

No. 811,128.

PATENTED JAN. 30, 1906.

J. M. CASE.
GRADUAL REDUCTION MILL.
APPLICATION FILED MAR. 21, 1903.

5 SHEETS—SHEET 1.

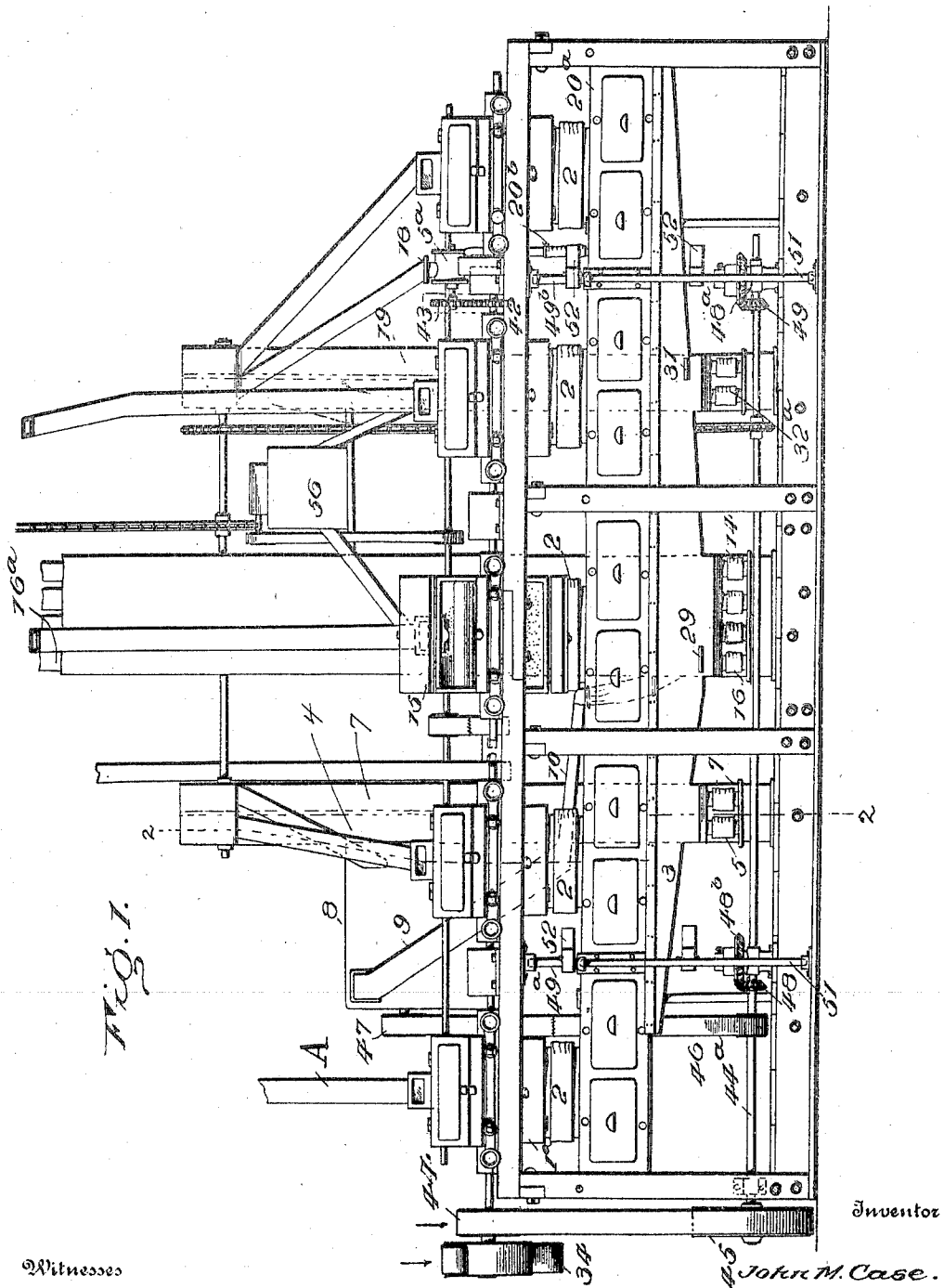


Fig. 1.

Witnesses

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Knight Bros

Attorneys

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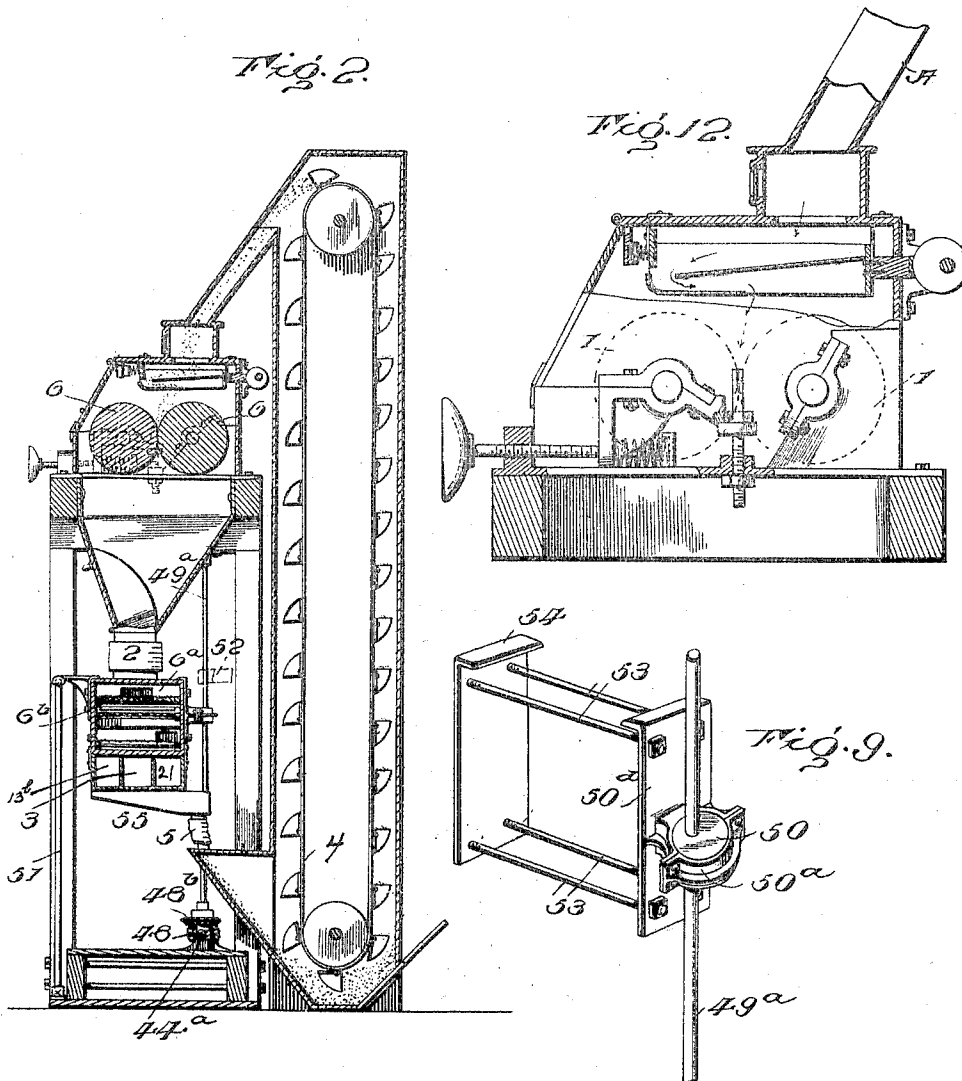
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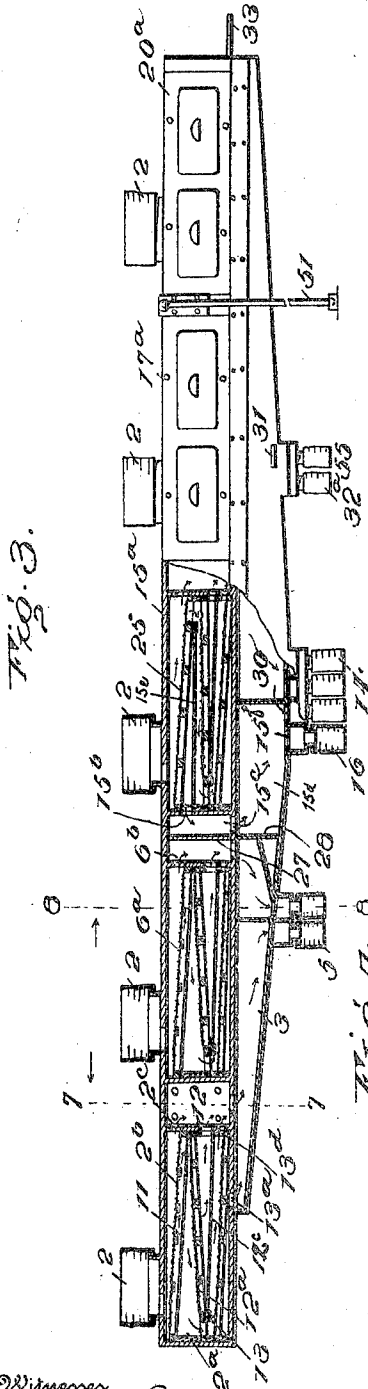
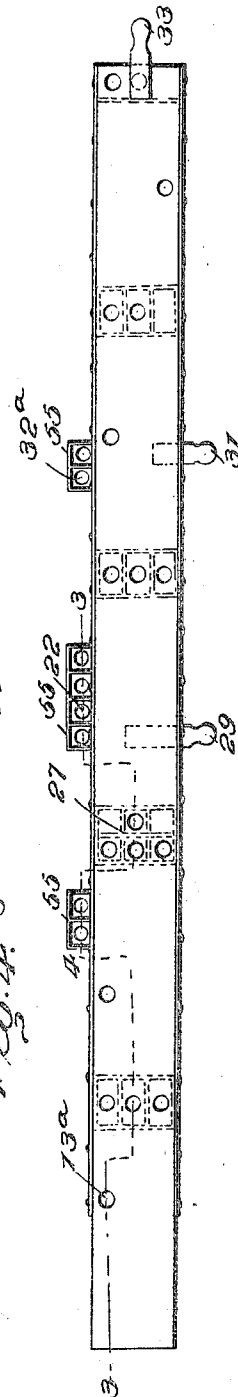
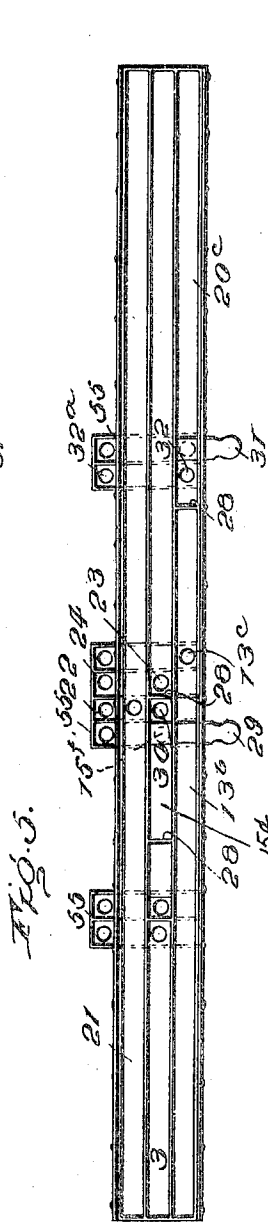
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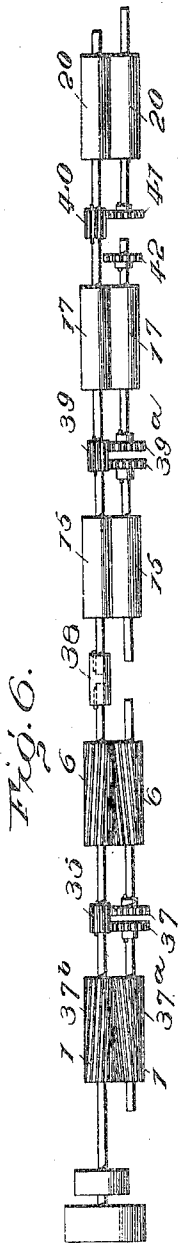
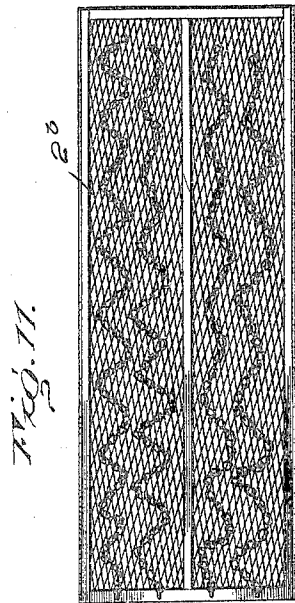
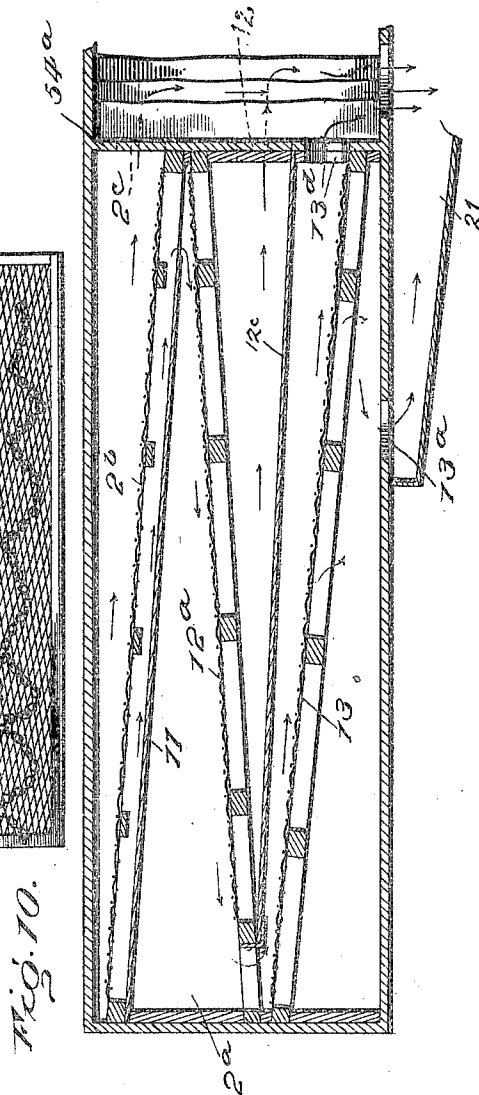
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5 SHEETS—SHEET 4.



WITNESSES:

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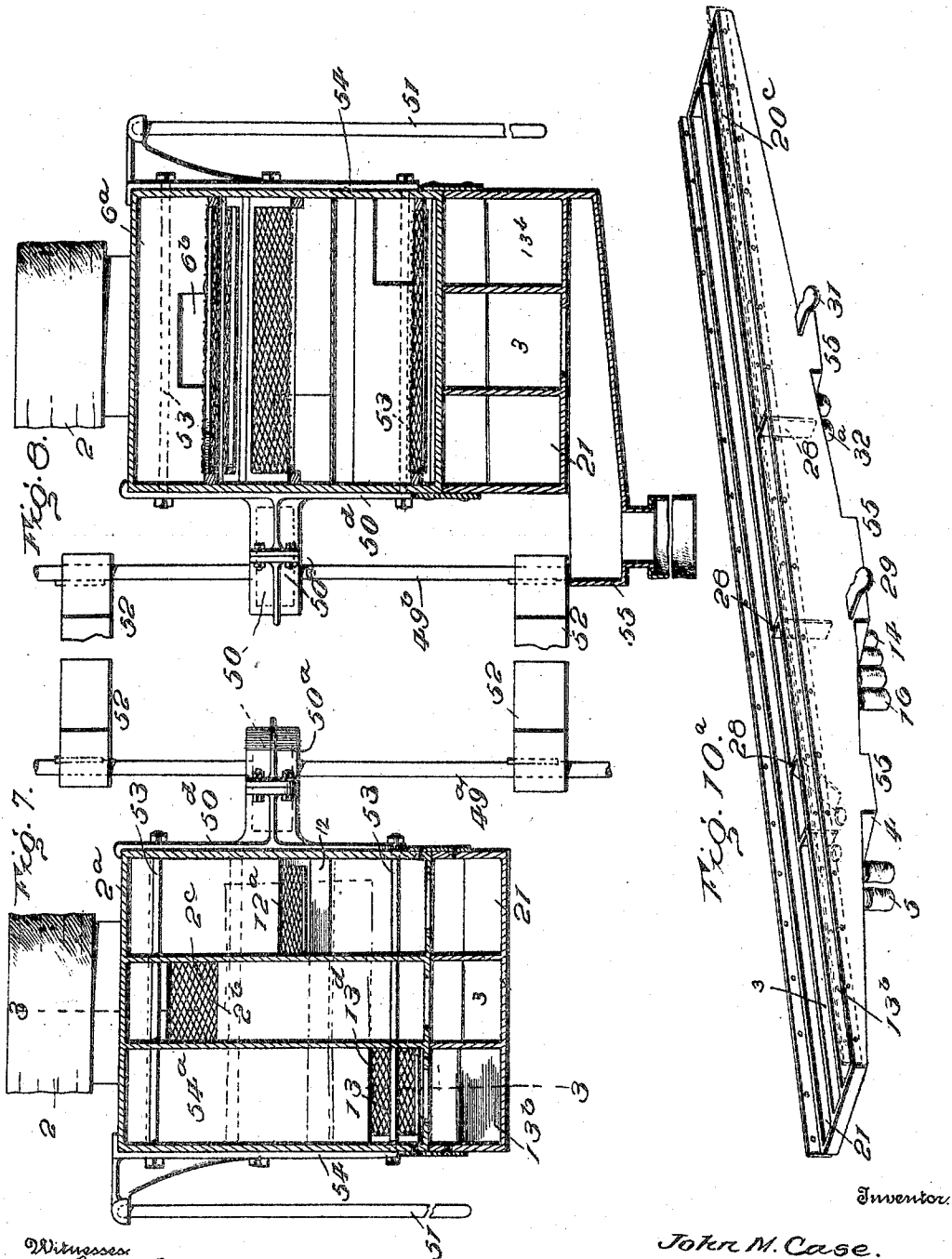
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5 SHEETS—SHEET 5.



Witnesses

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UNITED STATES PATENT OFFICE.

JOHN M. CASE, OF CINCINNATI, OHIO.

GRADUAL-REDUCTION MILL.

No. 811,128.

Specification of Letters Patent.

Patented Jan. 30, 1906.

Application filed March 21, 1903. Serial No. 148,944.

To all whom it may concern:

Be it known that I, JOHN M. CASE, a citizen of the United States, residing at Cincinnati, in the county of Hamilton, State of Ohio, have invented certain new and useful Improvements in Gradual-Reduction Mills, of which the following is a specification.

My invention relates to an improvement in roller flour-mills, and has for its object to provide a mill substantially in one frame, driven from one common shaft, and so constructed that the complete mill may be finished and all spouting and connections made in the factory, thus obviating the necessity of extensive millwrighting at the place of erection of the mill.

A further object is to so construct the mill that the frame may be divided through the center into two sections, each of which may be readily placed in an ordinary box-car and shipped to the destination, where the mill may then be set up in a very short space of time and with a limited amount of labor.

A further object is to provide a mill that may be placed in a very small building, requiring no basement, but only one story and an attic for the reception of the finished product and the wheat-cleaning machinery.

A further object is to provide a complete flour-mill that may be constructed and put in operation at a greatly-reduced cost of construction and expenditure of power, such mill having embodied in it all the essential features for the highest-grade milling and being adapted to make the highest grade of patent flour, a perfect finish of the offal, and a large yield from the wheat, every machine requisite for the highest-grade mill being used in the construction.

Referring to the drawings, Figure 1 is a front elevation of my improved mill assembled. Fig. 2 is a section on the irregular line 2 2, Fig. 1. Fig. 3 is a view of the bolter, partly in section, taken on the lines 3 3, Figs. 4 and 7. Fig. 4 is a top plan view of the base-board of the bolter. Fig. 5 is a top plan view of the conveyers of the bolter. Fig. 6 is a detail view of the rolls detached from the machine. Fig. 7 is a sectional view of the bolter on the line 7 7, Fig. 3. Fig. 8 is a sectional view of the bolter on the line 8 8, Fig. 3. Fig. 9 is a detail perspective view of the mechanism for shaking the bolter. Fig. 10 is an enlarged sectional view of the bolter. Fig. 10^a is a perspective view of the conveyer. Fig. 11 is a top plan view of the screen or

cloth with cleaners attached; and Fig. 12 is a side elevation of one of the mills, parts being broken away.

The wheat to be operated upon is received from a stock-hopper above (not shown) after being properly cleaned and is delivered through the spout A into a pair of rolls, (marked 1.) This pair of rolls is corrugated in the usual manner, and the wheat after being ground drops through a hopper 1^a below, which hopper is connected by a flexible pipe 2 to a sifting or bolting device 2^a immediately beneath the roll. On this sifting device the wheat is first scalped on the upper sieve 2^b, the unfinished product tailing over this sieve, passing down through a suitable opening 2^c to a conveying-trough 3 below, whence it is carried forward to a point opposite an elevator, as shown at 4, and by means of a flexible spout 5 the stock is delivered to said elevator and thence elevated and delivered to the next pair of rolls 6, where it is ground down to the finishing of the bran. It then passes onto the second section 6^a of the flour-sifter, which is constructed the same as the first section, excepting that finer cloth or wire is used for the scalping of the material. The bran from this scalper passes down through a suitable opening 6^b and is delivered to the second elevator 7, and from thence it is elevated to a bran-duster 8. In this bran-duster all of the valuable material is brushed out and the bran delivered through spout 9 to a conveying-spout 10, connected to the top of the sifter, and thence conveyed to one of the elevators and elevated to the finished-feed bin. The product from the bran-duster is delivered onto the second sifter 6^a. This completes the first operation of my mill—that is, it has reduced the wheat and separated the middlings and flour from the bran. Now, to return to the roll 1, the flour and middlings which have been made in this first reduction pass over two sieves arranged in the manner shown in Fig. 3. The flour which is taken off on the first sieve 2^b is delivered by cant-board 11 to the second sieve 12^a, the fines from which drop upon a second cant-board 12^c and are delivered through a suitable opening 12 into the conveying-trough 21, which will be hereinafter more fully described. The middlings tail out over the second sieve 12^a of the series, and flour which has not been sifted out is delivered onto the next or last sieve 13 in this first section, where it is dusted, and the middlings tailed over

through a suitable opening 13^d into the conveying-trough 13^b below, the flour from this sieve being delivered through an opening 13^a in the bottom of the sieve-box to another 5 conveyer-trough 21, arranged immediately below the sifter. The operation herein explained is duplicated precisely in the second reduction, and the middlings from the two reductions are conveyed through the conveying-trough 13^b to a point 13^c opposite one of 10 the center elevators, into which elevator it is delivered through the flexible spout 14 and is taken up into the second story, when desired, and delivered to a suitable purifier 56, 15 which purifier is arranged to take out all of the fine product on an upper sieve, and the coarser product is purified by means of air-currents on the lower sieve. The middlings from the lower sieve of the purifier are delivered to the third pair of rolls, (marked 15, 20 Fig. 1,) where they are suitably ground into flour and the product from this grinding delivered into the third section 15^a of the sifting device below said rolls. Here I take out 25 the higher grade of patent flour, which drops upon the cant-board 15^c, then through suitable openings 15^b 15^c, trough 15^d, flexible spout 16 to the elevator 16^a and is conducted to a flour-bin. (Not shown.) The tailings 30 from the last sieve on this section are sent either directly to feed or to a suitable dusting device (not shown) if it is desired to make a very close finish of the product.

The middlings from the upper sieve of the 35 purifier are spouted to the fourth pair of rolls 17 and are there suitably ground and delivered into the fourth section 17^a of the sifting device, where they go through precisely the same operation as that section which receives 40 the product from roll 15, tailing over to feed, these tailings from both pairs of rolls 15 and 17 passing through suitable openings and commingling in a conveying-trough 21 below. The unfinished middlings from the sifter handling 45 the stock from the fourth pair of rolls is elevated and delivered to a scroll-mill, (marked 5^a.) This scroll-mill is constructed for the purpose of grinding the soft fluffy stock and is especially adapted to that class 50 of work near the tail of the mill, as it has more capacity than a pair of rolls on soft stock. The product from this scroll-mill is delivered onto one side of the sifting device 20^a through 55 the flexible spout 20^b, this section of the sieve being arranged to handle the stock from both the scroll-mill 5^a and the last pair of rolls, the stock from the scroll-mill 5^a being handled on one side of the sieve and that from the roll-mill on the other side of the sieve. The unfinished 60 product from that section of the sieve which takes the stock from the scroll-mill is tailed over into the conveying-trough 20^c and delivered back into the last elevator at 19, from whence it is spouted to the last 65 finishing-roll (marked 20) and ground down

to a complete finish. The tailings from this grinding pass over into feed and are delivered into the same conveying-trough 21 that receives the feed from all the other reductions. All the flour made on both breaks 70 and the smooth rolls and the scroll-mill, except a part of that made on the center section, which may be drawn off as patent, is delivered into the rear conveyer-box 21, Fig. 5, and by the shaking action of the sifter is carried 75 to the center of the machine, where it is delivered out as finished flour through the side spout, (marked 22.) The feed is also carried back by another section, or the center section, of this shaking conveyer-trough to 80 another opening leading to another conveyer, as shown at 23 24, where it is also carried up and delivered into the finished-feed bin.

The patent or highest-grade flour is made on the upper sieve of the center section 15^a 85 and is returned backward and delivered into a suitable opening 15^b, and in order to draw off this flour separately I make this pocket with a partition through the center, as shown at 27, Fig. 4, so that I make four different 90 products and convey them all to one common center by the use of three different conveyer-troughs, there being suitable bridges 28 formed in one of these troughs, so as to control the stock and deliver it to its proper ele- 95 vator. I also provide means by the use of suitable sliding valves so that if the miller does not desire to make patent flour he can slide the valve 29 in, so that the opening 15^d, leading down into the channel below, would 100 be closed, as shown in Fig. 5. By drawing this valve 29 out the mill will make patent flour. By sliding the valve in the flour will run over the valve and deliver itself into the next opening, (marked 30,) whence it will be 105 commingled with the straight-grade flour. I also provide a means for controlling the low grade by the use of the valve 31, Fig. 5. By sliding this valve in, the low-grade flour will pass over the valve and be delivered into the 110 next opening 32, which communicates, by means of the spout 32^a, with the elevator that leads to the last finishing-roll, where it is re-ground and bolted into the straight flour. I also control the tailings from the last finish- 115 ing-roll by the use of the valve 33, Fig. 4, so that if the miller desires to draw off the last finished feed and not mix it with the coarser feed he may do so by simply pushing this valve in. I have thus far described in a gen- 120 eral way the operation of the material upon my improved mill. I now desire to describe specifically the various mechanical parts and their relative connection with each other. Referring to Fig. 1, the mill is connected to a 125 suitable power by means of the main driving-belt 34. The pulley to which this belt is attached is connected directly to the outer end of one of the fast-running rolls. This roll is coupled to the next successive roll by means 130

of a coupling, (shown at 35, Fig. 6,) which performs the function of both a coupling and a gear, the outer surface of the same being cut into gear-teeth and arranged to mesh into
 5 two suitable gears 37, connected with the two slow-moving rolls. These gears on the slow rolls 37^a are made about two and one-half times the diameter of those on the fast rolls 37^b, which gives a differential motion to the
 10 rolls of two and one-half to one, by which means grinding is done as in the usual manner. The next two fast-running rolls are connected together by means of an ordinary coupling 38, the shafts being keyed to this
 15 coupling. The next two fast-running rolls are connected at 39 precisely the same as in the first two rolls and have suitable gear 39^a on each of the two slow rolls. This gear may be made so as to give less differential speed, if
 20 desired, by simply a difference in the relative diameters of the gears. The next two fast rolls are connected together rigidly at 40 in the same manner as the other two and have one slow roll connected by gear 41 to the fast-roll shaft. The gear marked 42 connects
 25 with the scroll-mill, (better shown at 43, Fig. 1.) On the outer end of the first fast roll, as shown at 44, I communicate power to a line-shaft 44^a below by means of the pulley
 30 45. This line-shaft has a belt, as shown at 46, which connects with a suitable pulley 47 on the bran-duster 8. On this same line-shaft I arrange two pairs of gears, as shown at 48 and 49, which two pairs of gears connect, by means of gears 48^a and 48^b, with
 35 suitable vertical shafts 49^a and 49^b, on which are arranged eccentrics 50, which work in eccentric-boxes 50^a, rigidly connected with the sifter, one near each end thereof. These vertical shafts 49^a and 49^b have arranged upon
 40 each of them suitable counterbalance-weights 52, made of suitable dimensions to provide a perfect counterbalance to the weight of the sifter, so that in the gyratory motion there is
 45 no shaking of the machine, the one force counterbalancing the other. The sifter is swung or pivoted upon four vertical legs 51 in such a manner that as the sifter takes a gyrating motion it remains continuously in
 50 one common level plane. To more fully describe this sifter, I refer to Fig. 3, in which part of the sifting device is shown in section and part in front elevation. This sifter, as will be seen, has suitable flexible connecting-pipes, which are rigidly connected at the
 55 top with a hopper under each pair of rolls, also with the scroll-mill and the product from the bran-duster. It also has suitable flexible spouts on the under side, arranged to communicate and connect rigidly at the bottom
 60 with their respective elevators. The sifter is divided usually into five sections, the two first sections being for separating the break-stocks and the flour made thereon and the
 65 last three sections being for separating the

middlings and the flour made thereon. Each one of these sections or sieves is independent of each of the successive sections, they being complete bolts within themselves and having
 70 suitable tailing-openings for delivering the stock from each bolt; but this part of my invention I desire to cover by a separate patent and will enter into more detailed description of the same in that application, which is filed
 75 of even date herewith.

By referring to Fig. 2 it will be seen that I only require to elevate the stock being operated upon a sufficient distance to deliver it back into the next successive reduction and that the elevators which pass up into the upper
 80 story are only a convenience for delivering the finished product where it may be packed into suitable sacks or the flour packed in the ordinary manner.

In Fig. 4 I have shown the system of feeding the stock and the plan of tramming and adjustment of the rolls.

In Fig. 9 may be seen the means connecting the eccentric with the sifting-box, this being a most important matter in connection
 90 with sifters, as they are necessarily quite heavy, and it is important that the driving connections should be absolutely firm and free from danger of becoming rickety or shaking to pieces, as is very frequently the
 95 case with sifters now in use. I form one-half of the eccentric band integral with a plate of metal 50^d, which has suitable bolts 53 running through from one side of the sifter-box to the other through the division
 100 between the two end sections of the sifter. These bolts clamp a plate 54 on the opposite side of the box, so that I bind the whole box together and draw it up solid and rigid, and in this manner it is impossible for the shaking
 105 device to get out of order or any of the parts to become loose, as the end board 54^a of the sifter-sections extends across the sifter, so that almost any tension may be drawn upon these end boards, keeping this important
 110 part of a sifting device in such perfect working order that it gives the miller no trouble whatever. By the use of the shaking-bottom, Fig. 9, connected with the sifter, I accomplish some very important features, one of
 115 which is that the entire product is delivered to positions where it is desired to take it without the use of conveyers, thus saving greatly in expense in the matter of first construction and also preventing the material
 120 from being injured by being conveyed from place to place by the ordinary screw conveyor. I also save very greatly in expense by this shaking device, as each delivery-hole represents in the old-style milling a canvas
 125 spout, so that by referring to Fig. 4 it will be seen that there are in the bottom of the sifter leading to the shaking-trough eighteen delivery-holes, each of which would represent in the ordinary construction of mill a canvas
 130

spout, and the entire expense of my spouts, as will be seen, consists simply in boring eighteen holes. It will be necessary to explain in this specification the auxiliary delivery-spouts, which are arranged immediately beneath the shaking-trough. These spouts are shown by the projecting points on the sides of Figs. 4 and 5 and also in an enlarged view at 55, Fig. 8. The side spouts are arranged to discharge the stock so that it may be readily delivered into elevators. They also control the delivery of the different products as they are divided into sections of two and four, and the holes immediately above these delivery-spouts are cut in the proper place to deliver the stocks to their proper section and proper elevator.

In small custom mills it is often desirable that the miller deliver the finished feed and flour directly to sacks or boxes from which he shovels it up and puts it in the customers' bags. In cases of this kind it is not necessary that the four center elevators should extend to the upper story. The middlings-purifier 56 may be suspended between the elevators and over the middlings-rolls on the same story, as shown in Fig. 1, and the elevators herein shown as passing up into the second story may be made the same height of those at each end of the machine, or about eight feet in height, so that the extreme height of the mill at no point is over eight feet, thus enabling it to be placed in a one-story building without disturbing any of the parts of the building or the floors and joists above or below. The drive-shaft from the fast roll may be connected with an extended shaft that, if necessary, may pass outside of the mill-building or store-room and connected with drive-power on the outside of the building. In this construction it is apparent that a complete flour-mill having a capacity of forty barrels in twenty-four hours may be placed in a small store-room or in a small out-building. In this simplicity of the complete mill I am enabled to supply mills to the trade at about one-half the cost of ordinary roller-mills, and the same may be driven with about one-half the power—not infrequently one-third the power—of that required for the standard roller-mills. This places the mill within the reach of a class of men having small threshing-machine engines, sawmill-engines, or limited water-power, where they can erect a mill at a small cost and enabling them to use a power which

frequently is idle for most of the year. Another advantage of this construction of a mill is that its bulk and weight are less than one-third that of any other roller-mill now built, and I am enabled to place three of these complete mills in one box-car, where it would require from two to three cars to load one mill of the old construction. This gives me a great advantage in the matter of freight and in the delivery to foreign countries and in the transportation of mills to the border sections of the country. I am also enabled to ship this mill in what is termed "knock-down" or in separated pieces, so that no one piece will weigh over one hundred and fifty pounds, thus enabling the purchaser to transport the mill over mountainous sections either in small wagons or on the backs of animals, thus enabling me to reach a section which has hitherto never been reached by parties erecting roller-mills.

Having thus described the invention, the following is what I claim as new therein:

1. In a gradual-reduction milling-machine, arranged in a single structure, the combination of a series of mills arranged in a horizontal line, a gyratory bolt structure disposed beneath the mills and comprising a series of independent bolts having a plurality of sieves, separate connections between each mill and a bolt, a plurality of troughs receiving the material from each bolt, and means for conveying a plurality of the products of the same bolt received by the troughs, from the troughs to separate mills of the series.

2. In a gradual-reduction milling-machine, arranged in a single structure, the combination of a series of mills arranged in a horizontal line, a gyratory bolt structure disposed beneath the mills and comprising a series of independent bolts having a plurality of sieves, separate connections between each mill and a bolt, a conveyer movable with the structure and embodying a plurality of troughs disposed to receive all the products from each bolt, and the products from the same bolt in different troughs, and means for conveying a plurality of the products of the same bolt received by the troughs, from the troughs to separate mills of the series.

The foregoing specification signed this 20th day of March, 1903.

JOHN M. CASE.

In presence of—

EDWIN S. CLARKSON,
HAROLD LEWIS.