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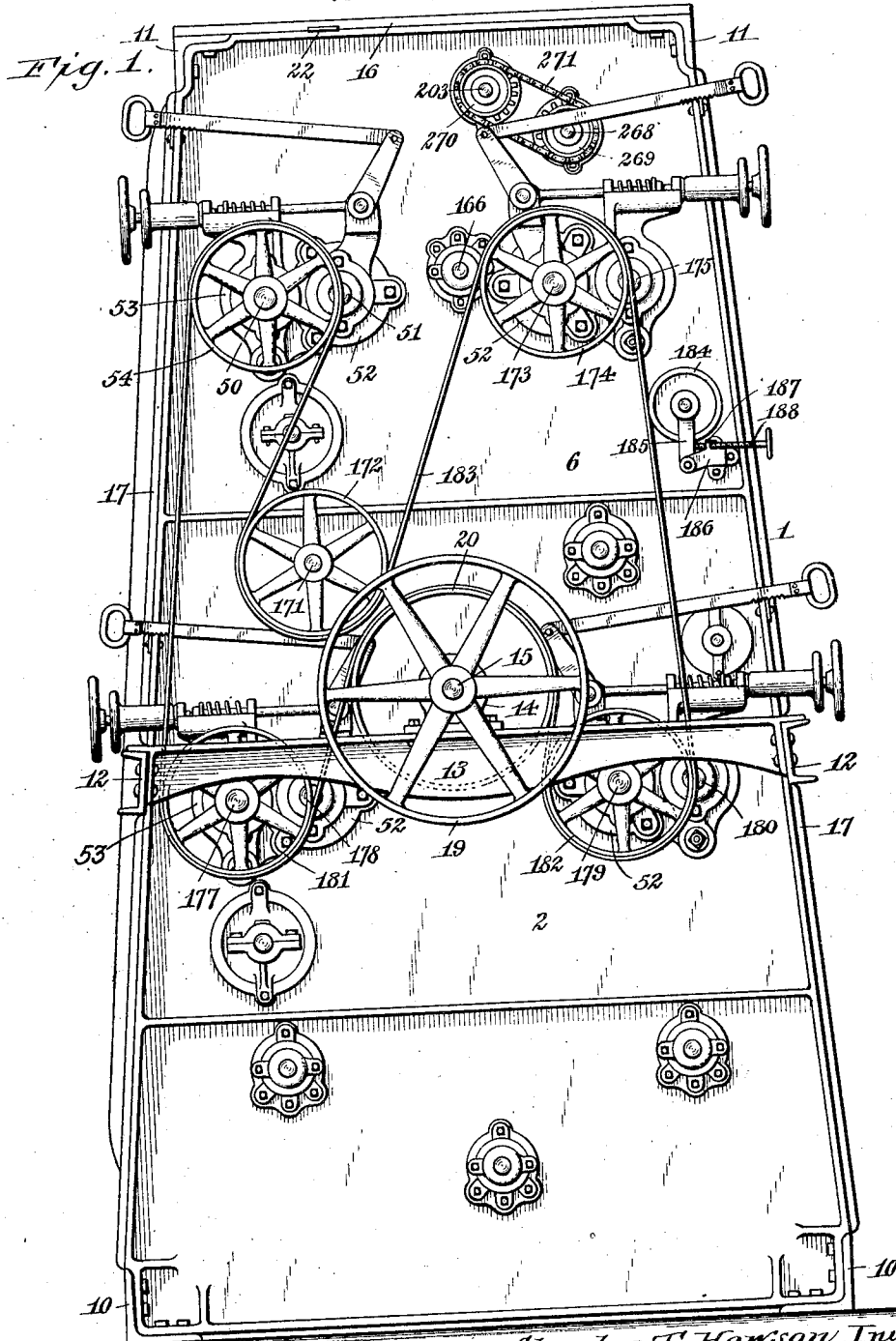
C. T. HOWSON

1,522,456

ROLLER MILL

Filed July 31, 1918

9 Sheets-Sheet 1



Witness:
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Jan. 6. 1925.

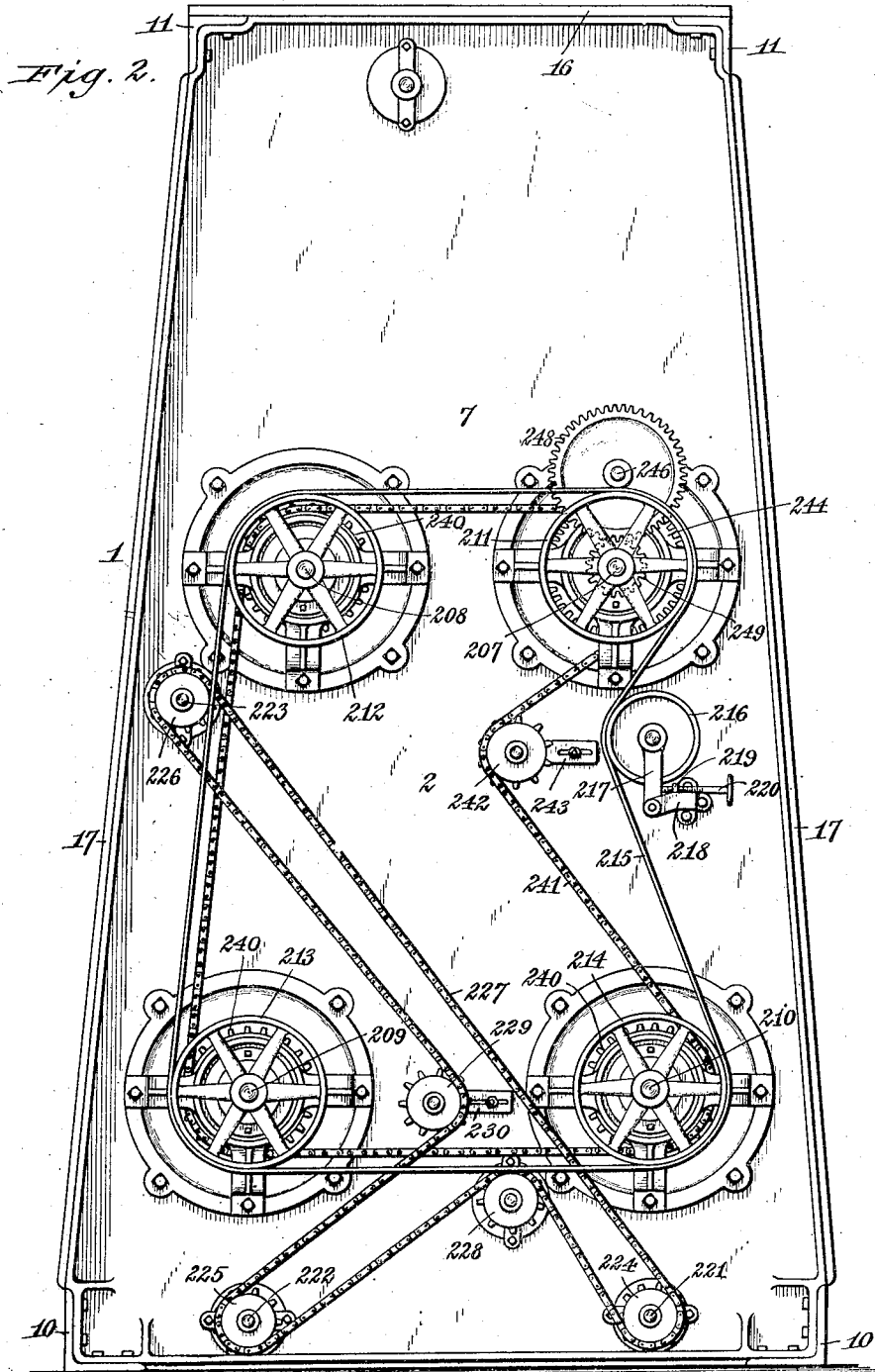
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9 Sheets-Sheet 2



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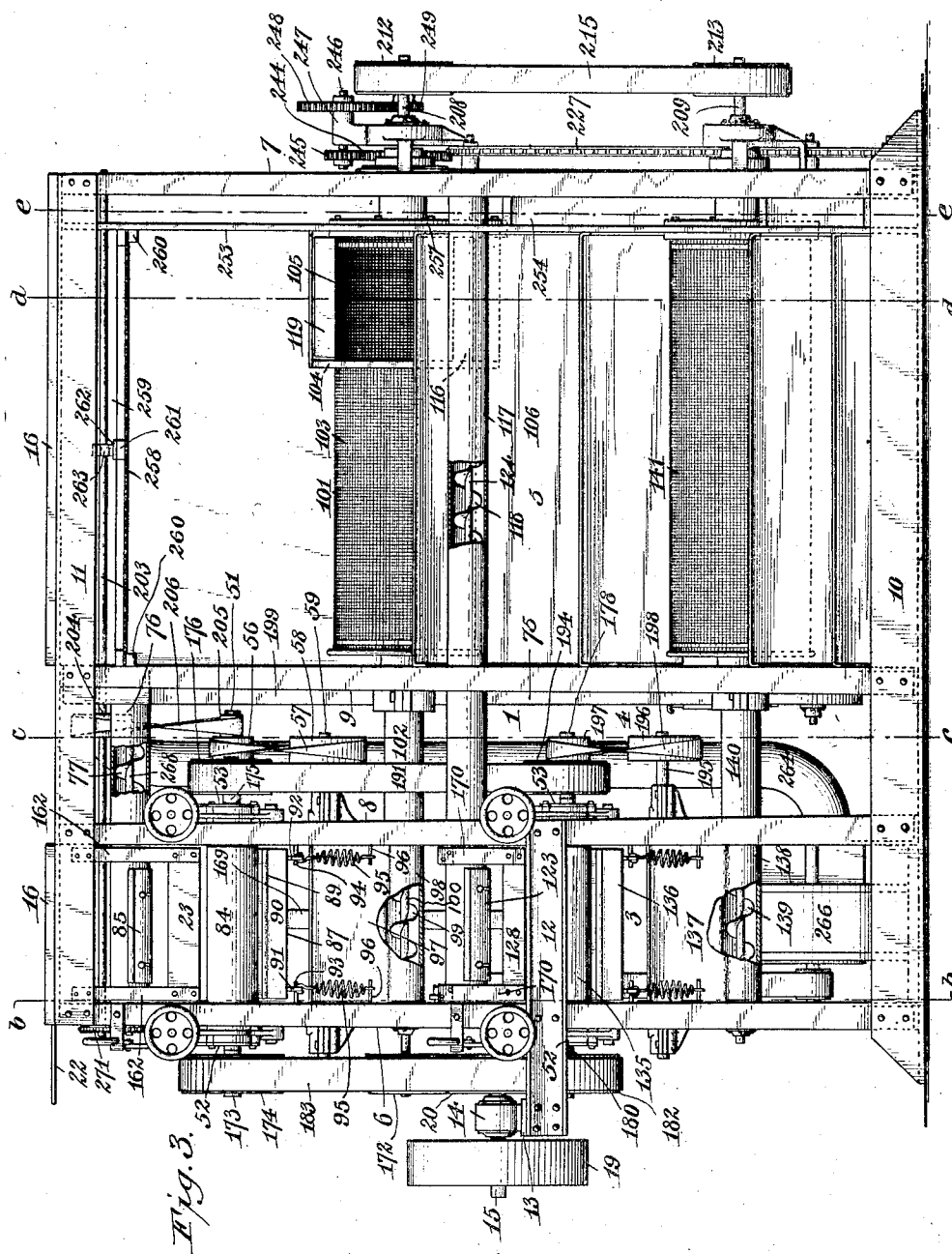
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9 Sheets-Sheet 3



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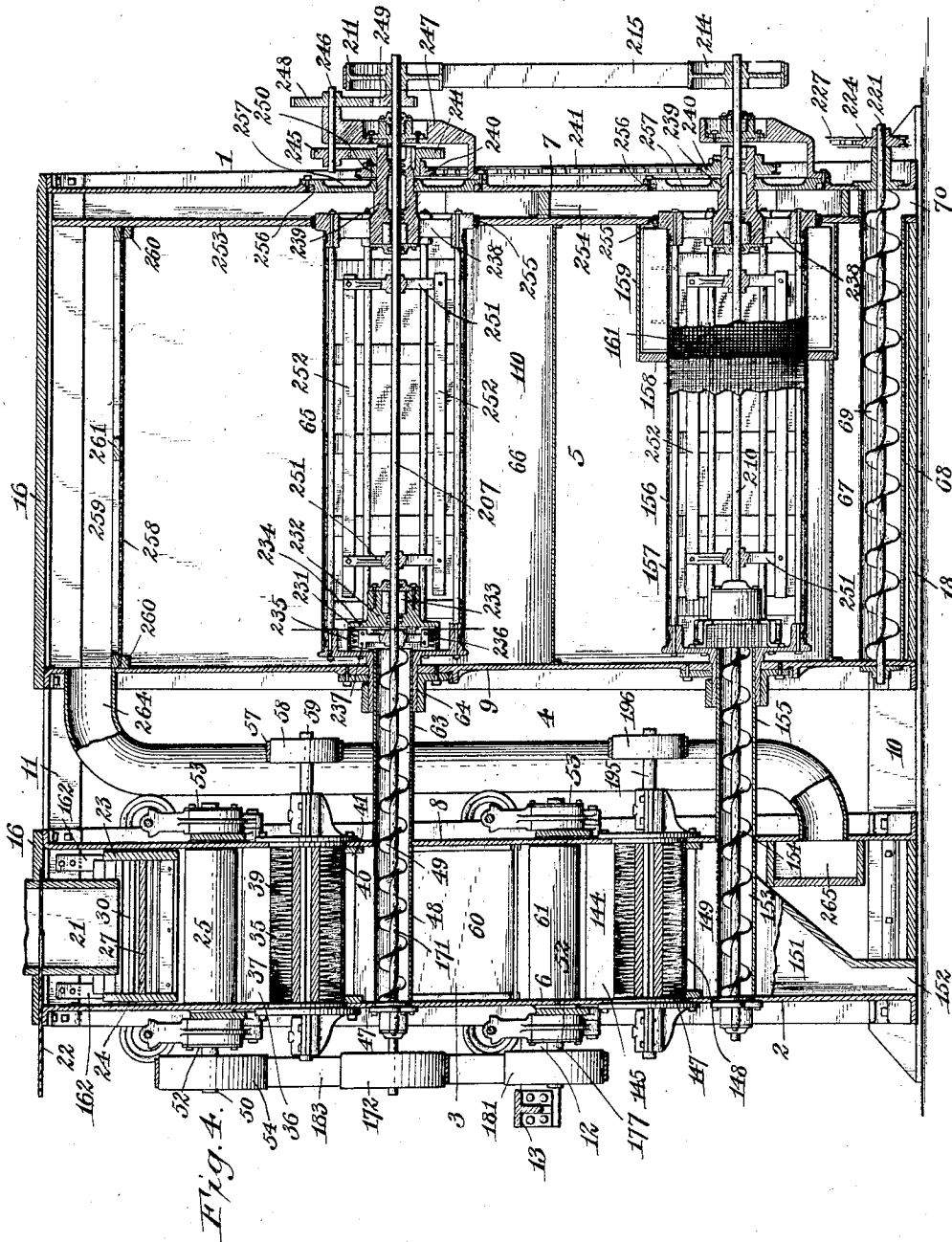
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9 Sheets-Sheet. 4



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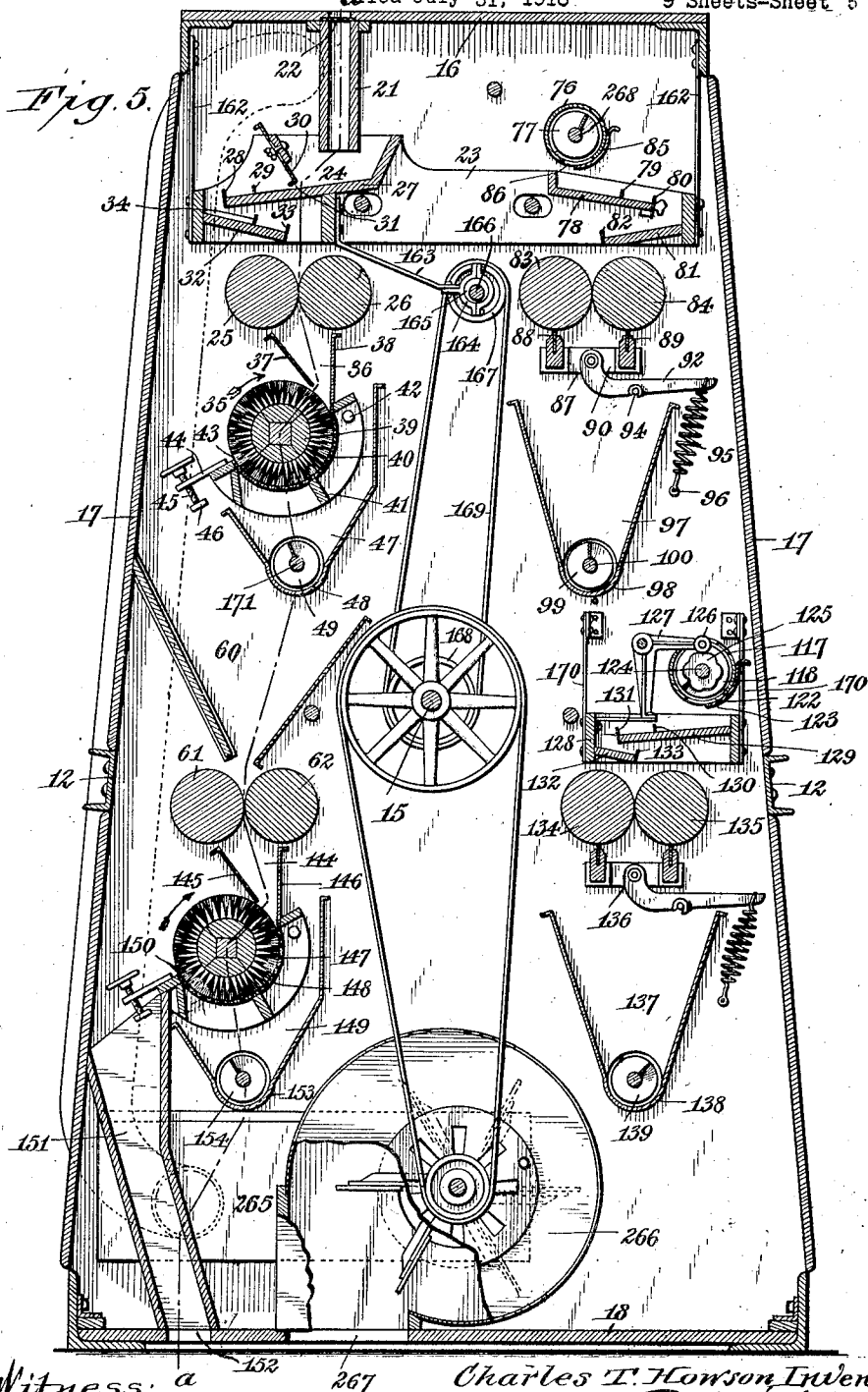
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ROLLER MILL

Filed July 31, 1918

9 Sheets-Sheet 5



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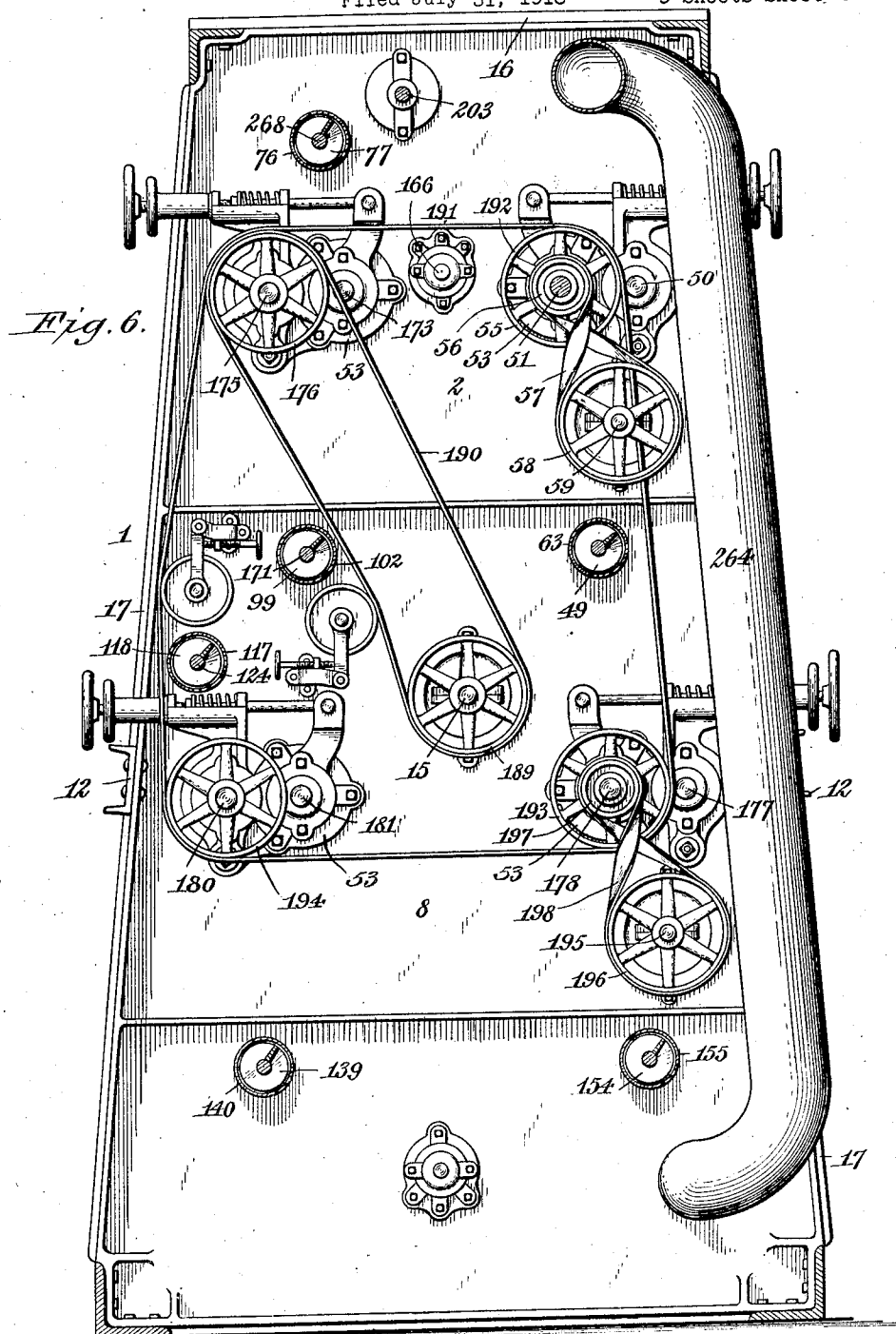
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9 Sheets-Sheet 6



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ROLLER MILL

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9 Sheets-Sheet. 7

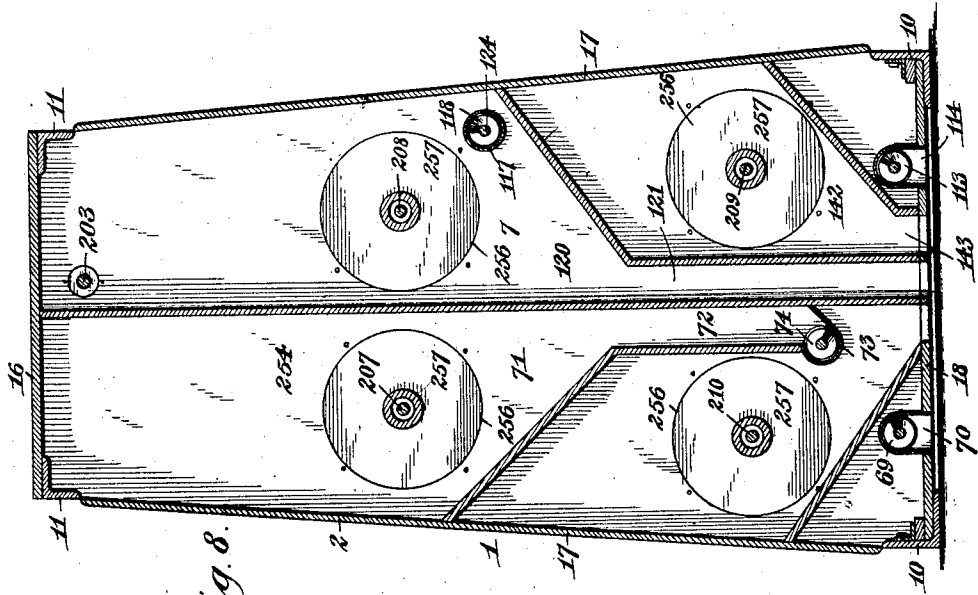


Fig. 8.

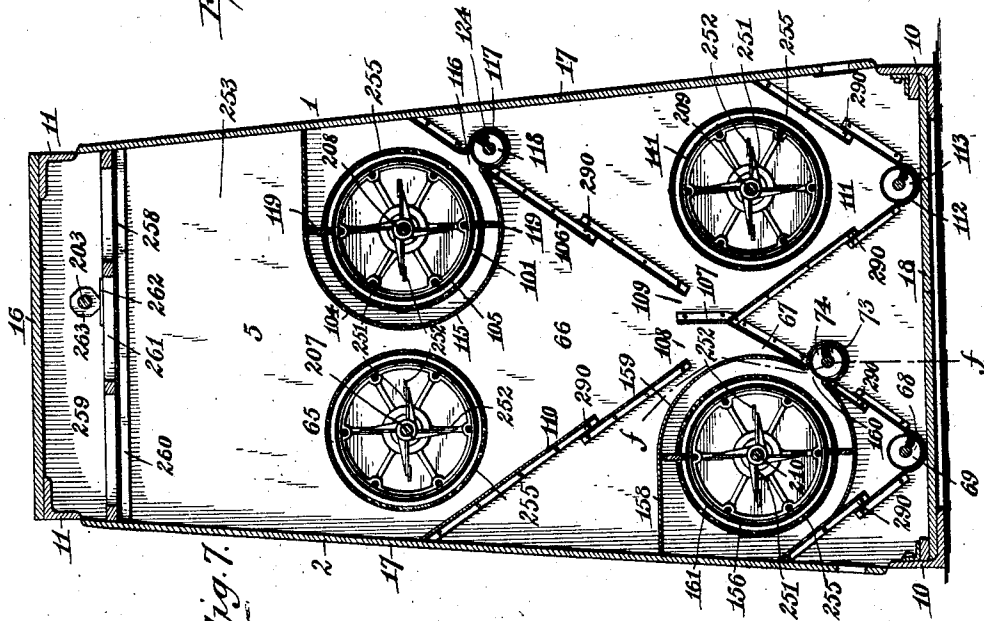


Fig. 7.

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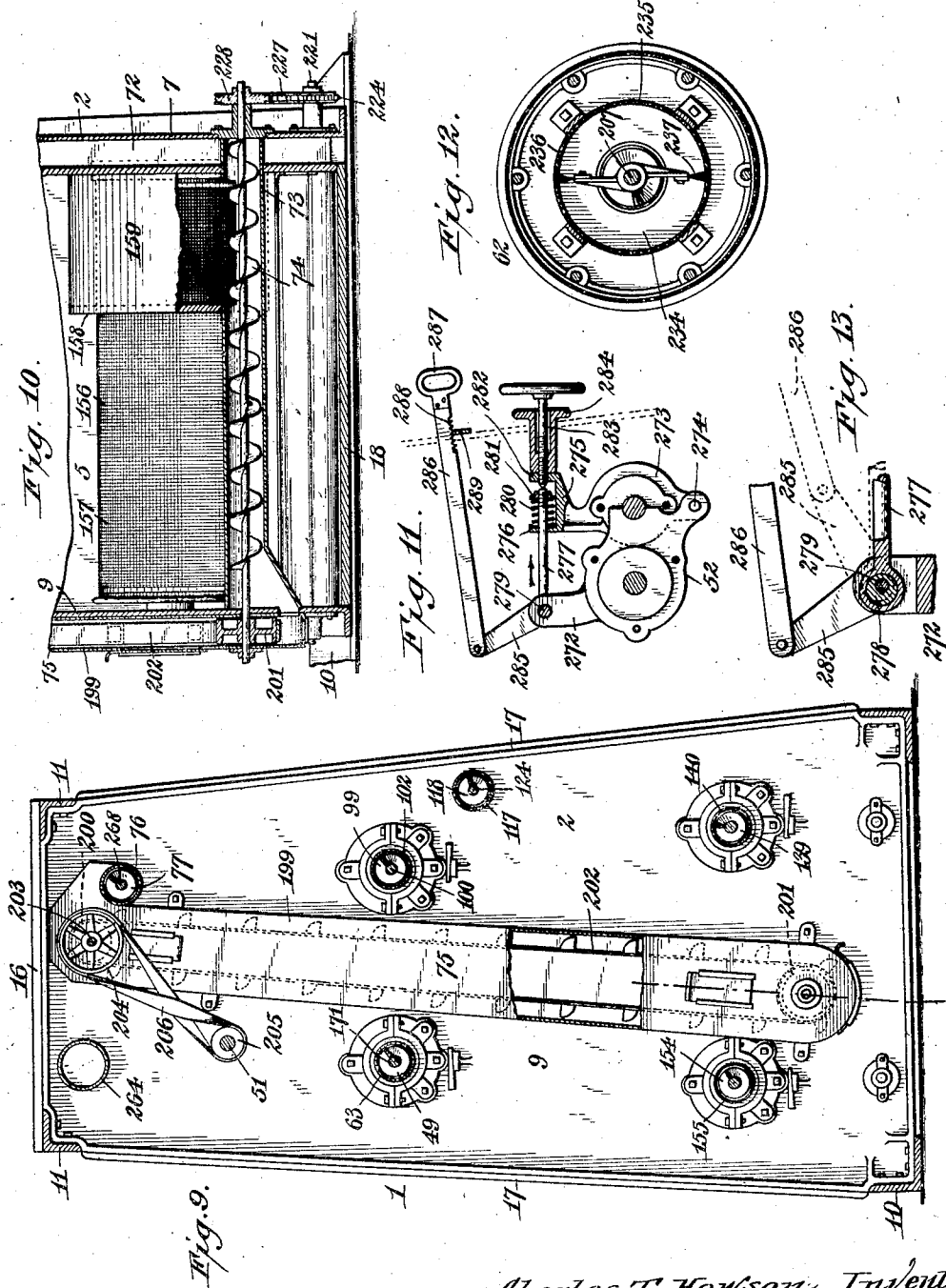
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C. T. HOWSON

ROLLER MILL

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9 Sheets-Sheet 8



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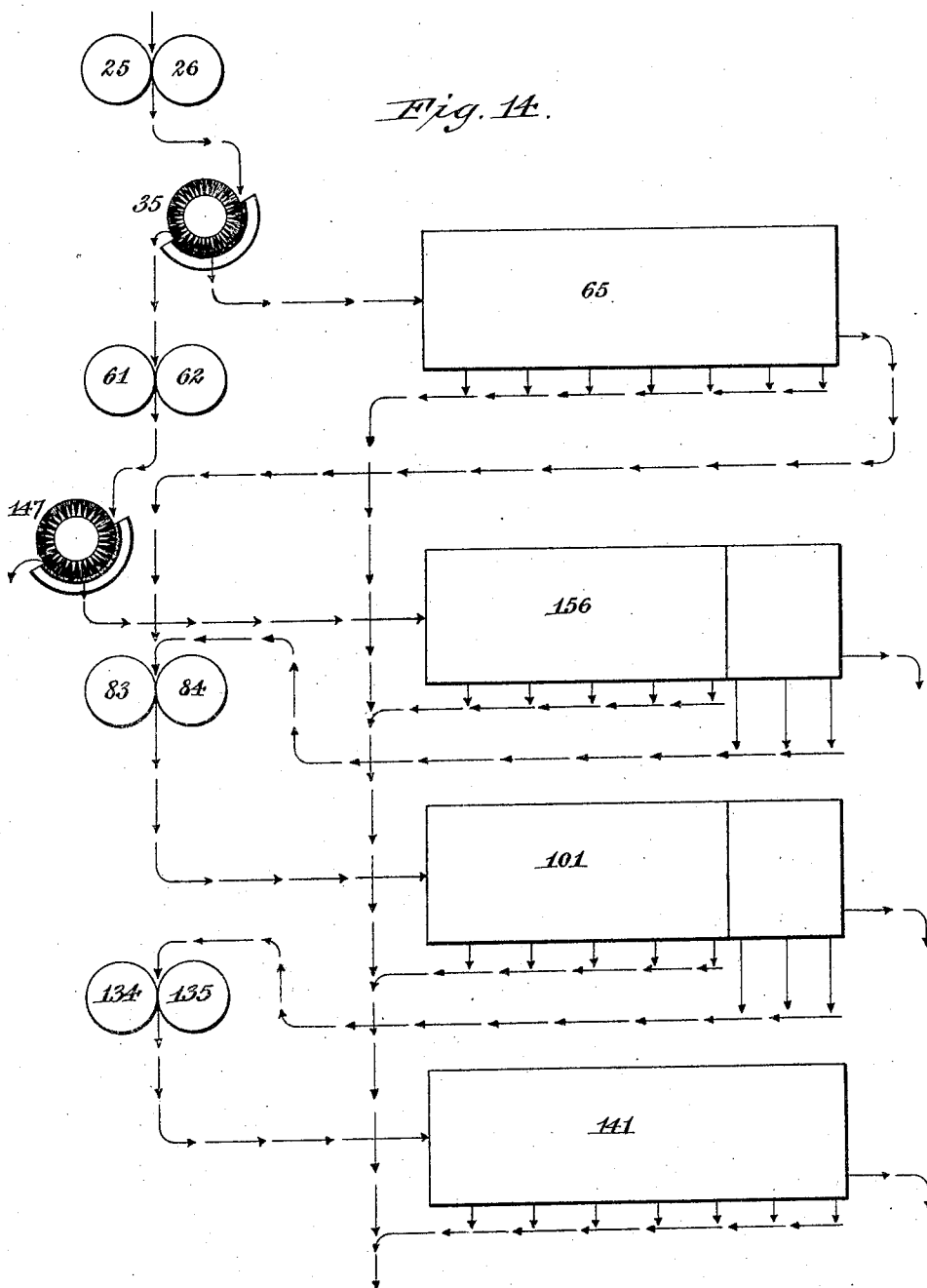
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ROLLER MILL

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9 Sheets-Sheet 9



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UNITED STATES PATENT OFFICE.

CHARLES T. HOWSON, OF SILVER CREEK, NEW YORK.

ROLLER MILL.

Application filed July 31, 1918. Serial No. 247,560.

To all whom it may concern:

Be it known that I, CHARLES T. HOWSON, a citizen of the United States, residing at Silver Creek, in the county of Chautauqua and State of New York, have invented certain new and useful Improvements in Roller Mills, of which the following is a specification.

This invention relates to mills, and more particularly to that type known as self-contained roller mills in which the constituent parts are confined within a single enclosure, and into which the grain is introduced and operated upon in its flow through the mill and discharged in the form of flour with the offal discharged through a separate exit or exits.

One of the objects of my invention is to provide a mill of this type in which the separation of the ground stock is greatly simplified and by means of which a high yield of flour is secured.

Another object of my invention is the construction of a flour mill in which the bran is separated from the flour during the initial portion of the flow of the stock through the mill so as to avoid its coming in contact with the flour in the bolting reels and to prevent its entering said reels, which are silk or wire-covered, this being highly desirable since the action of bran on the silk or fine wire of the reels would quickly cause holes to be worn therethrough.

Another object of my invention is the provision of a dust collecting device which is cleaned automatically, thereby allowing increased suction over existing mills without drawing off good flour, which results in more effective cooling and ventilating conditions within the mill and avoids what is generally termed "sweating."

Another object of my invention is the provision of a mill having improved centrifugal reels for scalping, grading and dressing the flour.

Another object of my invention is the provision of bolting reels which are removably arranged within the housing of the mill and capable of being removed therefrom through the tail end of the machine without disassembling the parts thereof and without separating any parts of the housing except the bearing members for the shafts of the reels.

Further objects of my invention will appear from the description to follow.

The invention consists in the novel features of construction and in the arrangement and combination of parts to be hereinafter described and more particularly pointed out in the subjoined claims.

In the drawings I have illustrated one embodiment of my invention, and in said drawings,

Fig. 1 is a head end elevation of my improved mill.

Fig. 2 is a tail end elevation of the same.

Fig. 3 is a side elevation of the mill with the enclosing walls removed from the frame and portions of the conveyer tubes broken away to show portions of the conveyers therein.

Fig. 4 is a longitudinal section taken on the irregular line *a-a*, Fig. 5.

Fig. 5 is a transverse section on an enlarged scale taken on line *b-b*, Fig. 3.

Fig. 6 is a transverse section on an enlarged scale taken on line *c-c*, Fig. 3, looking toward the left.

Fig. 7 is a transverse section taken on line *d-d*, Fig. 3.

Fig. 8 is a transverse section taken on line *e-e*, Fig. 3.

Fig. 9 is a transverse section taken on line *c-c*, Fig. 3, looking toward the right.

Fig. 10 is a longitudinal section taken on line *f-f*, Fig. 7, looking toward the left.

Fig. 11 is a sectional elevation of one of the roll adjusting devices viewed from the inner side thereof.

Fig. 12 is a transverse section through one of the bolting reels.

Fig. 13 is a detail view of the quick release operating mechanism for quickly separating the rolls.

Fig. 14 is a diagrammatic view showing the break and reduction reels, the brush scalpings for the break reels, the bolting reels, and the flow of stock through these parts.

Although various changes may be made in the details of construction and in the arrangement of parts without departing from the spirit or scope of my invention as defined in the appended claims, I have shown a representative construction in the drawings, in which the reference numeral 1 designates the complete unit or mill having a

housing 2 which is divided into three parts or sections 3, 4 and 5, in the first or roll section of which the break and reduction rolls and the scalpers are located; in the second
5 or intermediate section of which the driving mechanism, part of the roll adjusting devices and an elevator are located, and in the third or reel section of which the bolting
10 reels with separating hoppers or legs are located; suitable conveyers extending through the three parts or sections, as will be hereinafter explained.

The head end wall 6, the tail end wall 7, both of which form part of the housing 2,
15 and the two intermediate walls 8, 9, respectively, which separate the three parts or sections 3, 4 and 5, are preferably castings formed to the shape of the mill transversely, and in which the various rotatable parts of
20 the mill are journaled, also by means of which other parts are supported. These walls may be termed transverse frame members and these frame members are connected at the bottom by longitudinally-disposed
25 angle irons 10 serving as sills which provide proper bearing faces for contact with the floor or foundation on which the machine is set. Longitudinally-disposed angle
30 irons 11 connect the upper ends of these frames together. Connecting the head end transverse member 6 with the adjacent intermediate transverse frame member
35 8 at points between their upper and lower ends are channel beams 12 which are secured to opposite side edges of these frame members and extend a distance forward or in
advance of the head end frame member 6, as clearly shown in Fig. 3.

A transverse bearing member 13 is riveted
40 or otherwise fastened at opposite ends to the outer ends of said channel beams. Said channel beams and the transverse bearing member 13 therefore constitute a supplemental frame to which, midway between the
45 ends of said transverse member, a bearing 14 is secured in which the main or driving shaft 15 of the machine is journaled. The frame work is closed at the top, bottom and sides to form a housing or enclosure for the
50 machine. For this purpose, a top wall 16 is provided which receives support from the opposite longitudinal channel irons at the upper ends of the transverse frame members and is secured thereto in any suitable manner.
55 Side walls 17 are provided which close the sides of the machine and may be secured in any suitable manner to the side edges of said transverse frame members, and a bottom wall or machine floor 18 rests upon the
60 inner faces of the horizontal webs of the angle beams connecting the lower ends of said transverse walls.

To the main or power shaft 15, the main
65 drive pulley 19 is secured. Said pulley being positioned outside of the transverse

bearing member 13 of the supplemental frame. A pulley 20 is also secured to said drive shaft and located inside of said transverse bearing member. From the pulley 20,
70 one of each of the two pairs of break rolls and the two pairs of reduction rolls are driven; also one of the rotary scalpers, as will appear hereinafter. A feed spout 21
75 is arranged in the top of the housing through which the grain is fed into the machine, and a sliding cut-off 22 is movable within said spout to regulate the flow of the grain or to entirely shut off the same. This
80 spout or "feeding device", as it may be termed, projects into the roll part or section 3 of the machine between the transverse frame members 6 and 8, and delivers the grain onto a shoe or vibrating shaker 23
85 having a distributing device 24 at one end thereof directly over the first pair of break rolls, which the rolls 25, 26 constitute. This distributing device has an inclined table 27 provided with upstanding ledges 28, 29,
90 respectively, at and near its lower end. Above said inclined table an adjustable plate 30 is arranged between which and the table a passage 31 is provided. Beneath the lower end of the inclined table a second table 32 is provided which is inclined in an opposite direction and has upstanding ledges 33,
95 34, respectively, at and near the lower end of the same.

The last-mentioned inclined table terminates with its lower end at or near a plane in which the two break rolls 25, 26
100 come in contact. The oppositely-inclined tables are substantially of the same length as said break rolls so that when the frame 23 is actuated the grain is distributed over the two tables from end to end and is delivered between the break rolls in a thin
105 stream so that the break rolls are effective from end to end thereof.

The manner of operating the shaker or shoe 23 and rotating said break rolls will be
110 described hereinafter.

Situated beneath said break rolls is a scalper 35, and between said break rolls and said scalper is a hopper 36 formed by plates or walls 37, 38, which extend from the head
115 end frame member 6 to the adjacent intermediate frame member 8. The scalper 35 comprises a rotary brush 39 and a suitable screen 40 of substantially semi-circular formation in cross section, this screen being
120 secured to a frame 41 pivoted to the two transverse frame members 6 and 8, as at 42. The scalper frame 41 is preferably inclined so that the screen will tail off freely at a low point, as at 43. Extending from said
125 scalper frame is a bar 44 having a threaded opening through which an adjusting screw 45 is passed which bears against a fixed lug 46, so that upon rotating said adjusting screw the screen may be adjusted toward or
130

from said brush, thereby regulating the amount of stock, such as flour and middlings, to be removed from the bran and more effectively cleaning the bran.

5 Beneath the semi-circular screen 40 of the scalper, a hopper 47 is arranged which is closed at its lower end and has a semi-circular portion 48 at said end. In this
10 semi-circular portion a conveyer 49 is positioned.

The shafts 50, 51 of the break rolls 25, 26, respectively, are journaled in bearing mountings 52, 53 secured, respectively, in the transverse frame members 6 and 8, and
15 on the outer or front end of shaft 50 a pulley 54 is secured. This pulley is situated in front of the head end transverse frame member 6. The shaft 51 has a pulley 55 secured thereto in rear of the transverse frame member 8. The pulley 54 is rotated from the pulley 20 on the main or power shaft 15, in a manner to appear hereinafter.

Secured to the shaft 51 in rear of the pulley 55 is a pulley 56 around which a belt 57
25 is passed, which also passes around a pulley 58 secured to the inner or rear end of the shaft 59 on which the rotatable brush 39 of the scalper is secured. The belt 57 is crossed to cause the brush to travel to the right in Fig. 5. This crossing of the belt is necessitated, due to the fact that the break roll 26, to the shaft of which the pulley 56 is secured, travels to the left, and a reverse of this movement is required in order to carry the stock delivered into the scalper screen over the lower end thereof, from which point it is discharged into a hopper 60, which delivers the material between a second set of break rolls, which the rolls 61, 62 constitute. The shafts of these rolls are also journaled in bearing mountings 52, 53 secured, respectively, in the transverse frame members 6 and 8.

The material worked through the screen
45 of the scalper 35 is carried by the conveyer 49 through a conveyer tube 63 extending from the intermediate frame member 8 through a bushing 64 formed on a centrifugal bolting reel 65 located in the part or
50 section 5 of the machine between the intermediate frame member 9 and the tail end frame member 7, the flour being bolted out through the silk or wire of said bolting reel and being delivered into a hopper 66 from which it is delivered into a second hopper 67 having a semi-circular lower end 68 in which a conveyer 69 is arranged, the conveyer 69 serving to convey the flour to an outlet 70 which may be led to any suitable point or
60 have connection with any suitable point for storing or packing the flour.

The middlings tail over the reel 65, which may be termed the "first break reel," and are delivered into a hopper 71, having a depending leg 72 leading to a conveyer tube

73 in which a conveyer 74 is located. The conveyer 74 conveys the material to the bottom of an elevator 75, which may be of any suitable construction but is wholly within the mill and by means of which the middlings are carried up into a conveyer tube 76 having a conveyer 77 therein. The conveyer 74 conveys the material to the shoe or shaker 23 which is provided at that end opposite the table 27 with an inclined table 75
78 having an upstanding ledge 79 near its lower end, and a similar ledge 80 at its lower end. This table is constructed similar to the table 27 at the other end of the shoe or shaker and serves to distribute the tailings the full length thereof when said shoe or shaker is actuated, the material passing over the ledge 80 at the lower end of said table and dropping onto a second and oppositely-inclined table 81 having an upstanding ledge 82 at its lower end. This table terminates to feed the middlings between two rolls 83, 84, which constitute the first pair of reduction rolls of the machine and the shafts of which are journaled in bearing mountings 52, 53 secured, respectively, in the transverse frame members 6 and 8.

In order to regulate the flow of the middlings from the conveyer tube 76, a gate 85 is provided which may be actuated to close the outlet 86 in said tube to any desired degree.

It may here be mentioned that the break rolls 25, 26, 61 and 62 are corrugated in the usual manner, while the reduction rolls 83 and 84, and such reduction rolls as may be hereinafter described, are smooth surfaced.

Bearing against the two reduction rolls 83, 84 is a scraping device 87 which comprises two scrapers 88, 89 bearing, respectively against said reduction rolls at their lowermost points. These scrapers 88, 89 are secured to a frame 90 pivotally attached to levers 91, 92 mounted to swing on pivots 93, 94 extending, respectively, from the head end frame member 6 and the adjacent intermediate frame member 8. These levers 91 and 92 are pivotally mounted between their ends and secured to the outer end of each lever is one end of a retractile spring 95, fastened with its other end, as at 96, to a fixed point of the machine, preferably to the adjacent transverse frame members. These retractile springs serve to hold the scrapers 88, 89 with proper pressure against the reduction rolls 83, 84, removing from the latter all adhering particles.

The middlings passing between the reduction rolls 83, 84, are partially reduced to flour, and this product or material falls into a hopper 97 having a closed semi-circular lower portion 98. In the lower end of this hopper a conveyer 99 is arranged which extends rearwardly and has its shaft 100 continued through a bolting reel 101, said bolt-

ing reel having a sleeve journaled in the intermediate transverse frame member 9 in the same manner as the sleeve 64 of the bolting reel 65, shown in Fig. 4. A conveyer tube 102 extends rearwardly from the rear end of the hopper 97 and enters the journaled sleeve of said bolting reel. The material entering the hopper 97 is therefore conveyed by the conveyer 99 through the conveyer tube 102 and into said bolting reel 98, which may be termed the "first reduction reel."

The bolting reel 101 is covered throughout a portion of its length with fine bolting silk or wire 103, and it has a cut-off or box-like structure 104 built around its rear end. This end is covered with bolting silk or wire 105 of coarser mesh than the portion 103 of said reel. The material entering this bolting reel is therefore separated owing to the finest material or flour passing or being worked through the fine mesh silk or wire 103, while a coarser grade of material or the middlings passes or is worked through the coarser mesh silk or wire 105.

The flour or finished product passing through the fine mesh portion of said reel enters the hopper 66 and strikes the inclined wall 106 of said hopper located directly underneath said bolting reel. The outlet of said hopper 66 is divided by a vertically-disposed wall 107 into two passages 108, 109. Flour, or the finished product, from the bolting reel 65, previously described, falls onto the inclined wall 110 of said hopper, owing to said wall being positioned beneath said last-mentioned bolting reel. The flour or finished product of said last-mentioned bolting reel is thus directed through the passage 108 and falls into the hopper 67, as hereinbefore explained, while the flour or finished product from the first reduction reel 101 passes through the passage 109 and enters a hopper 111 having a closed semi-circular lower end 112 in which a conveyer 113 is located. This conveyer 113 carries the flour or finished material to an outlet 114, which may be led to any suitable point or have connection with any suitable point for storing or packing the flour. This flour may be stored separately from the flour or finished product passing through the outlet 70, hereinbefore referred to, or both these outlets may be led into a single storage hopper or receptacle. It will be observed therefore that the different runs of flour may be stored separately or mixed together, as may be desired.

The material or middlings passing or being worked through the coarser mesh silk or wire 105 of the bolting reel 101 falls into the cut-off or box-like structure 104, which has a parti-circular confining wall 115 and opens at 116 into a conveyer tube 117 having a conveyer 118 located

therein. The opening 116, whereby communication is established between said cut-off and said conveyer tube, is arranged at a point somewhat above the lowest point of said parti-circular wall 115, and for this reason the bolting reel is provided with sweep arms or bars 119 which serve to carry the material passing or worked through the coarse silk or wire of said bolting reel into said opening 116, through which it passes into the conveyer tube 117. This conveyer tube and the conveyer therein extends forwardly through the intermediate frame members 9 and 8, and into the front end frame member 6. The tailings from the reel 101 are delivered through the rear end of said reel and into a hopper 120 having a leg 121 which discharges the material for storing or packing the same.

That portion of the conveyer tube 117 situated between the front end frame member 6 and the adjacent intermediate frame member 8 is provided with an outlet opening which may be closed or opened to any desired extent by means of a gate 123. On the shaft 124 of the conveyer 118, a cam 125 is arranged, against the peripheral cam face of which a roller 126, mounted on the free end of one arm of an elbow lever 127, is adapted to act. This cam therefore causes said lever to vibrate, and the free end of the other arm of said lever is secured to a vibrating shoe or shaker 128 having an inclined table 129 directly beneath the outlet opening 122 of the conveyer tube 117.

Near its outer end the table 129 is provided with an upstanding ledge 130, and a similar ledge 131 is arranged at the outer end of said table. These ledges are similar to the ledges of the shoe or shaker 23, hereinbefore described, and serve to assist, during the vibration of the shoe or shaker, to distribute the material evenly over said platform. This material is delivered from said platform onto a second table 132 inclined in an opposite direction and having an upstanding ledge 133 at its outer end. The outer end of said last mentioned table is positioned directly above a second pair of reduction rolls, which the rolls 134, 135 constitute, and the shafts of which are journaled in bearing mountings 52, 53, secured, respectively, to the transverse frame members 6 and 8. It will be noticed that I referred to the bearing mountings of both pairs of break rolls and both pairs of reduction rolls by like numerals of reference, for the reason that such mountings are all alike. Like the rolls 83, 84 of the first pair of reduction rolls, these rolls are also smooth, and a scraping device 136 similar to the scraping device 87 described in connection with the first pair of reduction rolls, acts against the rolls 134, 135 at their lowest

points, serving to free the rolls from any material adhering thereto.

The material passing between the rolls 134, 135 is delivered into a hopper 137 situated directly beneath said rolls, said hopper having a lower semi-circular closed end 138 in which a conveyer 139 is arranged. The conveyer passes through a conveyer tube 140 extending rearwardly from the inner end of the hopper, and this tube enters a bearing sleeve formed on a bolting reel 141, which reel may be termed the "second reduction reel," in the same manner as the bearing sleeve 64 of the bolting reel 65, shown in Fig. 4. The material in the conveyer tube 140 is thus conveyed by the conveyer 139 into said bolting reel 141.

The bolting reel 141 is situated within the hopper 111 and flour is bolted through the silk or wire covering this reel and escapes to the bottom of said hopper where it is conveyed by the conveyer 113 to the discharge opening 114 hereinbefore referred to. The unsifted material or offal, tails over the rear end of the reel and enters a hopper 142, escaping therefrom through a leg 143 which may be led to any suitable point for storing or packing the offal.

Returning to the material passing between the second pair of break rolls 61, 62, hereinbefore referred to, this material enters a hopper 144 formed by the plates 145, 146. From this hopper the material enters a scalping device or bran-finisher 147 situated beneath the second pair of break rolls and being of the same construction as the scalping device 35 beneath the first pair of break rolls.

The material passing through the screen 148 of said scalper or bran-finisher enters a hopper 149 into the upper portion of which said scalper or bran-finisher extends, while that portion of the stock which is in the form of clean broad bran is brushed over the low end 150 of said screen and from said point is directed into a duct or leg 151 which has its outlet at the bottom of the machine, as at 152, and at which point the bran may be placed into sacks or suitable receptacles, or it may be carried by suitable ducts to other points, as may be desired. This scalper or bran-finisher separates all flour particles and middlings from the bran and discharges the bran from the machine.

Within the hopper, which is provided with a semi-circular lower end 153, a conveyer 154 is arranged. This conveyer extends through a conveyer tube 155 which has one end connected to said hopper and its other end entered in a bearing sleeve formed on a bolting reel 156, which may be termed the "second break reel," similar to the bearing sleeve of the bolting reel 65 shown in Fig. 4.

The bolting reel 156 is covered throughout

a portion of its length with fine mesh silk or wire 157, through which the flour from the material entering the reel passes or is worked, and this flour falls into the hopper 67 and is conveyed by the conveyer 69 therein to the discharge opening 70. At its rear end this bolting reel is surrounded by a cut-off or box-like structure 158 which has a parti-circular confining wall 159 and opens at 160 into the conveyer tube 73 having the conveyer 74 located therein. This bolting reel 156 and cut-off are situated in the hopper 67 and they are constructed in the same manner as the bolting reel 101 and cut-off 104, hereinbefore described. The coarser material or middlings passes through the coarse silk or wire 161 of the bolting reel within the cut-off and is carried into the conveyer tube 73, it being conveyed forwardly by the conveyer 74 within said tube to the lower end of the elevator 75, which elevates the same to the conveyer tube 76. These middlings are conveyed by the conveyer 77 within said tube to the first pair of reduction rolls, through which they are passed and enter the hopper 97 to be conveyed by the conveyer 99 therein to the first reduction reel 101, the material being reduced in passing through said reduction rolls and the flour from the reduced material passing or being worked through the fine screen of said reel, while the coarser material is carried on within the reel and passes or is worked through the coarse silk or wire within the cut-off 104, from which point it is conveyed by the conveyer 118 to the shoe or shaker 128, and from the latter to the second pair of reduction rolls, where it is again reduced in passing between said rolls and is delivered into the hopper 137 to be conveyed by the conveyer 139 into the second reduction reel 141. The flour or finished product passing through the silk or wire of this reel falls into the hopper 111 and is delivered by the conveyer therein to the outlet 114. The offal or tailings is tailed over the rear end of said reel and enters the hopper 142, from which it is directed into the leg 143, to be sacked or otherwise disposed of.

The shoe or shaker 23 is hung on spring arms 162 fastened to the frame of the machine and it is vibrated by means of an arm 163 secured at one end to the frame of the shaker and at its other end to an annulus or eccentric strap 164 surrounding an eccentric 165 fastened on a shaft, the shaft being journaled in suitable bearings in the frame and having a pulley 167 secured thereto at a point between the front end frame member 6 and the adjacent intermediate frame member 8. On the main or power shaft 15, in alinement with the pulley 167 on the eccentric shaft 166, is a pulley 168, around which and said pulley 167 a belt 169 passes,

thus the eccentric shaft is rotated directly from the main or power shaft 15. The shoe or shaker 128, which is actuated by the elbow lever 127 is also hung on spring arms 170 secured at their upper ends to fixed points of the frame.

The conveyer 49 has its shaft 171 extending forwardly through the front end frame member 6, and to this shaft a pulley 172 is secured. The roll 83 of the first pair of the reduction rolls has its shaft 173 journaled in bearings in the front end frame member 6 and the adjacent intermediate frame member 8, and to the front or outer end of said shaft a pulley 174 is secured. The shaft 175 of the reduction roll 84 is also journaled in bearings secured to said frame members, and at the rear or inner end of said shaft a pulley 176 is secured. Similar bearings are provided for the shafts 177, 178 of the two rolls constituting the second pair of break rolls and also for the shafts 179, 180 of the two rolls constituting the second pair of reduction rolls. To the outer end of the shaft 177 of the roll 61 of said second pair of break rolls, a pulley 181 is secured, and a similar pulley 182 is secured to the outer end of the shaft 179 of the roll 134 of said second pair of reduction rolls.

Provision is made for rotating the break and reduction rolls and the conveyer 49 directly from the main or power shaft 15, and this is done by passing a belt 183 over the pulley 20 of the main or power shaft 15, from which it is directed in opposite directions around the pulleys 181, 182, thence around the pulleys 54 and 174, and thence around the pulley 172, as clearly shown in Fig. 1 of the drawings. This belt is maintained in tightened condition by means of an idler pulley 184 journaled in swinging arms 185 pivoted to a bracket 186, which is fastened to the front end frame member 6. The bracket 186 has a lug 187 formed thereon through which a screw 188 is passed which bears against the arms 185 and retains the idler pulley 184, with proper pressure against the stretch of the belt passing from the pulley 174 to the pulley 182.

It will be observed that the main or power shaft 15 passes through the roll section 3 of the machine and extends through the intermediate frame member 8 serving as the rear wall of said roll section, and on the rear or inner end of said shaft a pulley 189 is secured. Around this pulley and the pulley 176 on the shaft 175 of the reduction roll 84, a belt 190 passes, said roll being therefore rotated directly from the main or power shaft 15, as clearly shown in Fig. 6. A belt 191 passes over and in contact with the belt 190 at the point said last-mentioned belt passes around the pulley 176, and said belt 191 passes over a pulley 192 secured to

the shaft 51 of the break roll 26, around a pulley 193 secured to the shaft 178 of the break roll 62 and around a pulley 194 secured to the shaft 180 of the reduction roll 135.

The roll 26 of the first pair of break rolls; the roll 61 of the second pair of break rolls, and the roll 135 of the second pair of reduction rolls are all driven from the pulley on the shaft of the roll 84 of the first pair of reduction rolls, all of said pulleys being situated directly in rear of the intermediate frame member 8.

Secured to the shaft 195 of the rotatable brush forming part of the scalper or bran-finisher 147, is a pulley 196 and around this pulley and a pulley 197 on the shaft 178 of the break roll 62 a cross belt 198 passes. These pulleys and said cross belt being located in rear of the intermediate frame member 8.

As is common in elevator constructions, the elevator 75 positioned in the space or section 4 between the intermediate frame members 8 and 9 comprises a housing 199, suitable pulleys 200, 201 at the upper and lower ends, respectively, of said housing, and a flexible bucket carrying element 202, which travels around said pulleys. One of said pulleys, preferably the upper pulley, has secured to its shaft 203 a pulley 204, which is arranged outside of said housing, and around this pulley and a pulley 205 on shaft 51, a cross belt 206 passes. The elevator is therefore actuated from the shaft 51 of the break roll 26.

While the conveyer 49 is rotated from the front end of the machine, the remaining conveyers are all operated from the rear end of the same, as will be presently explained.

The shafts of the conveyers feeding into the bolting reels are all continued through said reels and serve as the shafts for the beaters of said reels, the continuation of the shaft of the conveyer 49 being designated by the numeral 207; that of the conveyer 99 being designated by the numeral 208; that of the conveyer 139 being designated by the numeral 209, and that of the conveyer 154 being designated by the numeral 210, these shafts being, respectively, what may be termed the first, second, third and fourth reel or beater shafts.

To the rear end of the shaft 207 a pulley 211 is secured, similar pulleys 212, 213 and 214 are secured, respectively, to the rear ends of the shafts 208, 209 and 210, and around these pulleys a belt 215 passes. The shaft 207, which is a continuation and in effect an integral part of the shaft 171 of conveyer 49, is rotated from the front end of the machine by reason of the belt 183 passing around the pulley 172 secured to said shaft, and consequently the pulley 211 at the rear end of said continued shaft may

be considered the driving pulley for causing rotation of the beater shafts 208, 209 and 210.

The belt 215 at the rear end of the machine is held in tightened condition by an idler pulley 216 journaled in an arm or arms 217 pivotally secured to a bracket 218 fastened to the rear end frame members 7, said bracket having a lug 219 through which an adjusting screw 220 is threaded and which bears against the arm or arms 217.

The conveyers 69, 113 and 118 are also rotated from the rear of the machine. The shafts 221, 222, 223 of said conveyors having sprocket wheels 224, 225, 226, respectively, secured thereto. Around said sprocket wheels, a sprocket chain 227 is passed, said chain being also passed around a sprocket wheel 228 secured to the shaft of the conveyer 74, said shaft extending forwardly through the elevator housing and having the pulley 201 of said elevator secured thereto. The conveyer 74 is therefore rotated by said pulley 201 and the sprocket wheel 228 on the shaft of said conveyer serves to rotate the conveyers 69, 113 and 118 through the medium of the sprockets on said last-mentioned conveyers and the sprocket chain 227 passing around said sprockets. In order to retain said sprocket chain in tightened condition, I provide a sprocket idler 229, over which said chain passes and which is journaled on an adjustable bearing 230 fastened to the rear end frame member 7.

Arranged within the receiving or inlet end of each bolting reel is a disintegrator 231, which is secured to the head end of the reel so as to rotate therewith. Each disintegrator comprises a hub 232 provided with an anti-friction bearing 233 and a web or flange 234 which serves as one end wall of a screen cage 235, the adjacent end of the bolting reel serving as the other end wall of said screen cage. The screen cage is of cylindrical formation in cross section, and its cylindrical wall is formed of metallic screening 236. The material to be fed into the bolting reels from the several conveyers is first delivered by said conveyers into the disintegrators and from the latter into the bolting reels, the screening of the disintegrators being of course of coarser mesh than the silk screening of the reel in which it is located. A rotatable brush 237 is arranged within each disintegrator cage, said brush being secured to the conveyer shaft and having its brush head formed of steel wire or other suitable material adapted to separate the stock delivered into the screen cage and work the same through the metallic screening of said cage. In this manner the material is thoroughly disintegrated when delivered into the bolting reel.

It may be found desirable to have the

screening of the several disintegrators constructed with different size meshes, depending upon the fineness of the material delivered thereinto.

At the rear or tail end of each bolting reel a spider like head 238 is provided, each head having an axially-projecting sleeve or hub 239 into which the cooperating beater shaft is journaled. Secured to each hub or sleeve 239 is a sprocket wheel 240, the sprocket wheels of the four reels being in vertical alignment and having a sprocket chain 241 passing around the same. A sprocket idler 242 is journaled on an adjustable bracket 243 secured to the rear end frame member 7, said idler having the sprocket chain 241 passing over the same.

It will be observed that the bolting reels are rotatable independently of the reel or beater shafts, or as I have termed them, "the continuations of the conveyer shafts", and for this reason the hub or sleeve 239 of the first break reel 65 has a gear wheel 244 fastened thereon which meshes with a pinion 245 secured to a counter-shaft 246 journaled in a bearing 247. A gear wheel 248 is secured to said counter-shaft 246 and meshes with a pinion 249 secured to the beater shaft. The gear wheel 244 is provided with an extended hub 250 onto which is fastened one of the sprocket wheels 240. To the hubs or sleeves 239 of the remaining bolting reel the other sprocket wheels 240 are secured.

The power imparted to the reel or beater shaft 207 which passes through the first break reel 65 is therefore transmitted to the gear wheel 249, secured to said shaft and from which said reel 65 is rotated in the same direction as said shaft but at a slower speed, through the medium of the gear wheel 248, pinion 245, and gear wheel 244, which constitute reducing gearing.

Since the sprocket wheel 240 associated with the first break reel 65 is fastened to the extended hub of gear wheel 244, the remaining wheels are caused to rotate in unison with said reel, due to the sprocket chain 241 passing over the sprocket wheels 240 on the hubs or sleeves 239 of said remaining bolting reels.

As is common in bolting reels, the shafts extending therethrough are each provided with spiders 251, to the outer end of which blades 252 are secured which are arranged to throw the material against the bolting silk, said spider and blades forming the beaters hereinbefore referred to. One end of each reel is rotatable within an opening formed in a transverse wall 253 which forms a tailing section at the rear end of the reel section 4, and between the bolting reel and the wall of the opening, suitable packing 255 is interposed, thus preventing the mixing of stock in the reel section and tailing section.

In the rear end frame member 7 aligned with the bolting reels, are openings 256, the diameters of which are slightly larger than the diameters of the largest part of the bolting reels, and in these openings removable bearing members 257 are situated in which the sleeves or hubs 239 of said reels are journaled. With this arrangement, the bolting reels may be withdrawn from the machine without removing the walls of the machine or disassembling other parts of the machine.

In the upper end of the reel compartment 5 a vibrating dust screen 258 is situated, this screen being spaced from the top wall of said compartment to provide a suction chamber 259. This screen is supported at its ends on cleats 260 and is therefore free to flex between the cleats. It is provided with an intermediate cross bar 261 to which a wearing plate 262 is secured. Against said wearing plate a cam 263 acts to cause vibration of said screen so that any flour adhering to the under side of the screen will free itself and fall into the hopper 66, while the moisture laden air will pass through the screen and be drawn through a suction tube 264 opening into a box 265 connected to the eye of a suction fan 266, from which it is forced through an opening 267 in the bottom of the roll section venting into the atmosphere. The cam 263 is secured to the shaft 203 by means of which the elevator is driven. The shaft 268 of the conveyer 77 by means of which material is carried to the first pair of reduction rolls, is provided with a sprocket wheel 269 around which and a sprocket wheel 270 secured to the shaft 203 a sprocket chain 271 passes, thus driving said conveyer 77 from the elevator head shaft 203.

Upon examination of Fig. 14 of the drawings, the flow of the material through the machine will be clearly understood, this flow being as follows:—The clean wheat fed into the machine passes between the first pair of break rolls, designated by the numerals 25 and 26, material being delivered therefrom into the rotary scalper 35. Part of the material from the scalper is delivered by the conveyer 49 into the first break reel 65, while the coarser material or overtails which does not pass through the sieve of the scalper is delivered into the second pair of break rolls, designated by the numerals 61, 62.

The first break reel acts to bolt out all the flour from the material delivered thereinto, which flour is delivered out of the machine for storage or packing in the manner hereinbefore described. The overtails or middlings from this reel are delivered to the first pair of reduction rolls, designated by the numerals 83, 84, through the medium of the parts hereinbefore described. The overtails from the rotary scalper 35 having

been delivered to the second pair of break rolls and ground thereby, is conveyed into the rotary scalper or brand-finisher 147 situated beneath said second pair of brake rolls, the clean bran or overtails from said scalper or bran-finisher being delivered out of the machine for packing or storage, while the finer material is worked through the sieve of the scalper and carried to the second break reel 156, where all the flour is bolted out and passes out of the machine for packing or storage in the manner hereinbefore described. This reel has a cut-off at its tail end through which the middlings are scalped and conveyed, in the manner hereinbefore described, to the first pair of reduction rolls.

The middlings from the first break reel 65 and the middlings from the second break reel 156 are therefore conveyed in two streams to said first pair of reduction rolls. The overtails or offal of this second break reel is delivered out of the machine for sacking or otherwise. The middlings from both break reels are then ground by said first pair of reduction rolls and the ground stock conveyed thereby into the first reduction reel 101, in the manner hereinbefore described, the flour being bolted out, while the middlings enter the cut-off at the tail end of said reel and are again delivered into the second pair of reduction rolls, designated by the numerals 134, 135. The overtails or offal of the first reduction roll are conveyed out of the machine to be sacked or otherwise disposed of. The middlings conveyed to the second pair of reduction rolls are again ground by said rolls and conveyed by means hereinbefore described, to the second reduction reel 141, where the flour is bolted out and delivered out of the machine for packing or storage and the overtails or finish are spouted out of the machine to be sacked or otherwise disposed of.

It is of course understood, having reference to Fig. 14, that the flow of the grain, indicated by the arrow lines, is through conveyers, hoppers, and an elevator, as clearly shown in the remaining figures. One of the rolls of each pair of break rolls, and one roll of each pair of reduction rolls is adjustable toward and from the other roll of the pair, and for this purpose bearing mountings are provided at each end of each pair of rolls. These mountings are exact counterparts, and like the mountings of the first pair of break rolls, those of the remaining rolls are also designated by the numerals 52, 53. The mountings are fitted within openings in the front end frame member 6 and the intermediate frame member 8, each mounting having an arm 272 extending therefrom and having a journal member 273 pivotally connected thereto, as at 274. One of the shafts of each pair of rolls is journaled axially in the mountings 52, 53

arranged respectively in the frame members 6 and 8, and the other in the journal member 273, each journal member having a fork projection 275, through one arm 276 of which a rod 277 is adjustably secured. Said rod has one end encircling an eccentric 278 fastened to a shaft 279 journaled in the arm 272 of the bearing mounting.

Surrounding the other end of said rod 277 is a spring 280 which bears with one end against the arm 276 of said fork projection and with its other end against a nut 281 threaded on to said rod. Passing through the other arm 282 of said fork projection is a set screw 283, which bears against the adjacent end of the rod 277 and is adjustable within said arm 282. A jamb nut 284 is threaded onto said set screw to hold the latter in any adjusted position. Secured to the shaft 279 is a lever 285, to the outer or upper end of which a rod 286 is secured having a handle 287, said rod 286 is provided with a series of notches 288 adapted to have any one of the notches of the series engage a catch bar 289 fastened to the frame of the machine.

In the event of any foreign substance entering the machine with the wheat or other grain and being delivered between any pair of rolls, the pivoted journal member 273 will swing to cause the roll journaled therein to move away from the roll journaled in the bearing mountings 52 and 53, and during such movement the spring 280 surrounding the rod 277 is compressed. The set screw is adapted for adjusting the rolls to the exact degree of grinding desired. While, if it is desired to manually swing one of the rolls away from the other, the rod 286 is disengaged from the catch bar 289 and drawn to the position shown in dotted lines in Fig. 13, which causes the throw of the eccentric to move the rod 277 in the direction of the arrow in Fig. 11, thereby swinging the journal members 273 on the bearing mounting 52 and 53.

The walls of the hoppers in the reel section are louvered and thus provide openings or passages 290 as best shown in Fig. 7. Air is drawn into the reel section in the manner hereinbefore described and in its upward movement through the reel section passes through said openings 290 and through the falling flour, thereby cooling the flour and drawing off all moisture released by the grinding of the wheat or other grain.

It is to be understood that this invention is not to be limited to the use of the construction set forth, but rather that it shall include all reasonable departures or variations falling within the scope of the appended claims.

Having thus described my invention, what I claim is:—

1. In a flour mill, the combination of a

pair of break rolls, a bolting reel, a scalper through which the stock from said break rolls passes, means for delivering the material from said scalper to said bolting reel, a second pair of break rolls, means for delivering stock from said scalper to said second pair of break rolls, a second scalper associated with said second pair of break rolls and receiving the stock therefrom, a second bolting reel, means for conveying stock from said second scalper to said second bolting reel, a pair of reduction rolls, means for conveying middlings from said first-mentioned bolting reel to said pair of reduction rolls, means between said second bolting reel and said pair of reduction rolls for delivering stock to said last-mentioned rolls, a third bolting reel, means for conveying stock from said pair of reduction rolls to said third bolting reel, a second pair of reduction rolls, means for delivering middlings from said third bolting reel to said second pair of reduction rolls, a fourth bolting reel, and means for delivering material from said second pair of reduction rolls to said fourth bolting reel.

2. In a mill, the combination of two pairs of break rolls situated one pair above the other, two pairs of reduction rolls situated one pair above the other, means for delivering material passing through the upper pair of break rolls to the lower pair of break rolls and for delivering material from the upper pair of break rolls to the upper pair of reduction rolls, means for delivering material from said upper pair of reduction rolls to said lower pair of reduction rolls, said delivering means including scalpels and bolting reels whereby the stock passing through said delivering means is separated, and means for separating the material after having passed through said second pair of break rolls and delivering part thereof out the mill.

3. In a mill, the combination with a roll section, of a pair of break rolls within said section, a rotary scalper beneath said break rolls into which the material from said rolls is delivered, a second pair of break rolls situated beneath said first pair of break rolls and into which material from said scalper is delivered, a second rotary scalper beneath said second pair of break rolls receiving the material from said second pair of break rolls and delivering part thereof out of the mill, a pair of reduction rolls at one side of said first-mentioned break rolls into which material from both said scalpels is delivered, and a second pair of reduction rolls situated beneath said first-mentioned pair of reduction rolls.

4. In a mill, the combination of two pairs of break rolls, two pairs of reduction rolls, a bolting reel associated with each pair of said rolls, and a scalping device associated

with each pair of break rolls into which stock from said rolls is delivered, part of the stock delivered to one of said scalping devices being delivered out of the mill by said scalping device.

5. In a mill, two pairs of break rolls, a rotating scalping device situated beneath each pair of break rolls, and means to receive and convey clean bran from the scalping device under the second pair of break rolls.

6. In a mill, the combination of two pairs of break rolls, means between said pairs of rolls for separating the fine stock from the bran, and a scalping device beneath the second pair of break rolls arranged to separate the fine stock from the bran and deliver clean bran out of the mill.

7. In a mill, the combination of a casing having a roll section, a reel section, and an intermediate section, break and reduction rolls within said roll section, bolting reels within said reel section and adapted to receive material passed through said break rolls and said reduction rolls, a suction device in the lower end of said roll section, a dust space in the upper end of said reel section separated from the space containing said reels by a screen, and a tube connecting said screen with said suction device and extending through the intermediate section.

8. In a mill, the combination with a casing having a roll section, a reel section and an intervening section, break rolls and reduction rolls arranged in pairs in said roll section and having the shaft of one roll of each pair extending into said intervening section, a rotatable scalper beneath one pair of break rolls including a sieve and a brush having its shaft extending into said intervening section, a driving shaft, means for rotating the rolls having their axles extending into said intervening section from said driving shaft,

and means for rotating the brush of said scalper from the shaft of one of said rolls extending into said intervening section.

9. In a mill, the combination of a plurality of rolls, a plurality of bolting reels receiving material from said rolls, and means for separating and delivering clean bran from the material, said bran being delivered by said means out of the mill before delivering said material into the bolting reels.

10. In a mill, the combination of a casing having a roll section, a reel section and an intermediate section, break and reduction rolls within said roll section, bolting reels within said reel section adapted to receive material passed through said break rolls and said reduction rolls, a suction device outside of said reel section, and a dust screen in said reel section above said bolting reels spaced from the top wall of said reel section, the space between said screen and top wall having connection with said suction device.

11. A mill having power-driven elements, driving means for said elements, a chamber provided with a bolting reel, a space above said bolting reel divided into two parts by a screen, means operated by the driving means of one of said power-driven elements for vibrating said screen, and a suction tube in connection with the space above said screen.

12. A mill having power-driven elements, driving means for said elements, a chamber provided with a bolting reel, a space above said bolting reel divided into two parts by a screen, means operated by the driving means of one of said power-driven elements for vibrating said screen, and a suction tube in connection with the space above said screen.

In testimony whereof I affix my signature.

CHARLES T. HOWSON.