sweetest variety grown.	Virginia, North Carolina, Tennessee, West Virginia, Missouri.
Pennsylvania Seed-Leaf	Same as Connecticut Seed-Leaf	Same as Connecticut Seed-Leaf	Same as Connecticut Seed-Leaf.
Perique	Medium-sized leaf; fine fiber; small stem; tough, gummy, and glossy.	Smoking; cigars and cigarettes; for mixing with other kinds.	Louisiana.
Pittsylvania Yellow	Medium-size; leaves elongated, good distance apart; fine texture; small tough stems.	Fine wrappers and fillers; good export variety.	West Virginia.
Pryor—Blue	Large, fine leaf, long, and well proportioned; good color; slightly ruffled.	Cigar and plug fillers; stemmers for export.	Virginia, North Carolina, Kentucky, Tennessee, Missouri, Indiana.
Pryor—Yellow	Heavy, wide leaf; fine texture; fine bright color; tough; weighs well.	Cigar and plug wrappers and fillers; stemmers for export.	Same as last.
Pryor—White (or Medley Pryor).	Very broad leaf; soft and silky texture, and tough fiber; a beautiful grower.	Plug wrappers and fillers	Virginia.
Shoestring	Heavy leaf; rather narrow; long and large stem	Dark navy plug; good stripping leaf	Tennessee, Kentucky, Missouri, Virginia.
Sleek-stem	Large, long leaf; heavy weigher; no ruffles	Heavy dark fillers; shipping leaf	Tennessee.
Spanish Seed	Uniform dark color; medium size leaf; ripens ten days earlier than other varieties.	Highly prized for dark cigar wrappers	New York, Illinois, Wisconsin.
Thickset	Leaf long, pointed, narrow; coarse fiber; very short stalk; coarse and heavy.	Common plug work and shipping	Kentucky, Missouri, Maryland, West Virginia, Tennessee, eastern Ohio.
Twist-bud	Heavy, large leaf; screw-shaped terminal stem	Export mainly; also for plug fillers	Kentucky, Missouri, Maryland.
Vallandigham	Large, pointed, smooth leaf	Cigar wrappers and fillers; smokers	Wisconsin.
White Stem	Leaf long, slender, drooping; tough and fibrous; largest leaf grown.	Plug wrappers, strips, and shipping leaf.	Virginia.
Wilson's Hybrid	Said to be an improved Havana; erect habit; easy of cultivation.	Cigar wrappers, binders, and fillers	New York.
Yellow Mammoth	Very large leaf; rapid grower; yields largely	Stemmed for export, for Swiss wrappers	Tennessee.
Williams	Same as Beat-all, grown in Tennessee for twenty-five years as Williams.	British and German export	Tennessee.