No. 859,640. PATENTED JULY 9, 1907.

F. W. BRIGHT.

RATION PRESS.

APPLICATION FILED OCT. 8, 1906.

10 SHEETS—SHEET 1.

FIG. 1

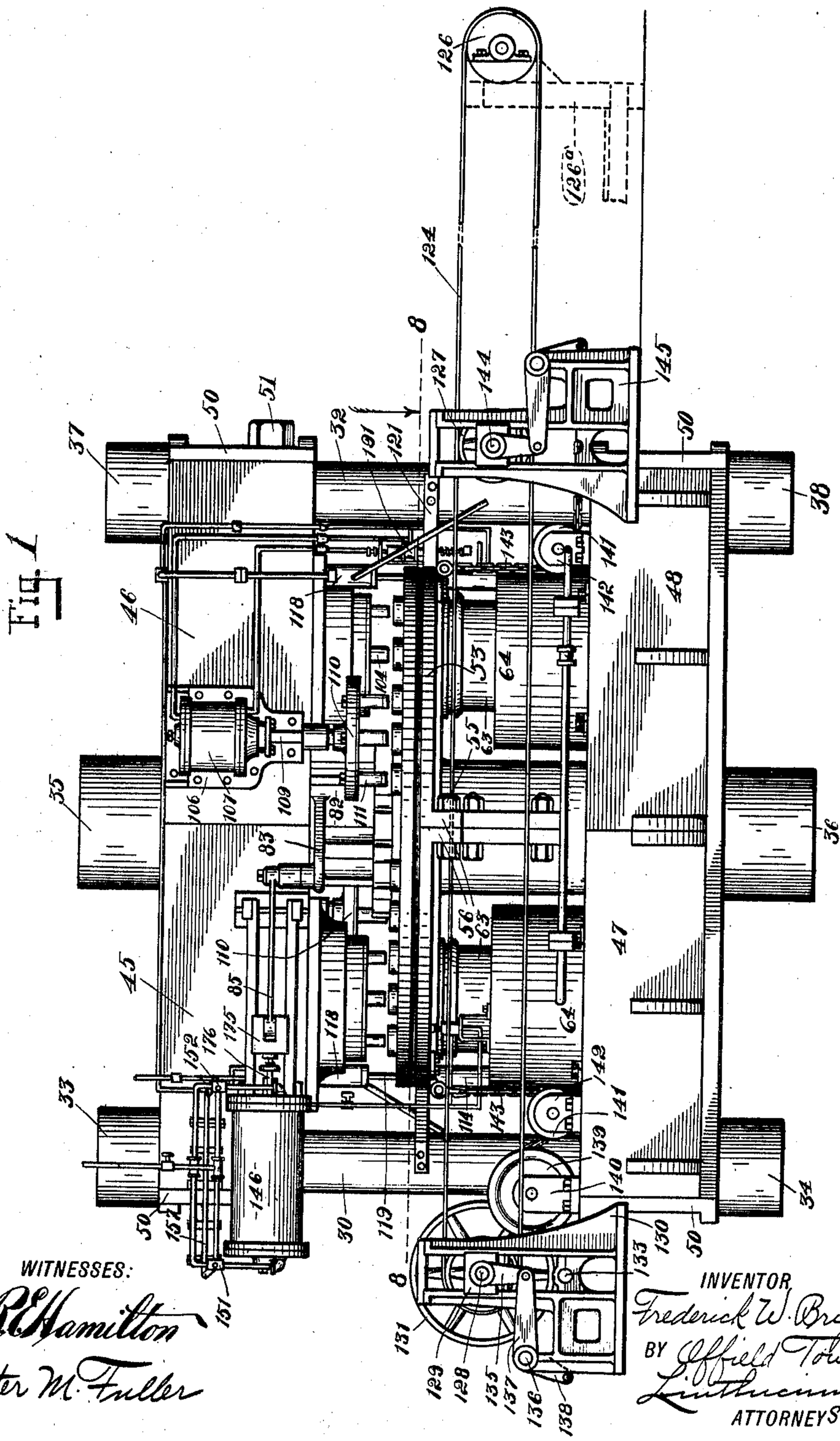

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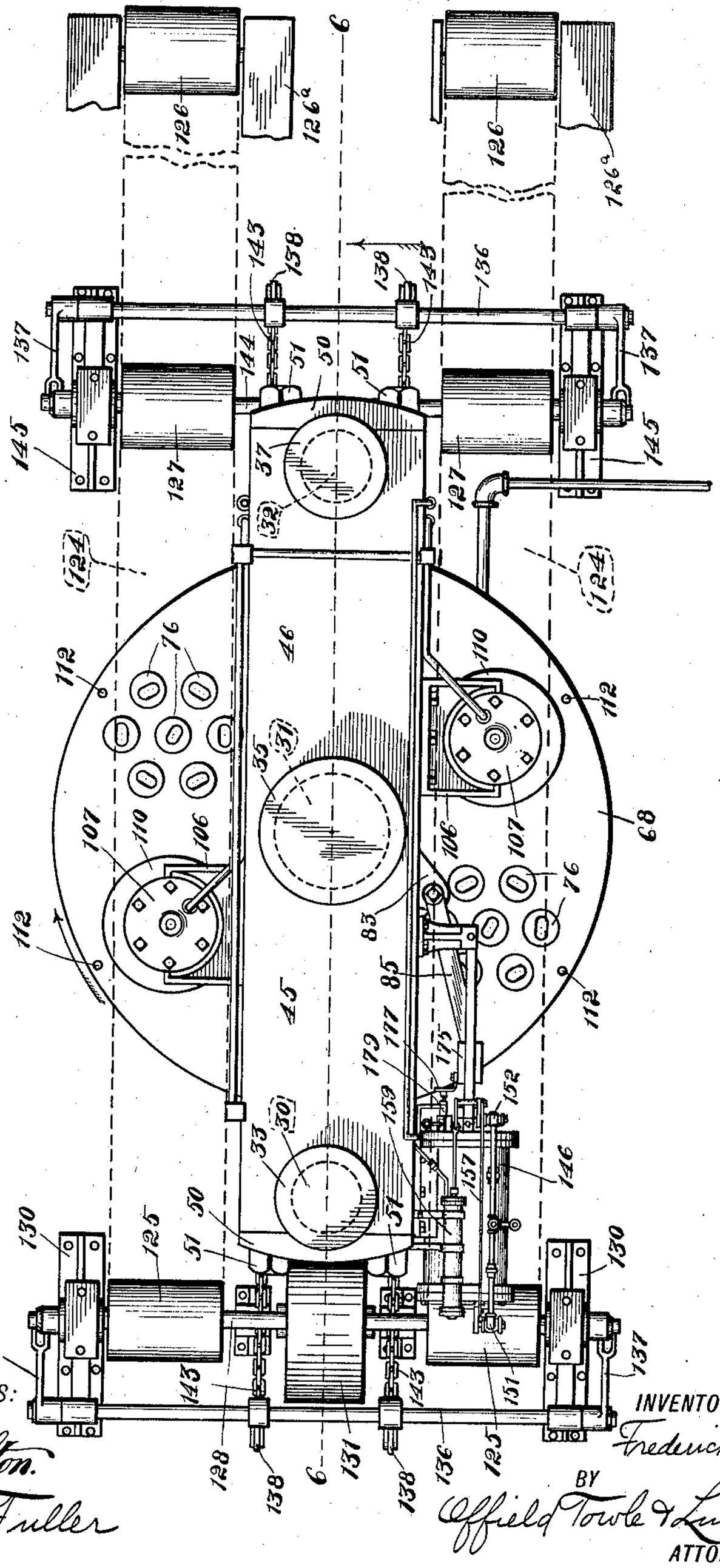
Fig. 2



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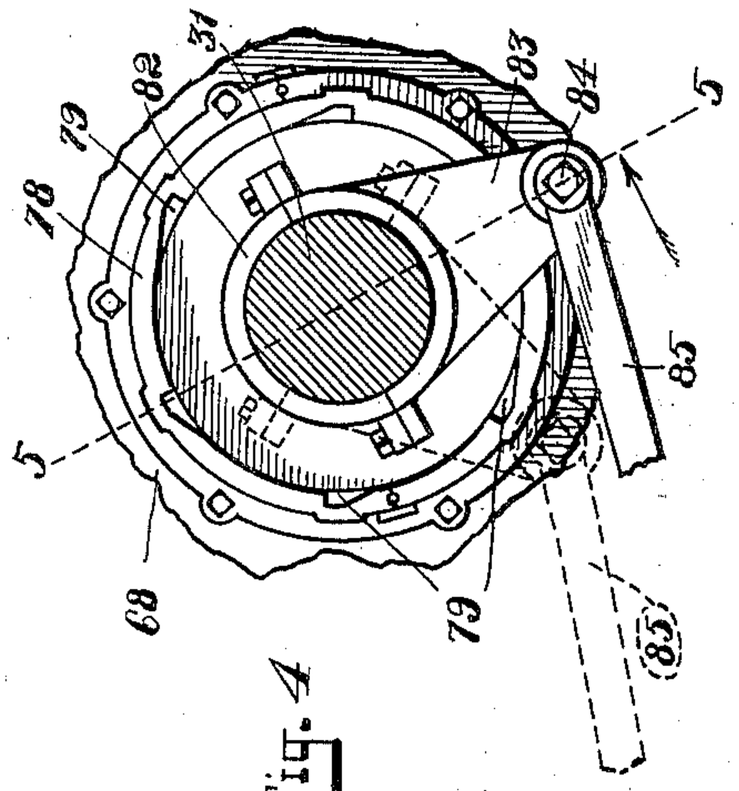

Fig. 4

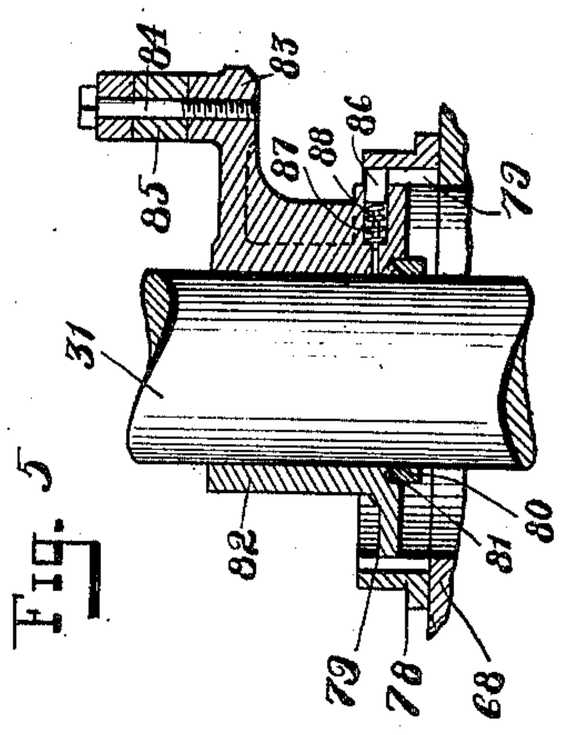

Fig. 5

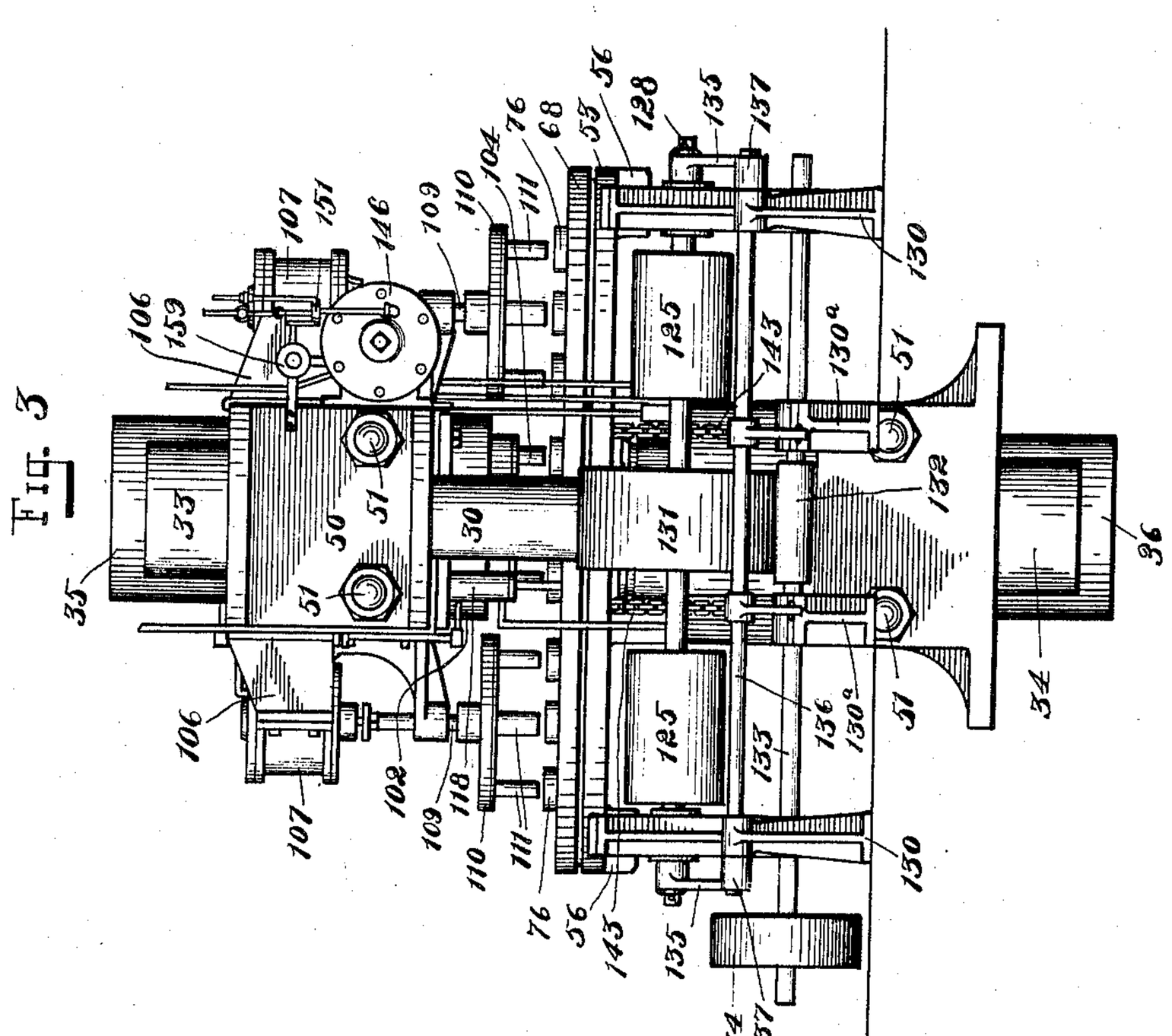

Fig. 3

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Fig. 6

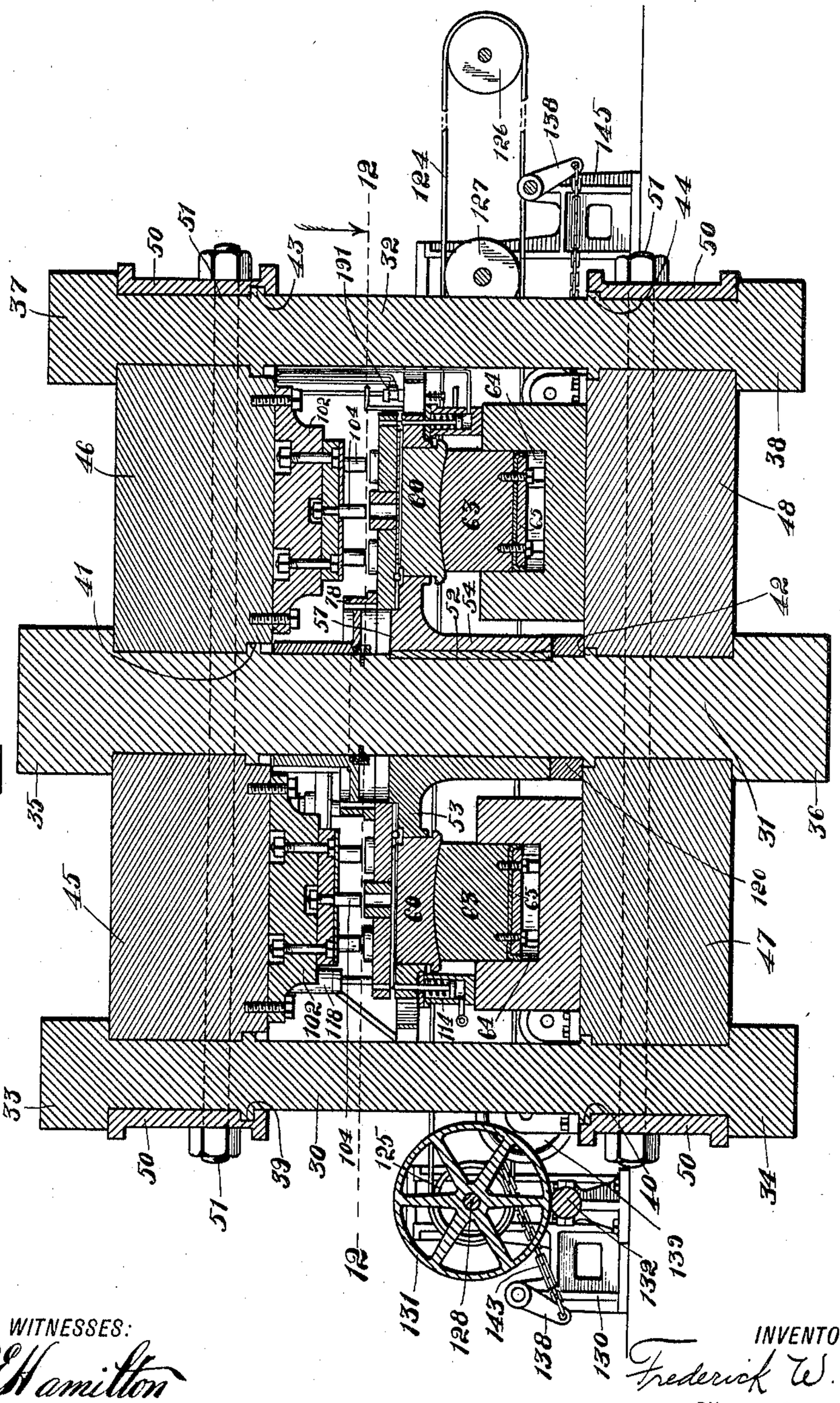

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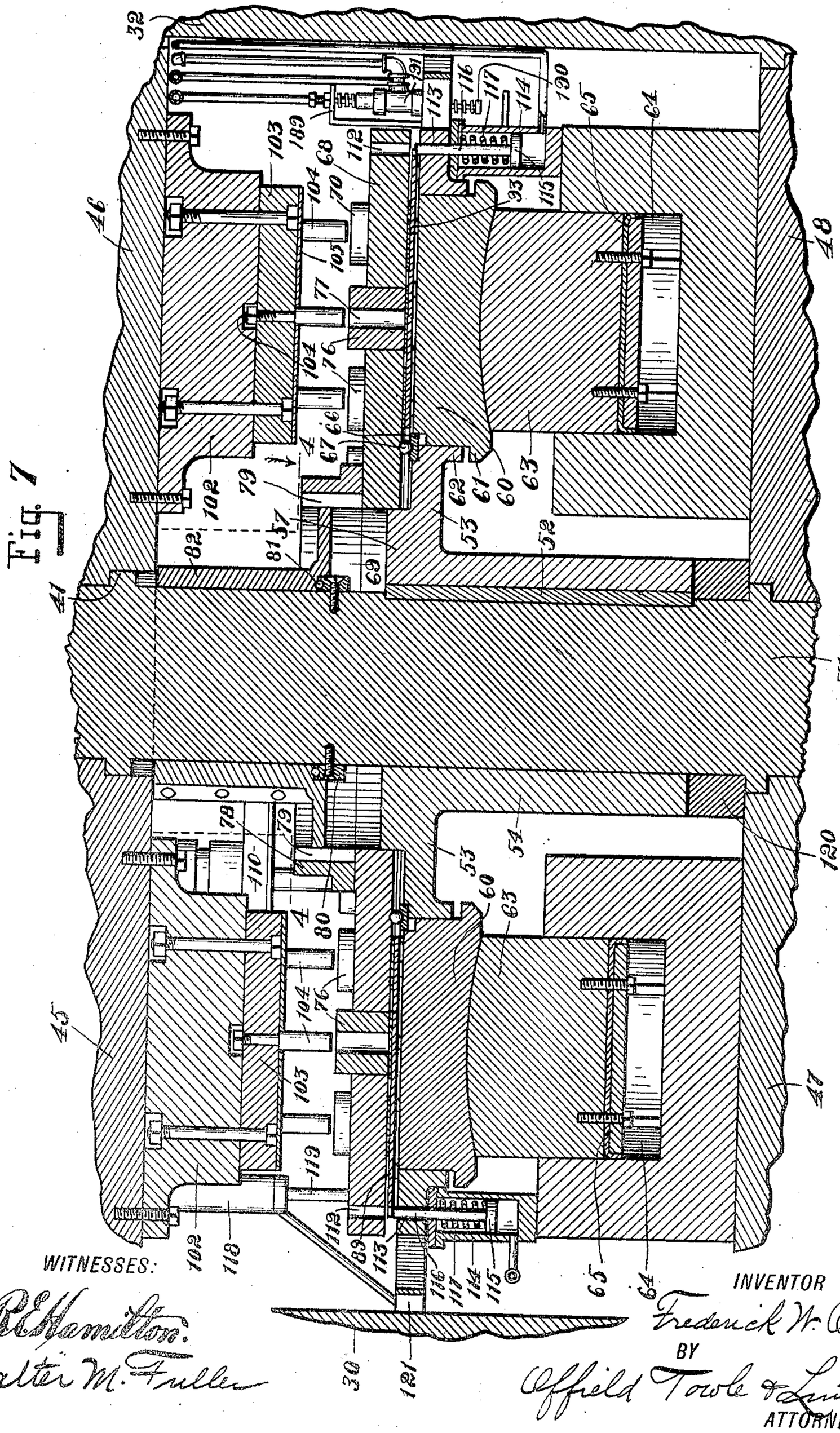
FIG. 7



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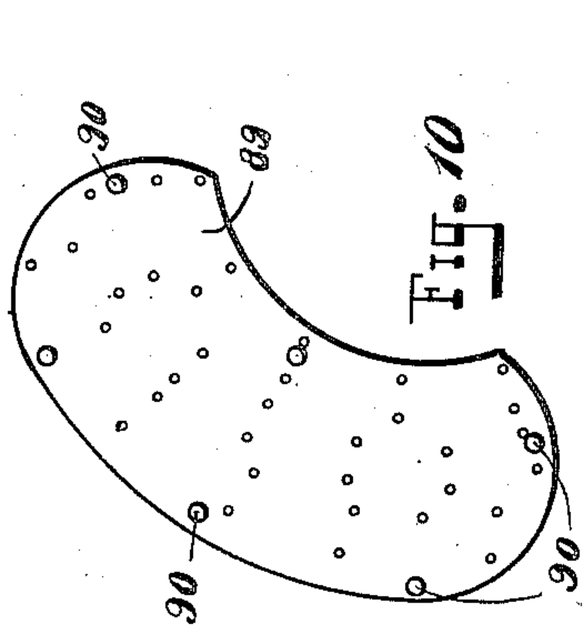

Fig. 10

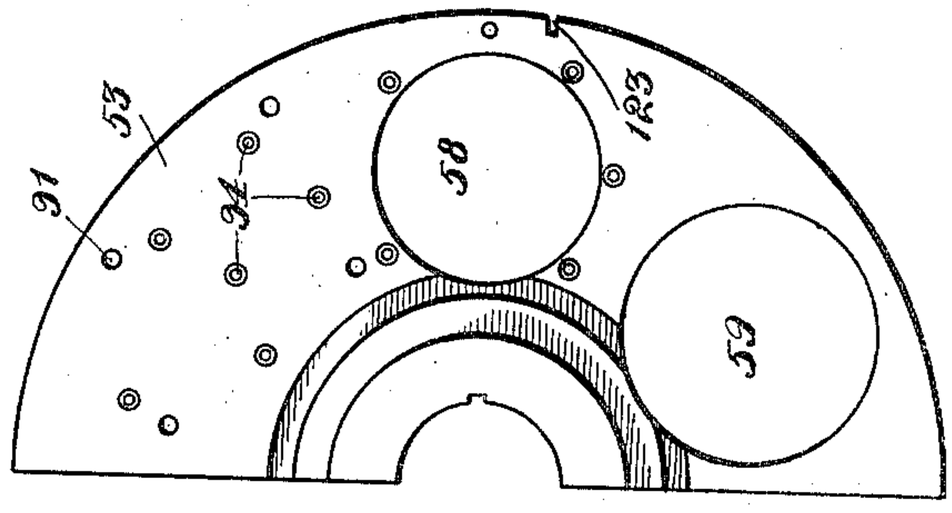

Fig. 9

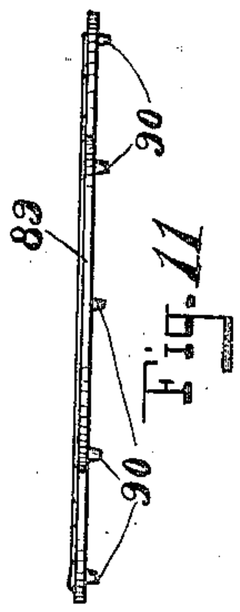

Fig. 11

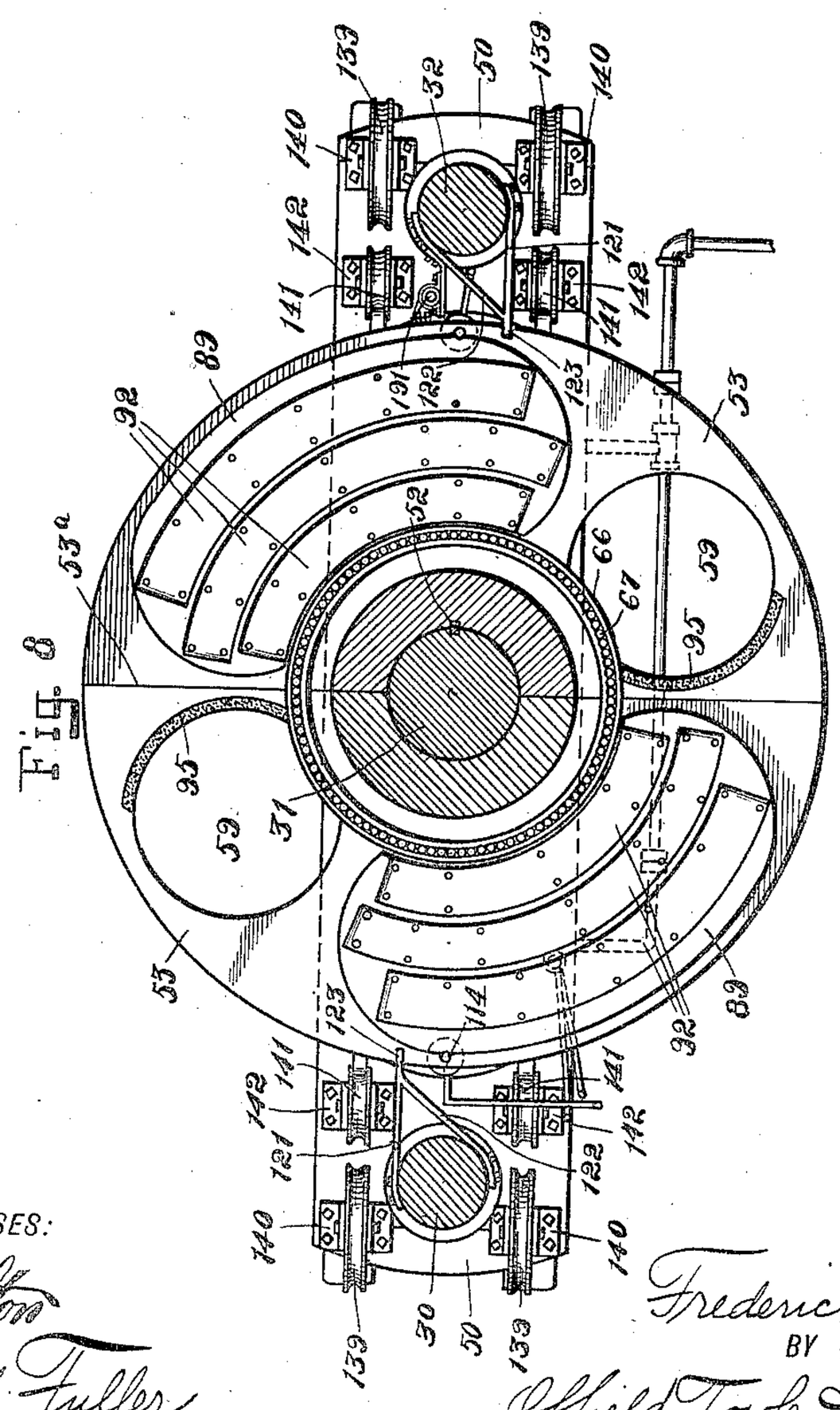

Fig. 8

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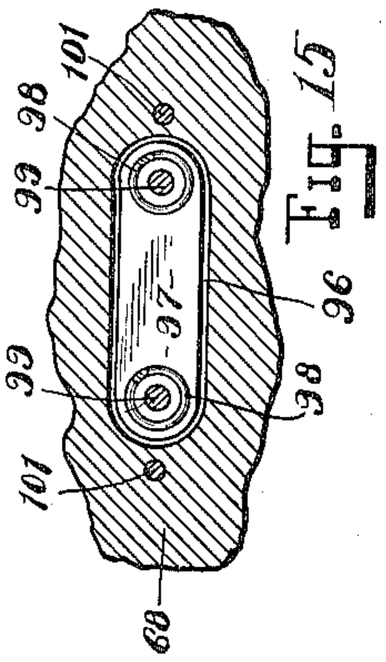

Fig. 15

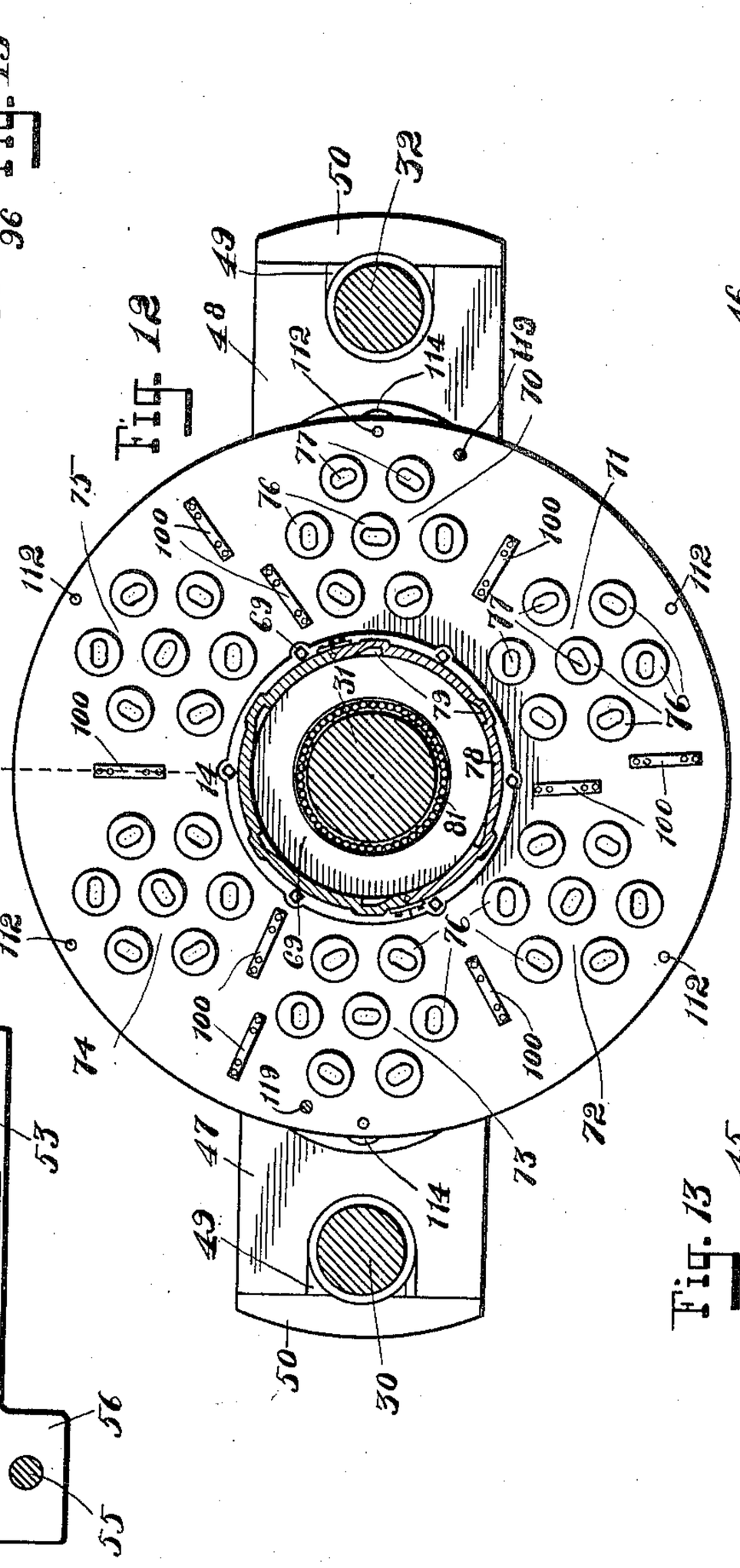

Fig. 12

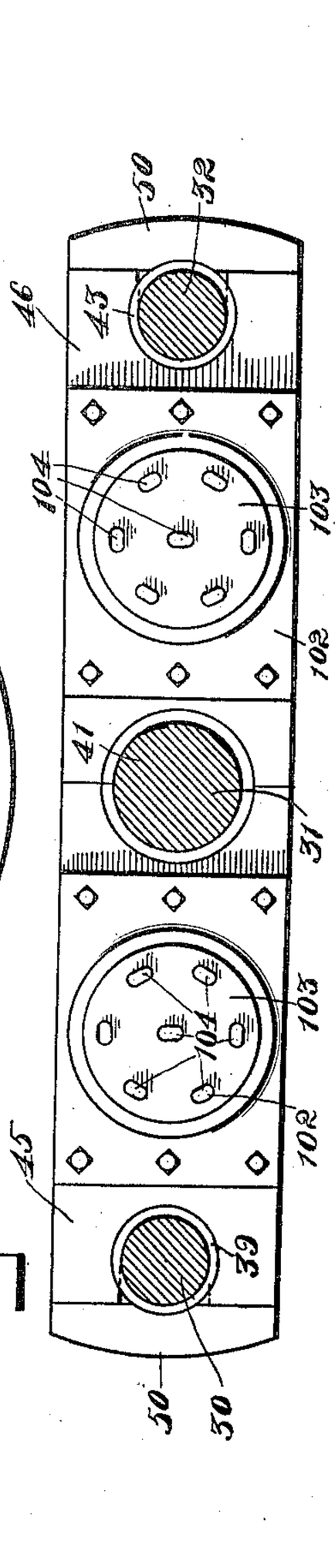

Fig. 13

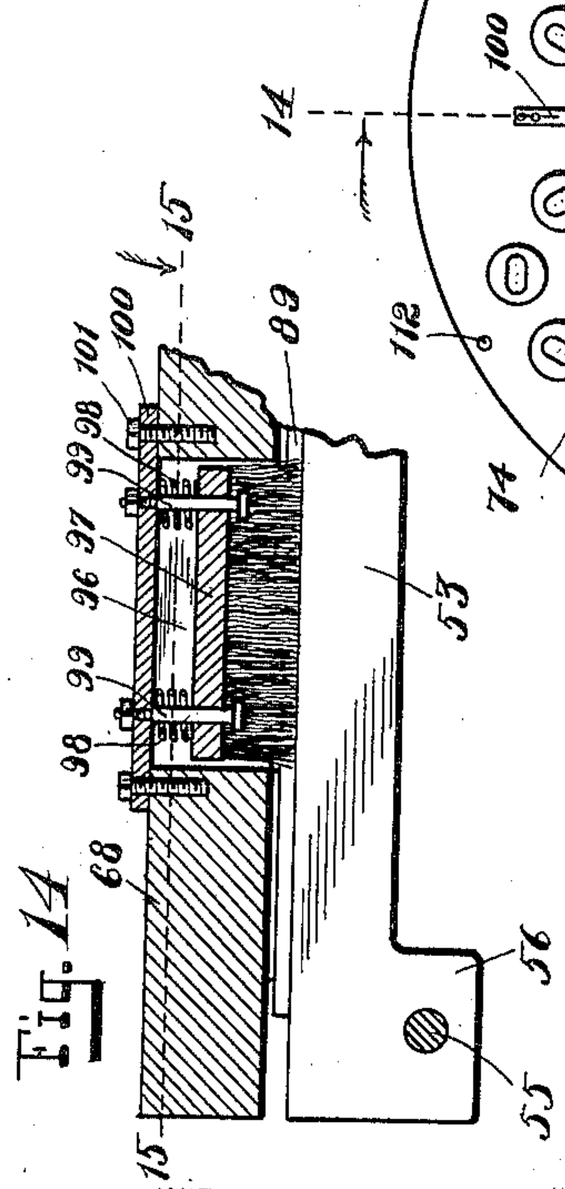

Fig. 14

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Fig. 16

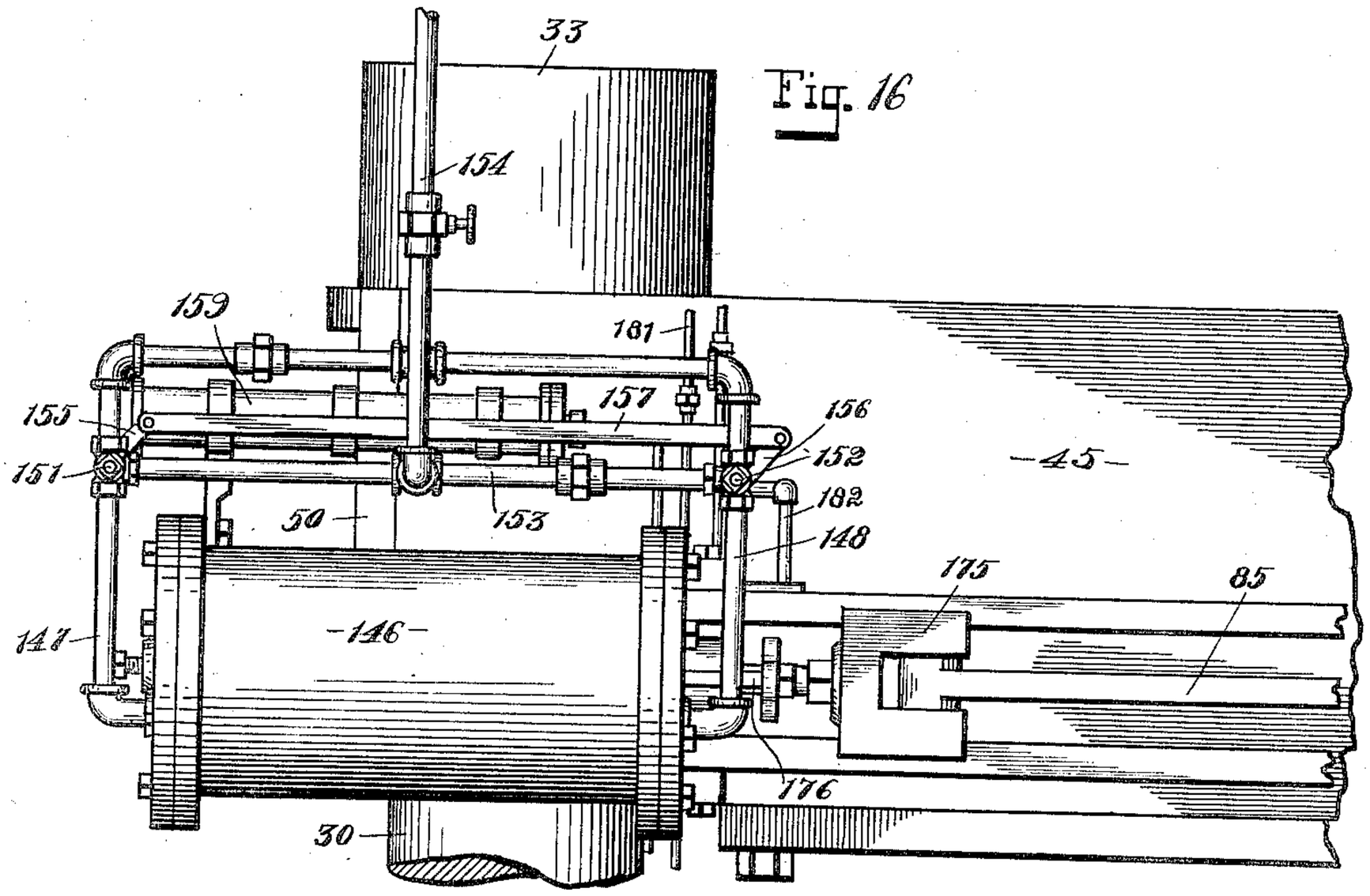
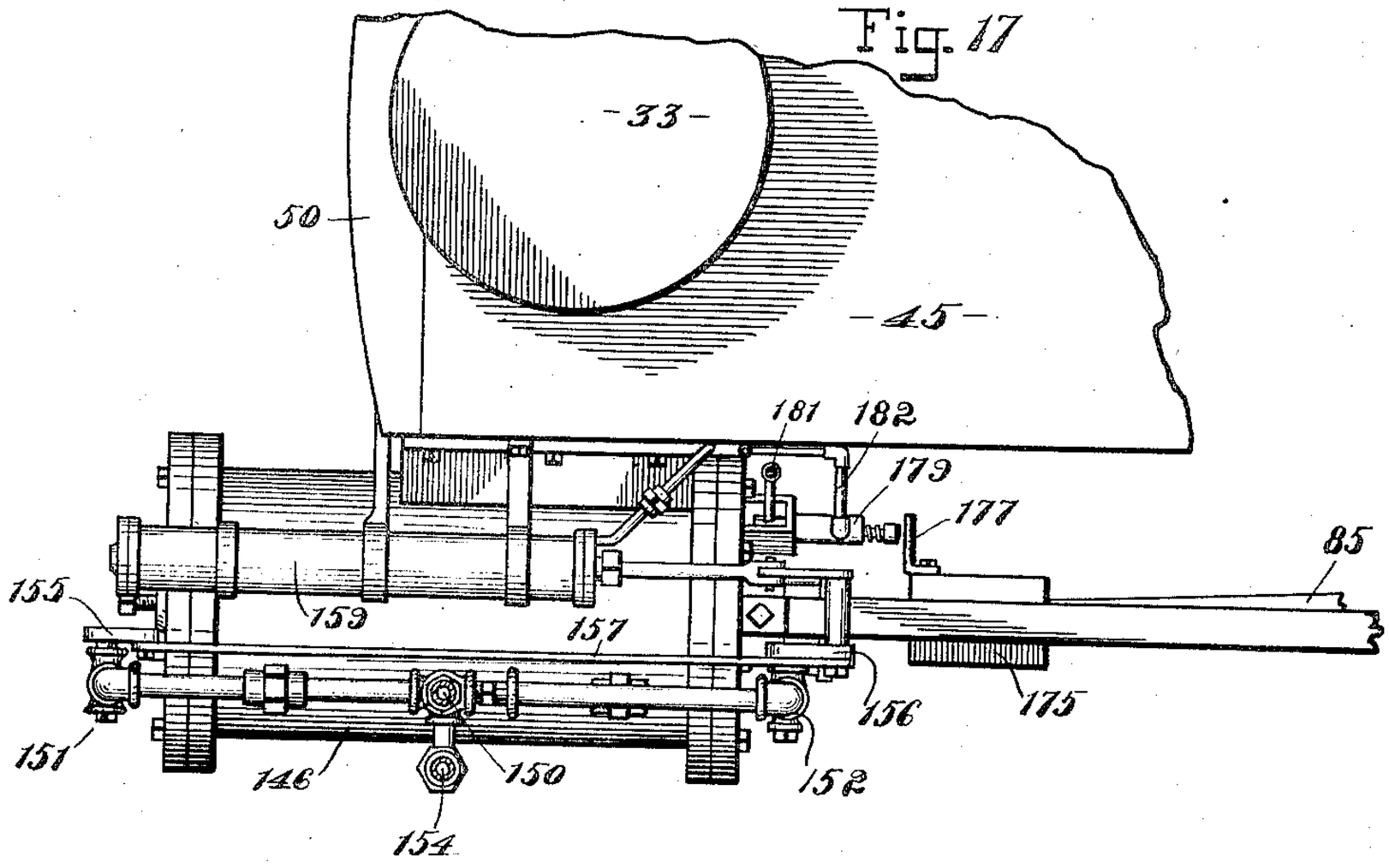


Fig. 17



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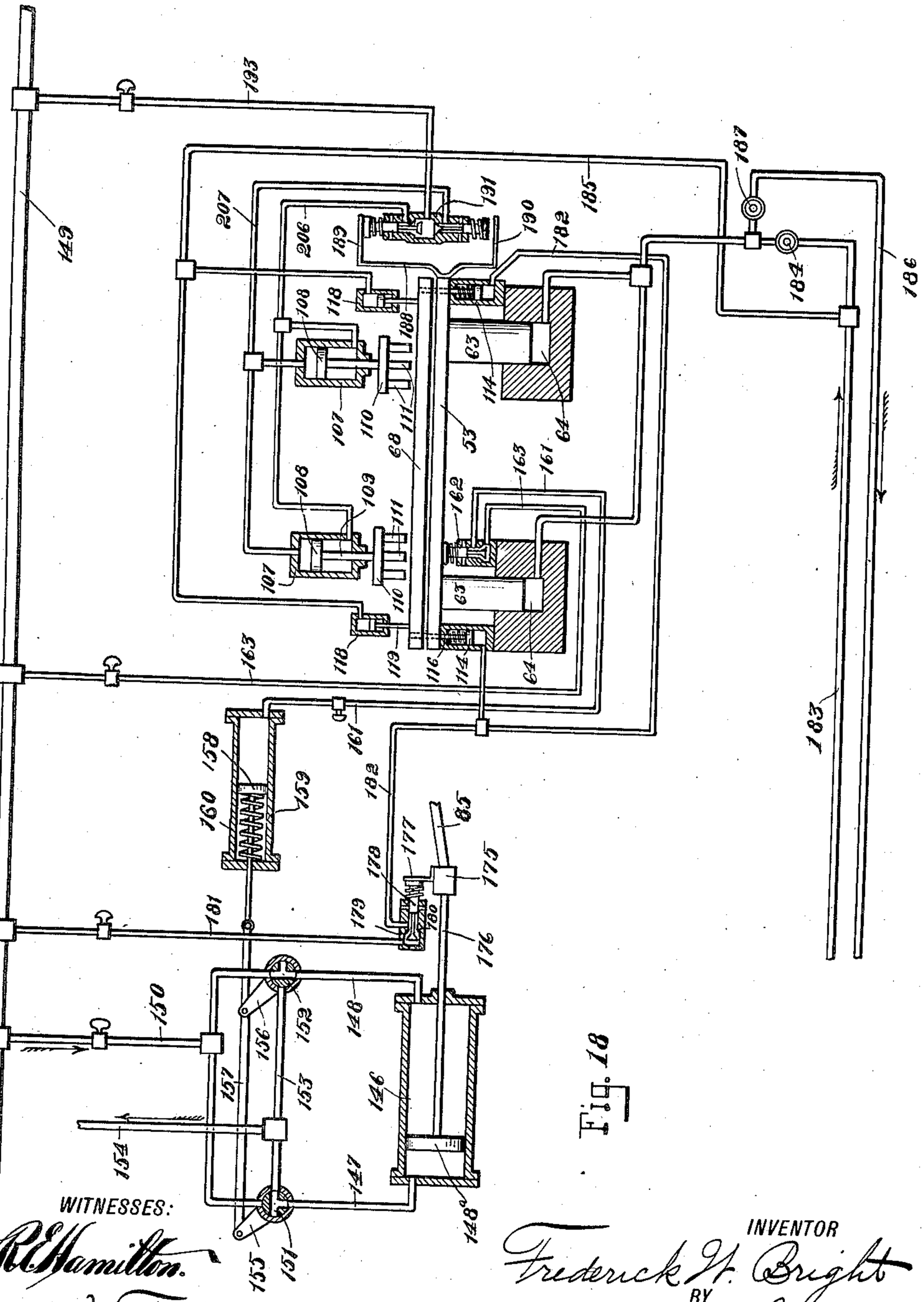

Fig. 18.

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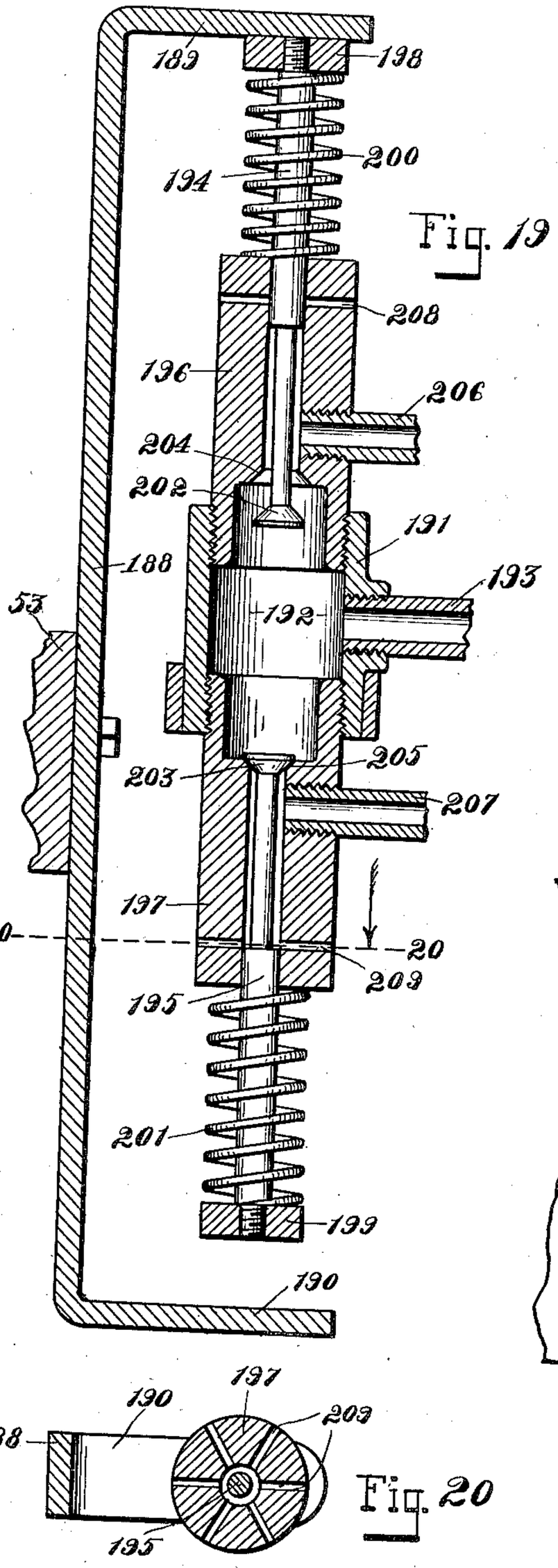

Fig. 19

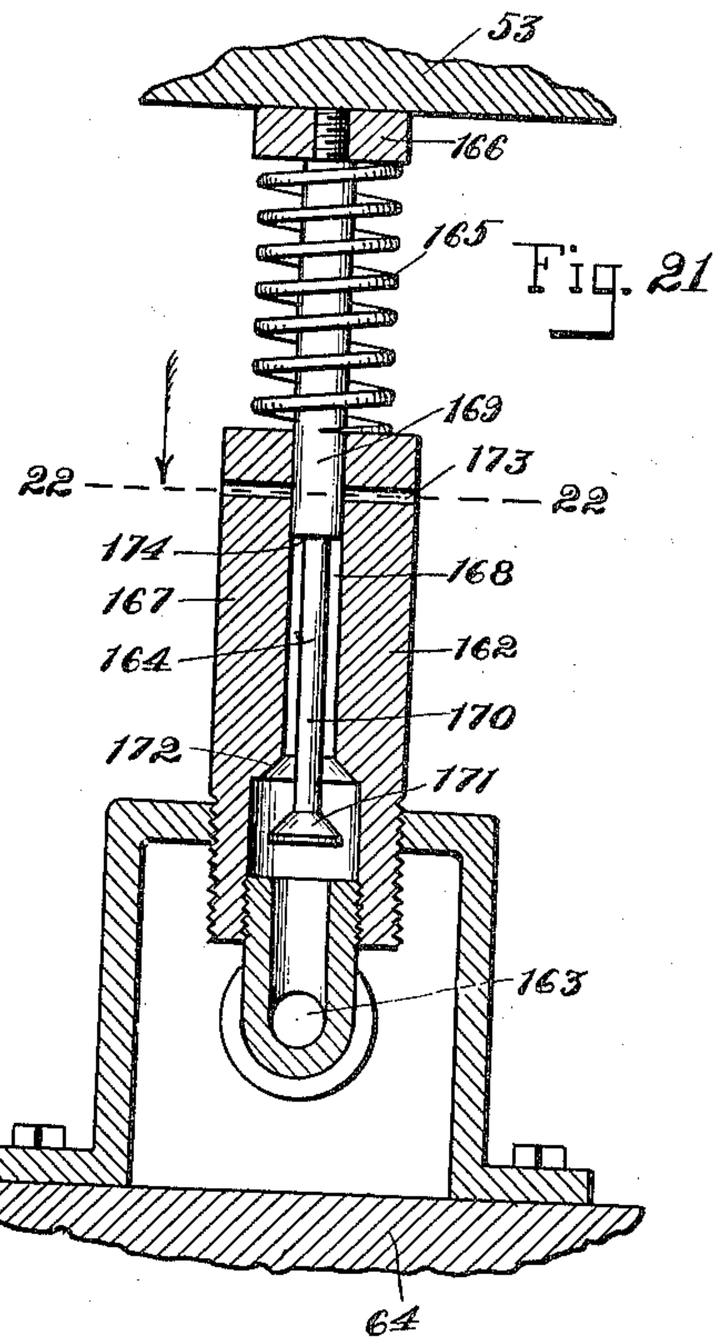

Fig. 21

Fig. 20

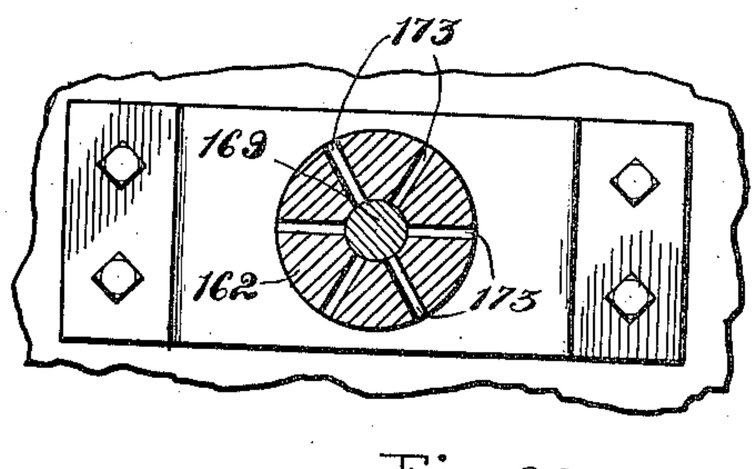

Fig. 22

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UNITED STATES PATENT OFFICE.

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RATION-PRESS.

No. 859,640. Specification of Letters Patent. Patented July 9, 1907.

Application filed October 8, 1906. Serial No. 337,997.

To all whom it may concern:

Be it known that I, FREDERICK W. BRIGHT, a citizen of the United States, residing at Kansas City, in the county of Wyandotte and State of Kansas, have invented certain new and useful Improvements in Ration-Presses, of which the following is a specification.

My invention concerns improvements in presses, and more particularly relates to compressors for compacting into small compass, such as cakes or blocks, emergency rations of ground wheat and dried beef, or similar edible and nutritious products, in a state of fine subdivision. After being operated upon by the press and discharged from the machine one or more of these edible cakes are sealed in air-tight cans ready for use by an army.

The salient objects of my invention are to provide a mold of such shape and form that the finished cake or tablet after being canned may be easily and conveniently carried by the soldier; to provide means to press the mixture of wheat and beef into a cake of convenient shape and eject it from its mold onto a suitable conveyer whereby it is carried away from the machine.

In its preferred embodiment the device comprises a suitable rigid and strong main supporting frame upon which is mounted a lower reciprocating plate actuated by hydraulic pistons which force a group of food-filled molds in an upper rotatable and slidable mold-supporting disk or table into co-operative relation with stationary compression plungers. Simultaneously with this compressing operation the compressed cakes of another group of molds are ejected by suitable plungers upon a conveying belt from which they are removed to be sealed hermetically in cans or the like. Desirably my machine is provided with six sets or groups of molds, each group being successively filled by hand or automatically, its contents pressed, and then discharged. At each actuation of the device the contents of two groups of molds are subjected to considerable pressure, the cakes of two adjacent groups are ejected, while the remaining pair of groups are being filled. A suitable motor, in the present instance fluid-actuated, is provided for rotating the upper revoluble mold disk step by step so as to bring each set of molds successively into filling, compressing, and discharging position. One or more air-actuated, motor-controlled locks are used to maintain the rotary mold disk and slidable plate in proper angular relation while the disk, plate, and hydraulic pistons are being elevated to cause the compression and ejector plungers to enter the molds of the various groups. I prefer to make the compression plungers stationary while the ejectors are reciprocated by air pressure, the operation of the ejectors being governed by automatic valves controlled by the movement of the lower sliding plate. The operation of the air motor's valves is also governed by suitable means associated with the lower sliding plate. In order to equalize the rise of the sliding plate and mold disk and facilitate their descent there is provided a pair of hydraulic jacks constantly pressing downwardly upon the upper mold disk in opposition to the action of the large main hydraulic pistons except when the mold disk is in its lowermost or rotary position. To land the compressed cakes upon the conveying belts in whole and uninjured condition, the travel of the belts is made intermittent whereby they will be stationary when the cakes are ejected upon them. Preferably the action of the belts is controlled by friction means connected mechanically with the lower plate whereby, when the latter rises, the friction elements or pulleys are separated and the belts brought to a stand-still until the plate descends. In addition my new machine embodies several other improvements in its operating mechanism which will be apparent to those skilled in the art from the following description and the accompanying drawings.

In said drawings like reference characters refer to the same parts throughout the various views.

Figure 1 is a side elevation of my novel ration press, showing the conveyer belts partly broken away; Fig. 2 is a plan view of the structure illustrated in Fig. 1, the conveyer belts being indicated by dotted lines and being broken away; Fig. 3 is an elevation of the left hand end of the structure shown in Figs. 1 and 2; Fig. 4 is a horizontal section on line 4—4 of Fig. 7, looking downwardly, and illustrates the ratchet mechanism for rotating the mold disk or table step by step; Fig. 5 is a section of the mechanism illustrated in Fig. 4 on line 5—5; Fig. 6 is a vertical longitudinal central section of the press on line 6—6 of Fig. 2, as viewed in the direction indicated by the arrow; Fig. 7 is an enlarged view of the central portion of Fig. 6, certain parts being broken away; Fig. 8 is a horizontal section on line 8—8 of Fig. 1, looking downwardly, and shows in detail the upper surface of the lower plate and attached parts; Fig. 9 is a plan of one section of the lower table or plate shown in Fig. 8; Fig. 10 is an inverted plan view of one of the curved steel plates secured to the upper surface of the lower table or plate shown in Fig. 8; Fig. 11 is an edge elevation of the plate shown in Fig. 10; Fig. 12 is a horizontal section of the press on line 12—12 of Fig. 6, looking downwardly, with the belt-raising mechanism omitted; Fig. 13 is a section on the line 12—12 of Fig. 6, looking upwardly, some parts being omitted; Fig. 14 is a section of a portion of the mold disk or table on line 14—14 of Fig. 12; Fig. 15 is a horizontal section on line 15—15 of Fig. 14; Fig. 16 is an enlarged side elevation of the mold disk or table rotat-

ing mechanism; Fig. 17 is an enlarged plan of the table rotating mechanism shown in Fig. 16; Fig. 18 is a diagrammatic view of the hydraulic and air systems; Fig. 19 is a vertical central section of the double air regulating valve and operating bar; Fig. 20 is a horizontal section taken on line 20—20 of Fig. 19; Fig. 21 is a vertical central section of a single air regulating valve; and Fig. 22 is a horizontal section taken on line 22—22 of Fig. 21.

The supporting frame of this machine comprises three upright columns 30, 31 and 32, each having enlarged heads 33 and 34, 35 and 36, and 37 and 38, respectively, at its opposite ends and a pair of integral collars or circular flanges 39, 40, 41, 42, 43 and 44 spaced a suitable distance from the adjacent heads. In addition to these columns or posts the frame has substantial and massive top and bottom beams, the former comprising two halves 45 and 46 and the latter two parts 47 and 48, each of which is semi-circularly recessed at its inner end to partially fit around the shank of the column 31 between its heads 35 and 36 and collars 41 and 42, and is slotted at 49 (Figs. 12 and 13) at its outer end to similarly receive the end columns 30 and 32. As shown, the inner ends of slots 49 are semi-circular to neatly engage the posts or columns, and to retain the parts in proper relation end caps 50 are fitted over the ends of slots 49 while longitudinal bolts 51 (Fig. 6) not only hold the caps in place but bind all the parts together.

Feathered into the intermediate column 31 at 52 (Fig. 6) and slidable thereon is a lower plate or table 53 having a depending sleeve or hub 54 encircling the column. This plate or table is split in halves on line 53^a (Fig. 8) and the two portions are secured together by bolts 55 passing through holes in the downwardly extended flanges 56 (Fig. 1). Plate 53 has a central circular hub 57 (Fig. 7) on its top surface and each half of said plate has two round apertures 58 and 59 (Fig. 9), the latter being slightly greater in diameter than the former. Within each of the two apertures 58 is slidably mounted a piston head 60 (Figs. 6 and 7) having a flange 61 adapted on upward movement of the head to engage the circular hub 62 extending around the margin of aperture 58. Below piston heads 60 are hydraulic operating pistons 63 reciprocating in casings or chambers 64 mounted on the lower beams 47 and 48, the pistons having suitable packings 65 to prevent escape of fluid around them. Upon the upper surface of plate 53 I provide an annular grooved ball race 66 in which travel the balls 67. Upon these balls is adapted to rotate about central column 31 a round mold-supporting disk or table 68 which is kept centered by the hub 57 of the lower plate projecting into its central circular aperture 69. In holes extending through this disk or table are fastened six groups 70, 71, 72, 73, 74 and 75 (Fig. 12) of round molds 76, each having a mold chamber 77 therein somewhat wider than it is thick and with rounded ends, as shown.

Bolted to the top surface of disk 68 surrounding the aperture 69 is an annular ring 78 (Figs. 4 and 7) concentric with post 31 and notched on its inner surface at six places 79 spaced apart angularly equal amounts (sixty degrees). This ring if desired may be made in two parts secured together as shown in Fig. 12 and within it a circular collar 80 (Fig. 7) is attached to post 31 by screws, the collar having on its top a round groove to receive balls 81. A split sleeve 82, the parts of which are bolted together, encircles post 31 and is adapted to oscillate on the same riding upon the anti-friction balls 81. This sleeve has an outwardly extended arm 83 (Figs. 4 and 5) to which is pivotally connected at 84 a link 85 which connects the arm 83 with an operating motor described below. A pawl or catch 86 (Fig. 5) is housed within a recess 87 in sleeve 82 and is pressed outwardly by a spring 88 so that its exterior end is adapted to engage the internal notches 79 of ratchet 78. These notches, it will be noticed, have one side abrupt while the other is inclined, which permits the pawl 86 to ride out of the notches when traveling backwards, but compels the ratchet and mold table 68 to turn with arm 83 when the latter is rotated forwardly. Link 85 being reciprocated back and forth the mold table is rotated intermittently step by step one-sixth of a rotation whereby all of the groups of molds are brought to their successive operative positions.

Since the table 68 is raised some distance above the lower table 53 by balls 67 it becomes necessary to provide means between the two to prevent crumbs from accumulating between them, and for this purpose I attach to the upper surface of each half of table 53 a thin curved steel plate 89 (Fig. 10). This plate is maintained in position on table 53 by means of dowel pins 90 engaging holes 91 in the table, the position of each plate being such that one end portion of it completely covers one of the circular apertures 58. Riveted to the upper surface of each plate 89 are three curved, steel, flat tracks or plates 92 (Fig. 8), which are disposed concentric with column 31 and are so positioned that they lie beneath the circular paths of travel of the under surfaces of molds 76. As will be observed, each group consists of six molds arranged around a central one and the molds are so located that the three curved tracks 92 will cover the lower surfaces of all the molds in two adjacent groups. In order to yieldingly maintain these track plates against the lower ends of the molds, I provide springs 93 (Fig. 7) seated in apertures 94 (Fig. 9) in the top surface of the lower table 53 and which by pressing outwardly force the steel plate 89 and its attached track plates 92 against the molds.

In order to rid the bottom surface of table 68 and molds 76 of any crumbs which may adhere thereto, I provide along substantially one half of the margin of each aperture 59 a curved brush 95 (Fig. 8) which loosens the crumbs from the revolving table so that they fall through the holes 59. It is also desirable to brush the top surfaces of the flat tracks 92 and for this purpose I mount in recesses 96 in the under side of table 68 a number of brushes 97 (Fig. 14) thrust downwardly upon the tracks by coil springs 98. A suitable number of these brushes is provided, each being guided in its vertical reciprocation by a pair of bolts 99, the brushes being arranged in the table in any convenient manner so that the tracks will be properly cleaned. A convenient way of mounting these brushes is to provide a plate 100 for each recess 96 and fasten the same by screws 101 to the top surface of the mold table 68, bolts 99 being held rigidly on this plate.

Above and in alinement with the hydraulic pistons 63 and secured to the under surfaces of beams 45 and 46 are a pair of supports 102 (Fig. 7) to the lower face of each of which is bolted a circular plate 103. Projecting downwardly from this latter plate are seven stationary compression plungers 104 spaced so as to register with the mold chambers 77 of the group of molds beneath the same. Each of these plungers is secured to plate 103 in any convenient manner, but preferably by having its inner screw-threaded end project through the plate into an aperture 104ª in the support 102 which may accommodate a nut screwed on the end of the shank of the plunger. To aid in maintaining these plungers in proper position and prevent them from being bent out of alinement with the mold apertures, I provide a thin steel templet 105 having holes which neatly fit around the plungers 104.

Mounted on opposite sides of beams 45 and 46 on suitable brackets 106 (Fig. 2) are a pair of cylinders 107 within which reciprocate pistons 108 (Fig. 18) having piston rods 109 projecting through the lower end of the cylinders 107 through suitably packed apertures. On its lower end each piston rod 109 carries a round plate 110 from the under surface of which project downwardly seven ejector plungers 111 arranged in the same relation as the molds of each of the groups. These discharge plungers 111 are so positioned on the frame that they will co-act with a group of molds next to the group being operated upon by the compression plungers 104.

In order to lock the rotary table 68 to the non-rotating table 53 in the proper angular position so that the compression and ejector plungers will be in exact alinement with the apertures of the molds, I provide table 68 with six cylindrical holes 112 (Figs. 7 and 12) near its periphery and spaced apart sixty degrees. Table 53 is provided with two similar holes 113 opposite each other and at the same distance from the axis of column 31. On the hydraulic casings 64 I mount two chambers 114 beneath the apertures 113, and within these chambers adapted to slide therein are pistons 115 whose rods 116 are adapted to be forced by air pressure into the holes 113 and 112 so as to lock the two tables together, thereby preventing rotation relative to each other. Air pressure is used to force these locking rods or pins 116 outwardly, while springs 117 acting on the top surfaces of pistons 115 force the locking rods 116, when the air in the chambers is allowed to exhaust, to travel downwardly, unlocking the two tables.

In addition to the locking pins or rods 116 to maintain table 53 in proper position, I attach to each of the standards 30 and 32 an inwardly projecting bar 121 (Fig. 8) braced to the other side of the standard by a bar 122, the inner end of bar 121 engaging a slot 123 in the periphery of the lower table 53. These locks are merely steadying means acting in conjunction with feather 52 to prevent rotation of table 53, but it should be remembered, however, that they allow it to slide up and down.

Instead of relying solely upon the weight of the tables and attached parts to secure their descent when such movement is permitted by pistons 63, I equip the machine with two or more hydraulic jacks 118 (Figs. 1, 7 and 18) whose plungers 119 press downwardly on the upper surface of the top or mold table 68. In the present instance I use two of these jacks and have them oppositely disposed relative to the center column 31 whereby an even rising of the tables is secured whenever there is a tendency for one of the pistons 63 to act more quickly or more forcibly than the other. It will be observed that these jacks and the hydraulic pistons 63 act in opposition upon the tables. To limit the descent of these tables I provide beneath sleeve 54 a collar 120 (Figs. 6 and 7) which encircles the lower end of post 31 and rests upon the beams 47 and 48.

The machine is provided with two endless conveyer belts 124 which travel on opposite sides of the center of the machine beneath table 53 and below the discharge openings 59, whereby they may receive the ejected cakes as they drop through these openings. At one end these belts pass over pulleys or drums 125 while at their opposite ends they pass around similar drums 126. Also adjacent to the opposite end of the machine from the pulleys 125 they pass over and rest upon intermediate supporting pulleys 127. Drums 125 are keyed to a shaft 128 which is rotatably mounted in bearings 129 (Fig. 1) adapted to slide vertically in a pair of standards or guides 130. At approximately its center shaft 128 is equipped with a friction pulley 131 (Figs. 2 and 3) which, under certain circumstances, is in frictional engagement with a small friction driving pulley 132 (Fig. 3) on a shaft 133 rotatably mounted in standards 130ª and supplied at one end with a driving pulley 134. Shaft 128 is connected to table 53 so that it, its bearings 129, the drums 125, and the friction pulley 131 will be elevated as the table rises. To effect this co-operation I rigidly mount on the ends of shaft 128 arms or levers 135 (Figs. 1 and 3) and in suitable bearings on standards 130 I mount a rock shaft 136 which has arms 137 affixed thereto whose free ends are pivoted to the ends of levers 135. Rock shaft 136 is also supplied with a pair of depending arms 138 keyed thereto whereby oscillation of arms 138 causes a turning of shaft 136 and a bodily rise of shaft 128, its bearings, drums, and friction pulley.

On each of the outer corners of beams 47 and 48 I fasten sheaves 139 (Figs. 1 and 8) rotatably mounted in suitable bearings 140, and just inside of these sheaves and in alinement therewith I provide smaller sheaves or grooved pulleys 141 mounted in bearings 142. Each arm 138 is connected to the under side of table 53 by a chain 143 which passes beneath one of the sheaves 141 and over its adjacent sheave 139. It will thus be apparent that elevation of table 53 causes a lifting of shaft 128 thereby securing a separation of the friction pulleys so that the travel of the belts ceases. At the opposite end of the machine drums 127 are mounted upon a shaft 144 which is vertically slidable in standards 145. Shaft 144 is raised simultaneously with the elevation of table 53 by connecting means exactly like those used in connection with shaft 128. It will be obvious that the only effect secured by the raising of shaft 144 is the maintenance of the surface of the belts in a horizontal plane. The shafts of pulleys 126 may be mounted in standards 126ª at any suitable distance from the machine, as will be readily apparent.

Referring to Figs. 1, 2, and 16 to 18, the air engine or motor 146 has the pipes 147 and 148 communicating

with its opposite ends on the two sides of piston 148ª. The pair of pipes 147 and 148 are connected to the air supply line 149 (Fig. 18) by pipe 150, and each of these pipes 147 and 148 is equipped with a three-way valve 151 and 152, respectively, the two pipes being joined by a cross-pipe 153 connected to the discharge pipe 154. The arms 155 and 156 of these two valves are joined together by a rod 157 and to a piston 158 slidable within a chamber 159, said piston being normally pressed to the right, as viewed in Fig. 18, by a spring 160 encircling its rod and abutting at its two ends against one head of the casing and against the piston. The chamber 159 communicates by means of pipe 161 with a single air regulating valve 162 and also connecting with this valve is a pipe 163 joined to the air supply line 149. Valve 162 may be conveniently located on the top of one of the hydraulic piston casings 64 and is provided with the valve stem 164 (Fig. 21) which controls the connection between pipes 161 and 163. The stem of this valve is normally pressed outwardly into closed position by a spring 165, the spring encircling the protruding end of the valve stem and abutting against the top of the valve casing 167 and a nut 166 screwed on the top of the stem. Casing 167 of the valve is longitudinally apertured at 168 and within this aperture the valve stem is mounted to slide. This stem has a larger portion 169 which is of the same diameter as the aperture 168 and has a smaller portion 170 which carries at its lower end the cone valve 171 adapted to be seated against the valve seat 172 to close the connection between pipes 161 and 163. Near its upper end valve casing 167 has a number of lateral channels 173 communicating at their inner ends with the central aperture 168 and at their outer ends with the atmosphere. It will be observed that the discharge of air through passage 168 and channels 173 is controlled by the position of the valve stem and when the table 53 reaches the limit of its upward movement the shoulder 174 of the stem will have risen above channels 173, permitting discharge therethrough.

The piston 148ª of the air motor or engine is connected to its cross-head 175 by a piston-rod 176, the cross-head in turn being pivoted to link 85. It is desirable to have this air engine control the operation of the air-actuated locking bolts or rods 116 and for this purpose I secure to the cross-head 175 a bracket 177 adapted to operate the valve stem 178 of valve 179 working in a casing 180, in all respects like that illustrated in Fig. 21. A pipe 181 connects the air supply line 149 with the casing 180 and on the opposite side of valve 179 this casing is connected by a pipe 182 and suitable branches to the chambers 114 of the locking bolts 116.

The pistons 63 are operated by hydraulic pressure and for this purpose there is provided a hydraulic line or pipe 183 (Fig. 18) leading from a suitable source of supply to both of the chambers 64 and equipped with a manually actuated valve 184. To the line side of valve 184 of pipe 183 is connected a pipe 185 and suitable branches leading to the hydraulic jack chambers 118 above their pistons. On the other side of valve 184 pipe 183 is jointed to a discharge pipe 186 equipped with a hand-operated valve 187. It will thus be apparent that the hydraulic jacks 119 are constantly subjected to pressure forcing them downwardly against the top surface of the upper table 68. However, when this table is at its lower point of descent, it is free from the pressure of these jacks which are made just long enough so that they escape the table when in the position indicated. To force the pistons 63 upwardly together with the tables 53 and 68 it is merely necessary for the operator to close valve 187 and open valve 184 which admits the water, oil, or other liquid under pressure to the chambers 64 beneath the pistons 63 thereby compelling the latter to rise. In actual use the pressure employed is such that the upward thrust on the under side of each of these pistons is approximately five hundred tons. In order to permit the tables and pistons to descend due to their own weight and the influence of the pair of jacks, the operator closes valve 184 and opens valve 187 which allows the liquid in the chambers to escape through the discharge pipe 186.

It is desirable to operate the two sets of ejector plungers automatically and to control their actuation by the reciprocation of table 53, and for this purpose I attach to the table a bracket 188 (Figs. 18 and 19) which has laterally extended arms 189 and 190 at its top and bottom, respectively. Positioned between the arms 189 and 190 is a stationary duplex valve characterized as a whole by 191. This valve at its center has a chamber 192 which connects with the air line 149 by a pipe or tube 193. Each end of this double valve is substantially like the single valve shown in Fig. 21, the duplex valve having two reduced or shouldered valve stems 194 and 195 which are adapted to reciprocate respectively in the longitudinal apertured casings 196 and 197. At its outer end each of these valve stems is provided with a nut, 198 and 199, respectively, and between these nuts and the adjacent ends of the valve casing are interposed compression springs 200 and 201 which normally tend to close the valves 202 and 203 in the inner ends of the valve stems against their seats 204 and 205. The apertures of valve casings 196 and 197 communicate by means of pipes 206 and 207 with the bottom and top portions of the ejector piston casings 107 which surround the pistons 108, carrying at their lower ends the two groups of ejector plungers 111. Each valve casing 196 and 197 is also provided with lateral channels 208 and 209 which form a connection between the interiors of the casings and the outer air, the opening and closing of these channels being controlled by the valve stems 194 and 195, as in the previous instance. It will be apparent that when either valve is open connection is established between pipe 193 and pipe 206 or 207, and that when the valve is closed there is a connection between pipe 206 or 207 and the external atmosphere through the series of channels 208 or 209.

Let it be assumed that the two tables 53 and 68 have descended, the operator having closed valves 184 and opened valve 187; that bracket arm 189 is maintaining valve 202 open so that air passes from the air line 149 through pipe 193, valve 202 and pipe 206 to the under surfaces of pistons 108 whereby the ejector plungers are raised to their upward limit of movement; that valve 203 is maintained closed by its spring 201, bracket arm 190 having receded sufficiently to allow spring 201 to become operative, thereby permitting discharge of the air above pistons 108 through pipe 207,

and channels 209; that valve 171 is open forming communication from pipe 163 to pipe 161, whereby the admitted air has forced piston 158 of the valve controller to the left (Fig. 18); that air has been admitted through pipes 150 and 148 and valve 152 to the right hand end of the air engine chamber 146, the air on the opposite side of the piston 148ª being discharged through pipe 147, valve 151, and pipes 153 and 154; that the upper mold table 68 has been rotated one-sixth of a turn by the engine or motor 146, bringing new groups of molds into filling, compressing, and ejecting positions; that bracket 177 on the engine cross-head 175 has shifted valve 179 to admit air to the pistons 115 of the locking bolts 116 through pipes 181 and 182 and the latter's branches; and that shafts 128 and 144 are down, the former being rotated through friction pulleys 131 and 132 of which the latter is driven by pulley 134 and shaft 133, whereby both belts 124 are conveying away in the same direction the cakes or biscuits discharged thereon. The operator then closes valve 187 and opens valve 184 admitting oil, water, or other liquid under considerable pressure to the pair of piston chambers 64 whereupon the pistons 63 and both tables 53 and 68 rise, flanges 61 and 62 abutting and jacks 119 urging the tables downwardly continuously, their action, however, being completely overcome by the powerful pistons 63. As the tables ascend shafts 128 and 144 together with their pulleys or drums and belts rise, their bearings sliding in guides in supports 130 and 145, due to the action of chains 143 co-operating with sheaves 139 and 141, whose ends are fastened to table 53 and indirectly to the shafts. Friction pulleys or drums 131 and 132 are consequently separated and the belts come to a stand-still ready to receive on their upper faces the discharged cakes. Continued upward movement of the tables causes the compression plungers 104 to enter the apertures of two diametrically opposite groups of molds, such as 70 and 73 (Fig. 12) whereby their contents which were previously fed in by hand are subjected to great compression. During the rise of the tables bracket arm 190 which also ascends engages the valve stem 195, pushing it upwardly in opposition to the action of its spring 201. When valve 203 leaves its seat 205 compressed air passes through pipes 193 and 207 to the tops of pistons 108. At the same time bracket arm 189 has risen sufficiently to permit valve 202 to close under the influence of its spring 200 thereby allowing the air beneath pistons 108 to escape through pipe 206 and the discharge channels 208. This control of the air supply and exhaust causes the ejector plungers 111 to descend and enter the molds of groups 71 and 74, whose contents were compressed on the previous rise of the tables, discharging their compacted cakes or biscuits through apertures 59 on to the stationary belts 124.

Upon sufficient ascent of the two tables, valve 171 closes, being thrust closed by its spring 165 which is no longer held compressed by table 53. The air in chamber 159 is then allowed to exhaust into the atmosphere through pipe 161, chamber 168 of valve 162 and channels 173 whereupon spring 160 pushes piston 158 to the right (Fig. 18), shifting the position of the engine valves 151 and 152 to admit air to the left hand part of engine casing 146 and connecting the right hand end to discharge pipe 154. Under the influence of the air admitted, piston 148ª travels to the right, turning arm 83 through link 85, and landing catch or pawl 86 in a new notch 79 of ratchet ring 78, table 68, however, partaking of no rotary movement. This forward travel of cross-head 175 allows valve 179 to close and permits the escape of the air in locking chambers 114 to the outer air through pipe 182 and the discharge channels of valve casing 180. Locking rods 116 under the action of their springs 117 descend to inoperative position, the compression and ejector plungers now maintaining the tables in proper registration.

After the tables have traveled upwardly their full extent, the operator closes valve 184 and opens valve 187, thereby permitting the descent of the tables which are aided in their downward movement by jacks 119. When bracket arm 189 pushes down valve 202 and the bracket arm 190 recedes from valve stem 195, valve 202 opens and valve 203 closes, whereupon the compressed air rushing in under pistons 108 thrusts them upwardly and raises the ejector plungers 111, the discharge taking place through pipe 207 and channels 209. When the two tables have descended sufficiently to remove the compression and ejector plungers from the molds, table 53 presses down valve stem 164, thereby opening valve 171. Air under pressure can then pass through pipes 163 and 161 to chamber 159, where it operates piston 158 to shift valves 151 and 152 of the motor so as to traverse piston 148ª to the left (Fig. 18), which causes the rotation of mold table 68 one-sixth of a revolution, bringing the molds which were filled by hand during the rise and fall of the tables under the compressor plungers and bringing the groups of molds containing compressed cakes beneath the two sets of ejector plungers. During this rotation of mold table 68 the spring-actuated brushes 97 are operative to clean the tracks 92, while the curved brushes 95 sweep the under surfaces of the molds and discharge the crumbs through openings 59. As cross-head 175 approaches the end of its movement in this direction, it strikes valve stem 178 and opens valve 179, admitting air through pipes 181 and 182 to the locking bolt chambers 114, thrusting the bolts up to lock the two tables together in their new relation.

The descent of table 53 permits shafts 128 and 144, the drums thereof, and the belts to descend bringing the friction pulleys together, thereby causing the belts to travel and convey away the cakes deposited thereon.

Obviously many minor changes may be made in the structure illustrated and described without departure from the substance of my invention. For example, instead of filling the molds manually and actuating valves 184 and 187 by hand they might be operated automatically. Other operating means instead of compressed air or water or oil under pressure may be employed and the type of motor and its controlling mechanism may be greatly varied without sacrifice of the advantages of my invention.

I claim:

1. In a ration press, the combination of a mold support, a mold carried by said support, a compression plunger adapted to co-act with said mold to effect compression of its contents, an ejector plunger adapted to co-operate with said mold to discharge the compressed ration, means to move said support and mold longitudinally of said compression and ejector plungers during compression and discharge of the mold's contents, and means to move said

support and mold relative to said compression and ejector plungers whereby to shift said mold from alinement with said compression plunger into registration with said ejector plunger, substantially as described.

2. In a ration press, the combination of a slidable mold support, a mold carried by said support, a stationary compression plunger adapted to co-act with said mold to effect compression of its contents, an ejector plunger adapted to co-operate with said mold to discharge the compressed ration, means to slide said support longitudinally of said plungers, and means to move said support to shift said mold from alinement with said compression plunger into registration with said ejector plunger, substantially as described.

3. In a ration press, a slidable mold support, one or more hydraulic pistons to slide said support, a mold carried by said support, a stationary compression plunger adapted to enter said mold to effect compression of its contents, a reciprocating ejector plunger adapted to discharge the compressed ration from said mold, means to reciprocate said ejector plunger, a controller for said means governed by the movements of said mold support, and means to move said support to shift said mold from alinement with said compression plunger into registration with said ejector plunger, substantially as described.

4. In a ration press, the combination of a slidable and rotary mold support, a mold carried by said support, means to slide said support during compression, a compression plunger adapted to enter said mold to effect compression of its contents, a reciprocating ejector plunger adapted to discharge the compressed ration from said mold, means to reciprocate said ejector plunger, and means to rotate said support to shift said mold from alinement with said compression plunger into registration with said ejector plunger, substantially as described.

5. In a ration press, the combination of a mold having a mold chamber extended therethrough, a temporary closure for one end of said chamber, a compression plunger adapted to enter the other end of said chamber to effect compression of its contents, means to slide said mold relative to said plunger during compression, and means to discharge the compressed ration from the said chamber, substantially as described.

6. In a ration press, the combination of a mold having a mold chamber extended therethrough, a temporary closure for one end of said chamber, a compression plunger adapted to enter said mold to effect compression of its contents, means to slide said mold relative to said plunger during compression, a traveling conveyer, means to discharge the compressed ration onto said conveyer, and means to bring said conveyer to a stand-still while receiving said ration, substantially as described.

7. In a ration press, the combination of a mold having a mold chamber extended therethrough, a temporary closure for one end of said chamber, a compression plunger adapted to enter the other end of said chamber to effect compression of its contents, means to slide said mold relative to said plunger during compression, a traveling conveyer, means to discharge the compressed ration from one end of said chamber onto said conveyer, and means to bring said conveyer to a stand-still while receiving said ration, substantially as described.

8. In a ration press, the combination of a mold support, a mold carried by said support, a plunger adapted to enter said mold to effect compression of its contents, means to move said support and mold toward said plunger during compression, and means to cause a separating pressure on said support in opposition to said moving means, substantially as described.

9. In a ration press, the combination of a mold support, a mold carried by said support, a plunger adapted to enter said mold to effect compression of its contents, one or more hydraulic pistons to move said support and mold toward said plunger, and one or more hydraulic jacks pressing upon said support in opposition to the action of said piston or pistons during the movement of said support, substantially as described.

10. In a ration press, the combination of a mold support capable of sliding and rotary movement, a mold carried by said support, a stationary plunger adapted to enter said mold to effect compression of its contents, one or more fluid-actuated pistons to move said support and mold toward said plunger, an ejector plunger, means to rotate said support to bring said mold from alinement with said stationary plunger into registration with said ejector plunger, and one or more fluid-operated jacks pressing on said support in opposition to the action of said pistons during the greater portion of the sliding movement of said support, substantially as described.

11. In a ration press, the combination of a table adapted to slide, a mold support thereon capable of sliding and rotary movement, a mold carried by said support, a compression plunger adapted to enter said mold to compress its contents, means to slide said table, support and mold, an ejector plunger, means to rotate said support to shift said mold from alinement with said compression plunger into registration with said ejector plunger, and locking means to prevent relative rotary movement of said table and support during their joint sliding movement, substantially as described.

12. In a ration press, the combination of a table adapted to slide, a mold support thereon capable of sliding and rotary movement, a mold carried by said support, a compression plunger adapted to enter said mold to compress its contents, means to slide said table, support and mold, an ejector plunger, a motor to rotate said support to shift said mold from alinement with said compression plunger into registration with said ejector plunger, one or more fluid-actuated locks to prevent relative rotary movement of said table and support during their joint sliding motion, and means operated by said motor to control the actuation of said lock or locks, substatially as described.

13. In a ration press, the combination of a table adapted to slide, a mold support thereon capable of sliding and rotary movement, a mold carried by and extending through said support to the surface thereof adjacent to said table, a spring-pressed track mounted on said table and thrust against the adjacent surface of said mold, a compression plunger adapted to enter said mold to compress its contents, means to simultaneously slide said table, support and mold toward said plunger, an ejector plunger, and means to rotate said support to shift said mold from alinement with said compression plunger into registration with said ejector plunger, substantially as described.

14. In a ration press, the combination of a table, a rotary mold support, an open-ended mold carried by said support, a track on said table adapted to co-operate with one end of said mold, and a brush on said support adapted to sweep said track as said support rotates, substantially as described.

15. In a ration press, the combination of a table, a rotary mold support, an open-ended mold carried by said support, a spring-pressed track on said table adapted to close one end of said mold, and a spring-pressed brush on said support adapted to sweep said track as said support rotates, substantially as described.

16. In a ration press, the combination of a table having an aperture, a movable mold support thereon, a mold carried by said support, and a brush secured to said table adjacent to the margin of said aperture and adapted to sweep over one end of said mold and discharge the crumbs through said aperture, substantially as described.

17. In a ration press, the combination of a table having an aperture, a reciprocatory mold support mounted thereon, a mold carried by said support, means for compressing the ration in said mold, means for ejecting the compressed ration from said mold and discharging it through said aperture, and means to move said support to bring said mold successively into filling, compressing and ejecting position, substantially as described.

18. In a ration press, the combination of a rotary mold support, a plurality of groups of molds carried by said support, means to compress the contents of one of said group of molds, means to slide said support and molds during compression, means to eject the compressed rations from another group of said molds simultaneously with said compressing operation, and means to rotate said support step by step to bring said groups of molds successively into filling, compressing and ejecting position, substantially as described.

19. In a ration press, the combination of a mold, means to effect a compression of the contents of said mold, means

to discharge the compressed ration, a traveling conveyer upon which the ration is discharged, and means for moving said conveyer toward said mold during the discharging operation.

20. In a ration press, the combination of a mold having a mold chamber extended therethrough, a temporary closure for one end of said chamber, a compression plunger adapted to enter the other end of said chamber to effect a compression of its contents, means to slide said mold and plunger relative to one another, a traveling conveyer, means to discharge the compressed ration onto said conveyer, and means to move said conveyer toward said mold during the discharging operation.

21. In a ration press, the combination of a mold, means to effect a compression of the contents of said mold, means to discharge the compressed ration, a traveling conveyer upon which said ration is discharged, and means to stop the conveying travel of said conveyer and to move the same toward said mold during the discharging operation.

22. In a ration or similar press, the combination of a compression plunger, a mold in which said plunger is adapted to enter to perform the compression of the mold's contents, and means to slide said mold toward said plunger during compression and from said plunger whereby the latter is inserted in and withdrawn from the mold, substantially as described.

23. In a ration or similar press, the combination of an ejector plunger, a mold in which said plunger is adapted to enter to discharge the mold's contents, and means to slide said mold toward said plunger during ejection and from said plunger whereby the latter is inserted in and withdrawn from the mold, substantially as described.

24. In a ration or similar press, the combination of a reciprocatory ejector plunger, a mold in which said plunger is adapted to enter to discharge the mold's contents, and means to slide said mold toward said plunger during ejection and from said plunger whereby the latter is inserted in and withdrawn from the mold, substantially as described.

25. In a ration or similar press, the combination of a table, a movable mold support, an open-ended mold carried by said support, and a track on said table adapted to cooperate with one end of said mold to close the same, substantially as described.

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Witnesses:
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