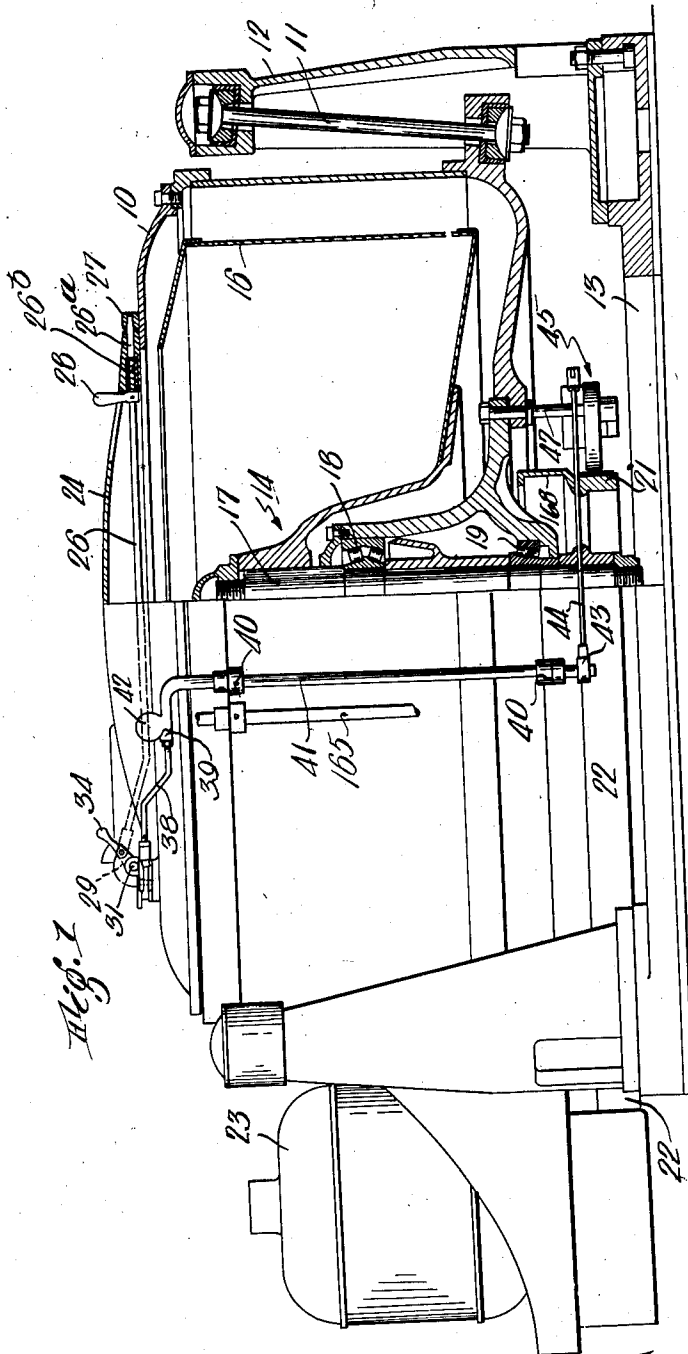
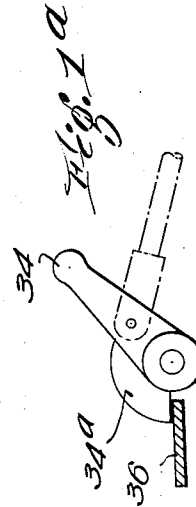


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F. I. WILLIAMS
CENTRIFUGAL APPARATUS
Filed Aug. 19, 1930

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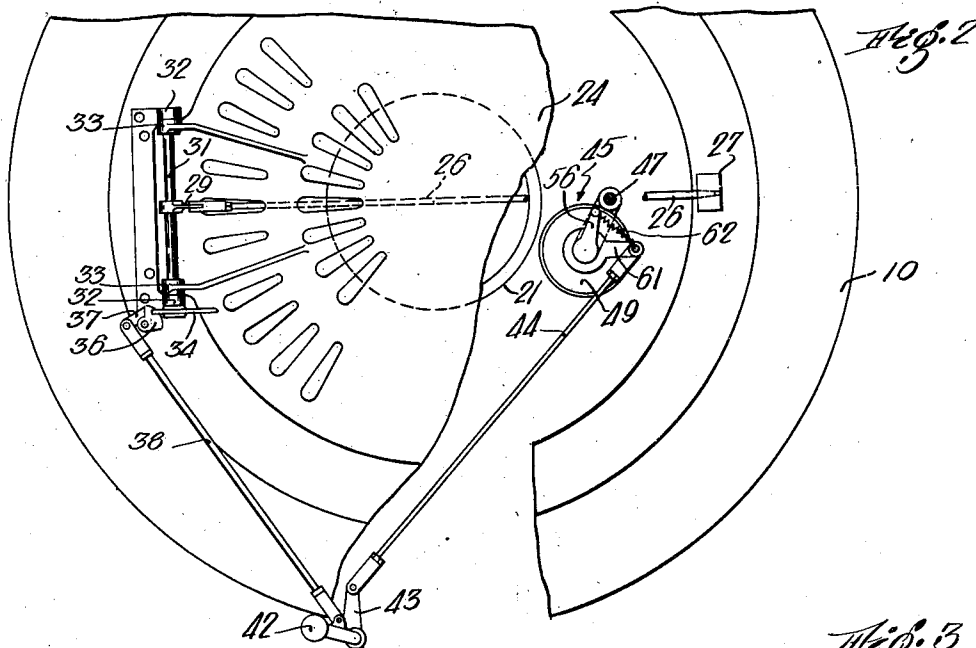
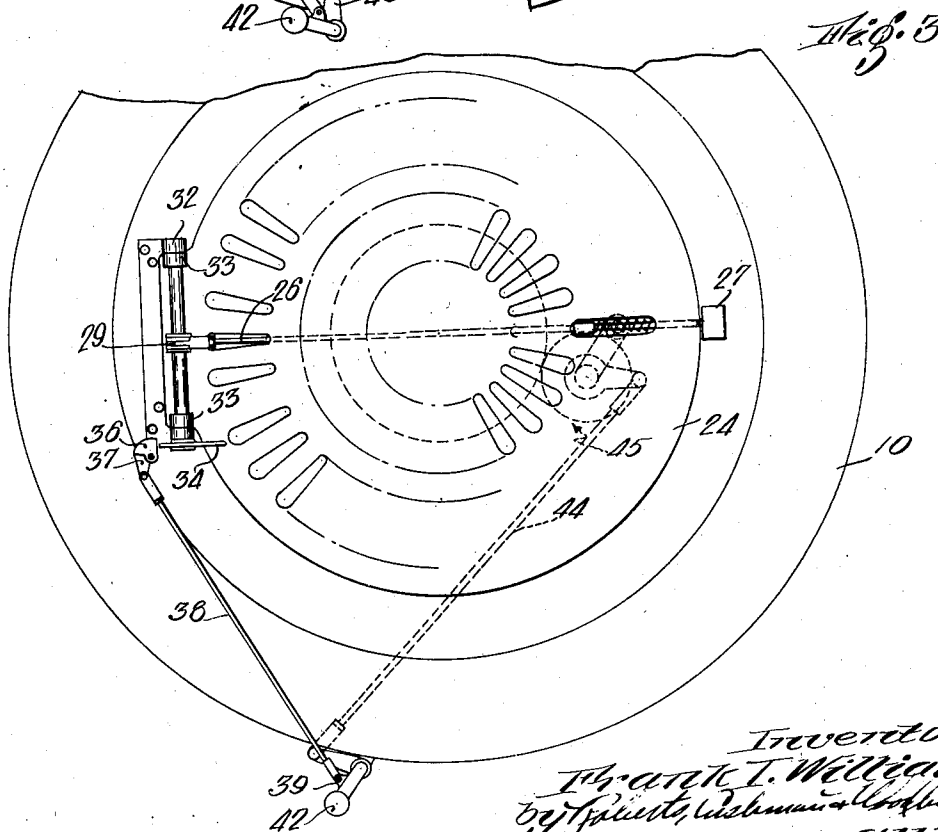
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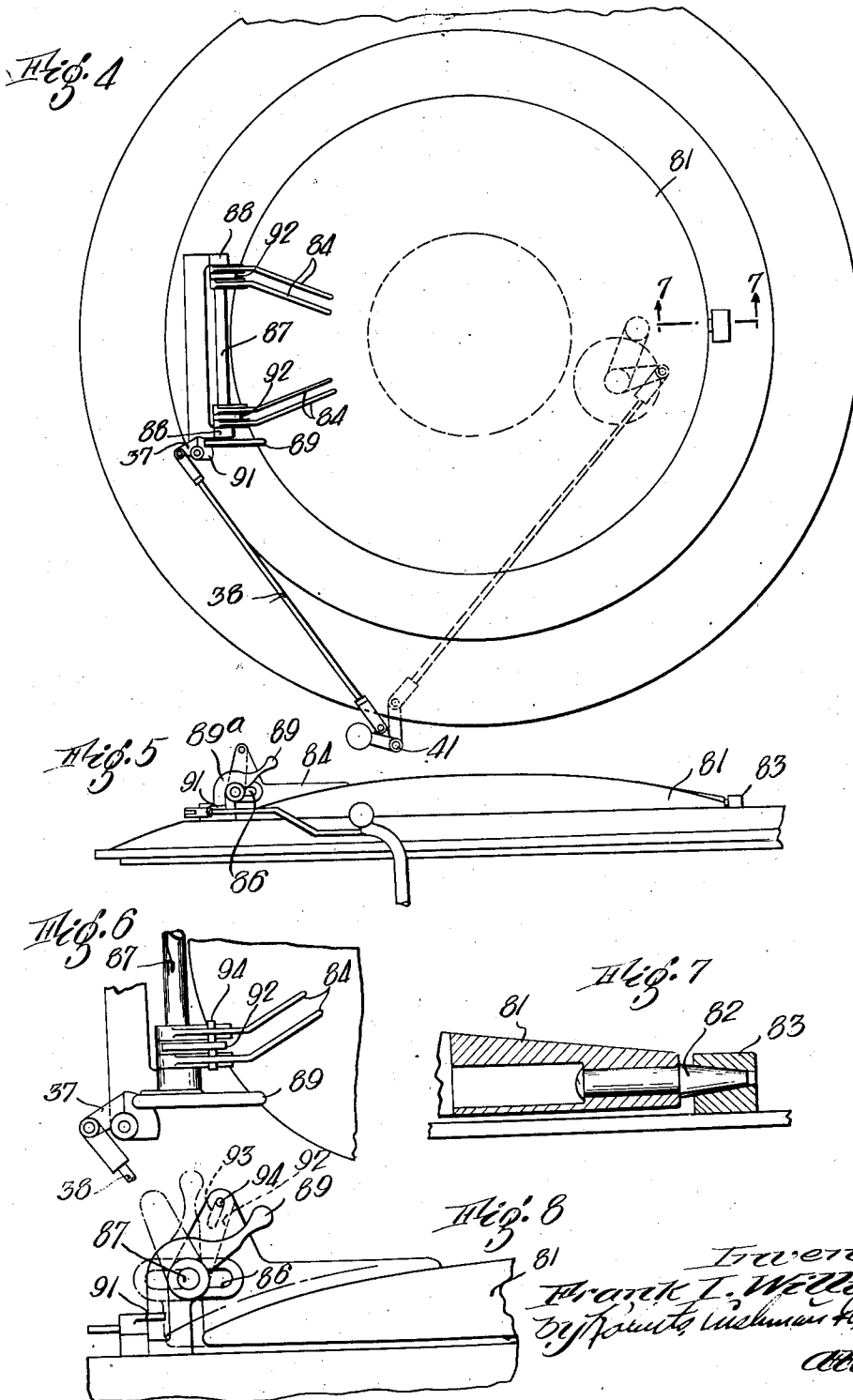
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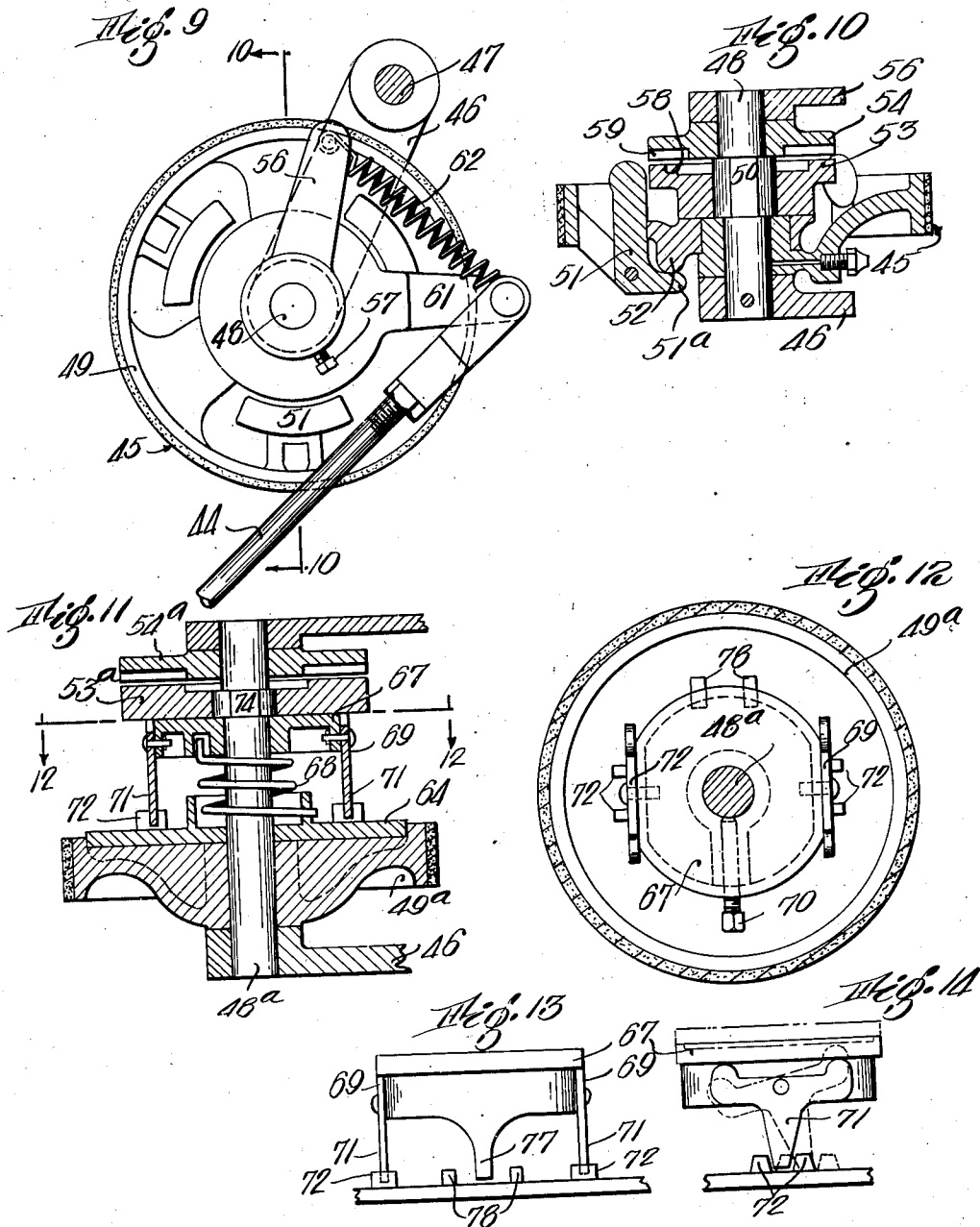
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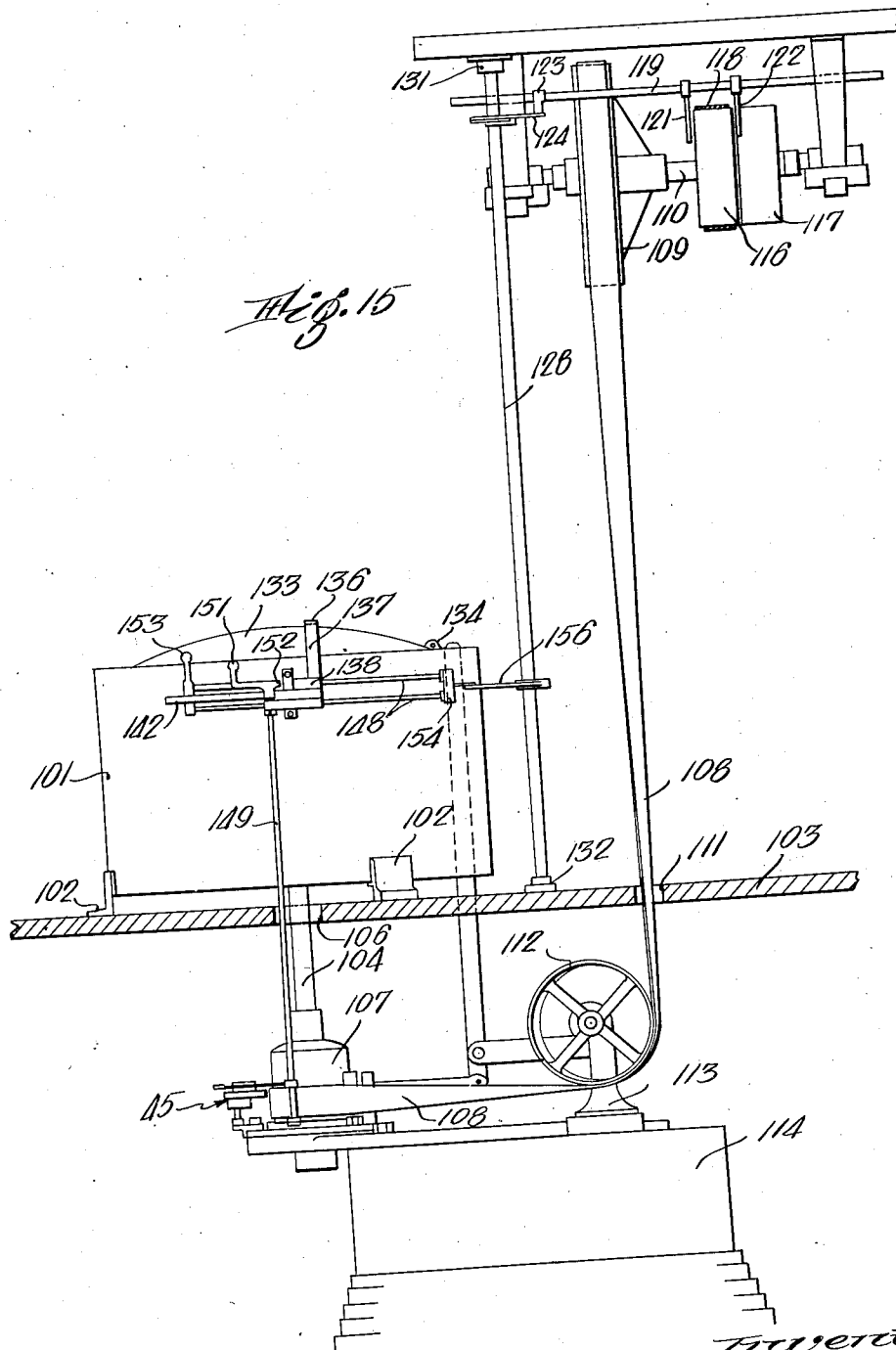
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8 Sheets-Sheet 5



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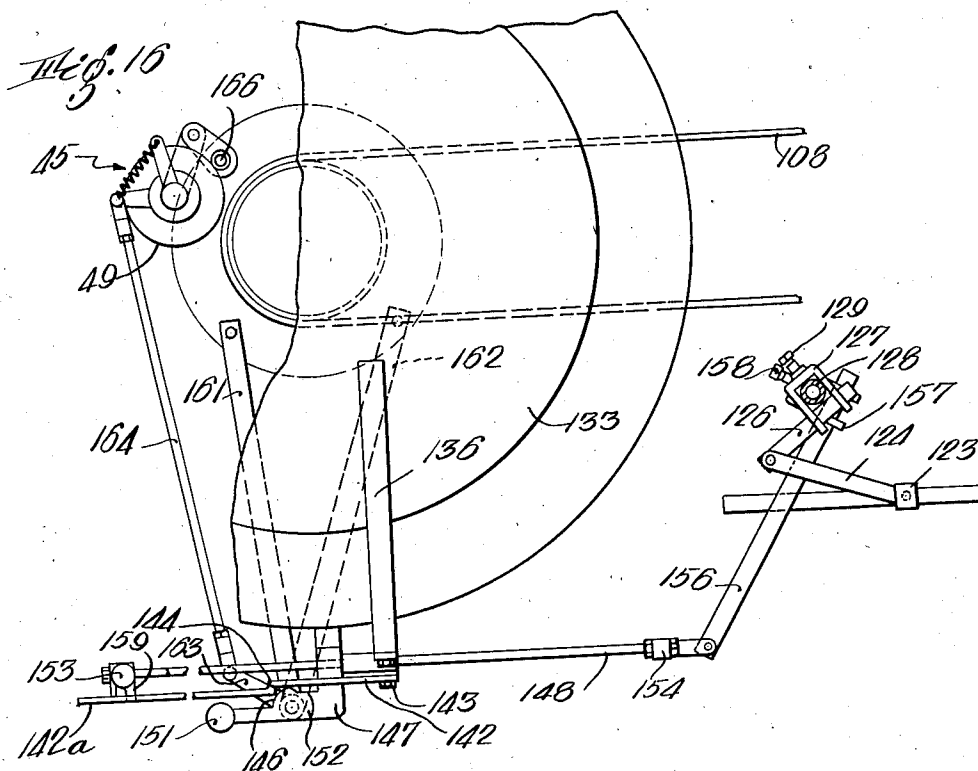
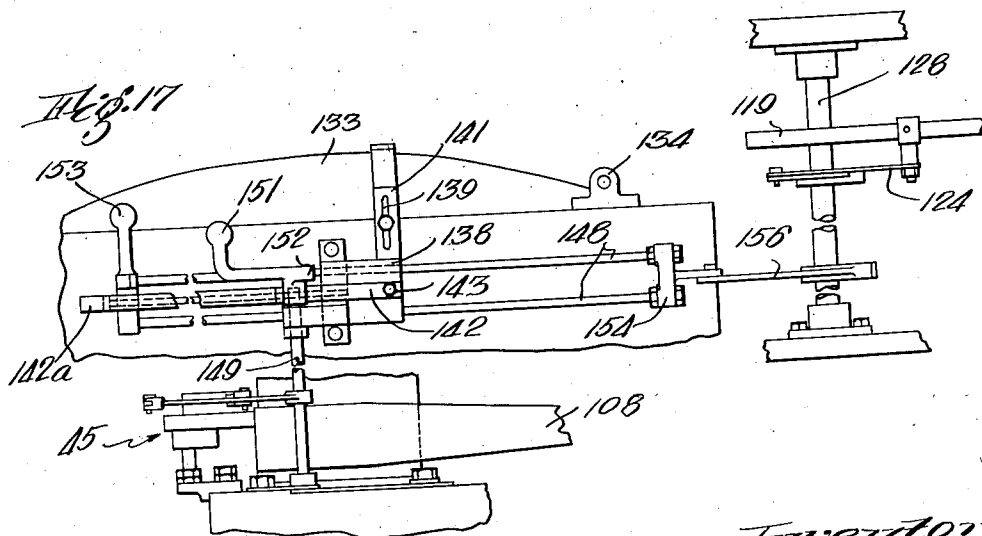
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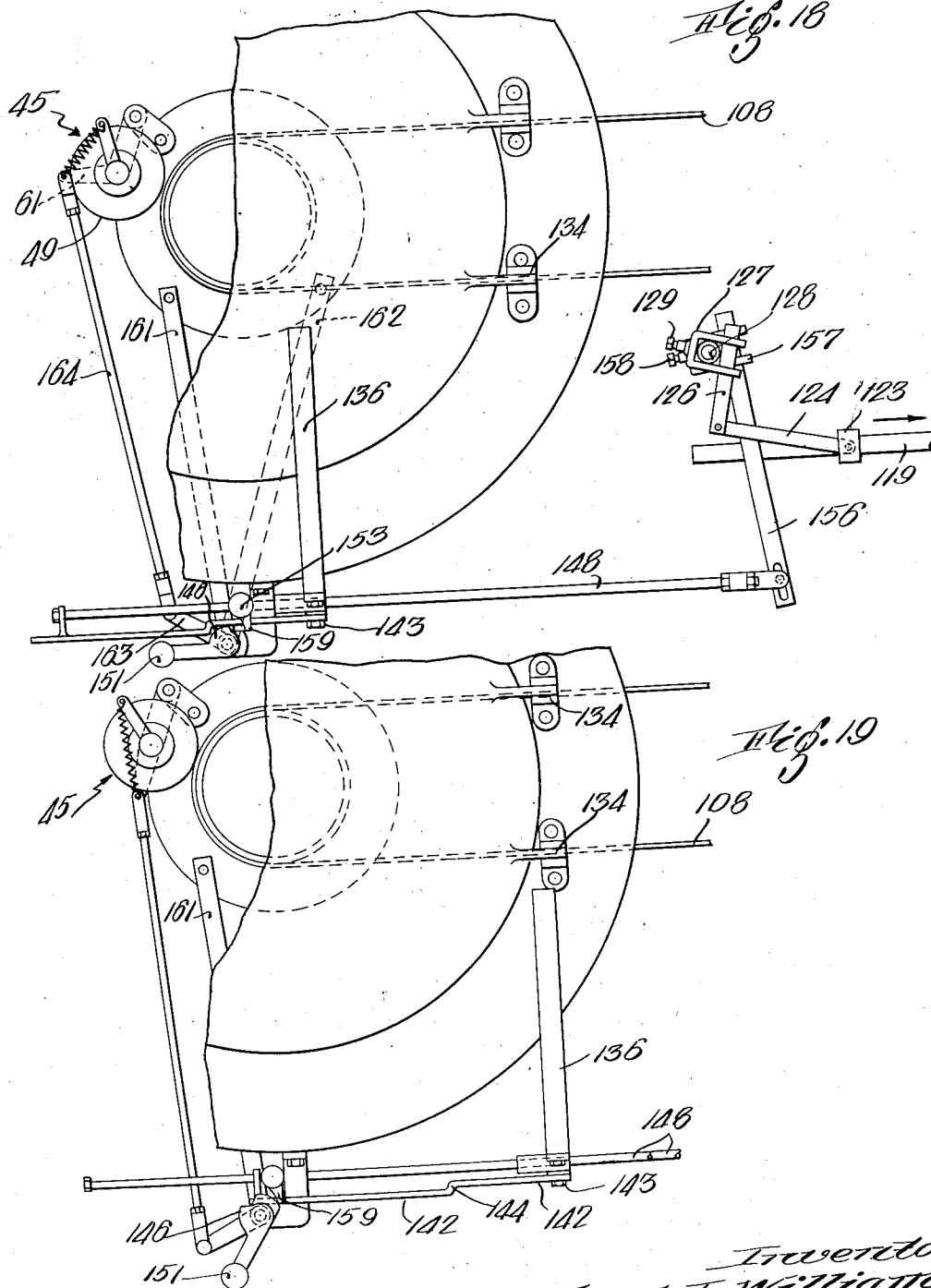
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CENTRIFUGAL APPARATUS
Filed Aug. 19, 1930

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8 Sheets-Sheet 7



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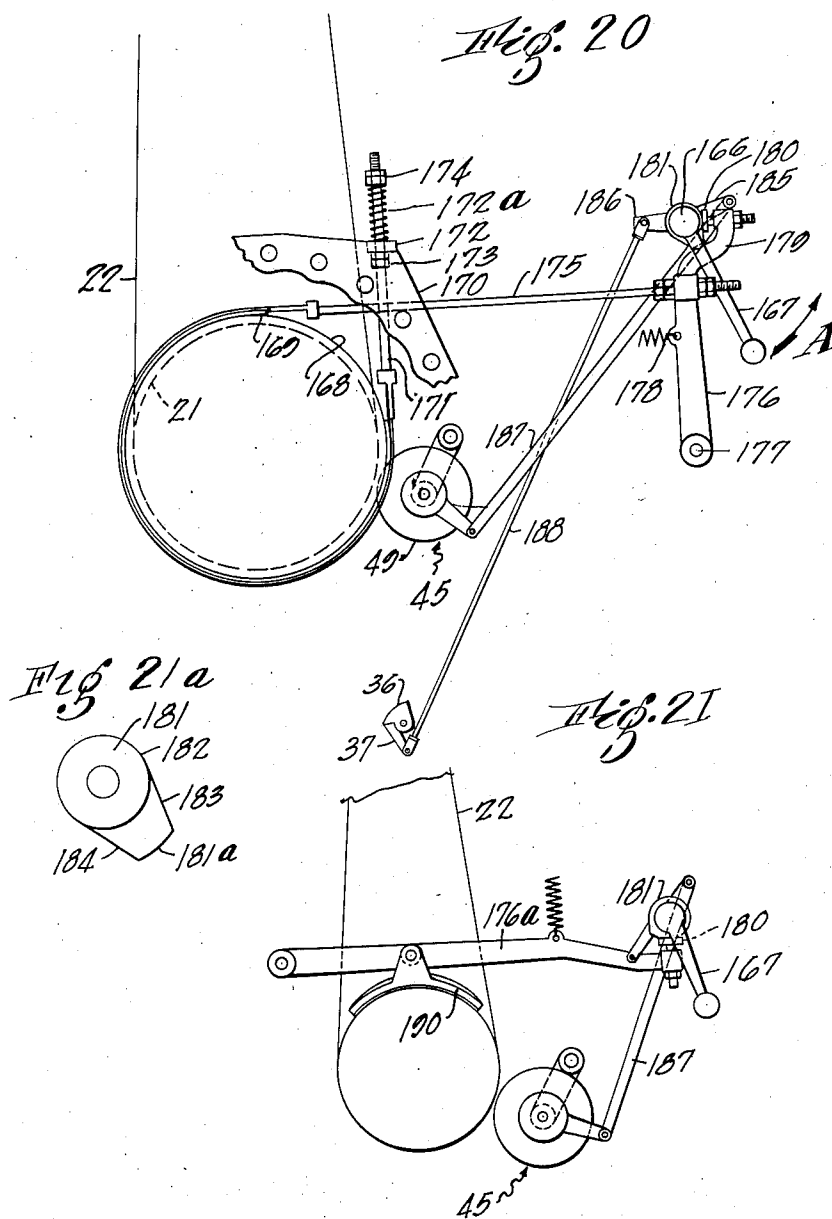
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1,991,874

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8 Sheets-Sheet 8



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UNITED STATES PATENT OFFICE

1,991,874

CENTRIFUGAL APPARATUS

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Application August 19, 1930, Serial No. 476,283

24 Claims. (Cl. 192—136)

This invention relates to machines such as centrifugal hydro-extractors and like apparatus having a closure member which must be kept closed while the machine is in operation in order to prevent injury to the operator or for other reasons. In a well-known type of centrifugal extractor a rotary basket is enclosed in a stationary housing or curb member which is equipped with a guard or cover at its top to afford access to the inner rotary container or basket. Interests of safety, economy, and efficiency of operation are best served if this cover or closure member be kept closed at all times except when the rotary container is at rest.

Accordingly it is one of the principal objects of the present invention to provide for locking such a closure member in closed position at all times while the machine is in operation, thereby to assure that operators will not expose themselves to unnecessary hazards, and that the apparatus will function in its intended manner to best advantage. Other objects are to provide apparatus for these purposes which is relatively simple and yet positive and thoroughly dependable in operation; and also to provide apparatus of this kind having an improved construction and arrangement of parts.

In accordance with the present invention apparatus of this general character may be equipped with some releasable retaining means, such as a latch, for holding a cover in closed position, and connections may be interposed between such releasable means and a control device adapted to be operated by an element which partakes of the rotary movement of the basket. While this control device may assume different forms, it preferably comprises a rotatable part adapted to be driven either directly from or with the rotary member, and to be effective so long as the basket rotates, to prevent withdrawal of the retaining member and thereby to assure that the door or cover will not be removed while the rotary member is in motion. When the basket is not in motion, the control device is not operated and the retaining member may be readily withdrawn and the cover opened. Although the control device may be arranged to be driven continuously while the machine is in operation, it is preferred that this control device remain normally idle and that means be provided for setting it in motion (if the basket is rotating) whenever an attempt is made to initiate withdrawal of the retaining member. In this way, removal of the cover is effectively prevented while the machine is in motion and yet the control apparatus op-

erates only when an attempt is being made to open the cover. This arrangement saves the control mechanism from all unnecessary wear and greatly prolongs the life of the operating parts while at the same time the control device is always ready instantly to lock the various parts and thus to prevent premature removal of the cover.

The invention is adapted for use with machines equipped with an individual motor drive as well as with machines which receive power from a main shaft and which are controlled by shifting a belt, and also provides means for controlling the application of power to machines of the latter type. Furthermore, the features of the invention may be embodied in a machine during the manufacture thereof or apparatus including these features may be supplied as a separate unit adapted to be applied to machines now in service.

In the drawings:

Fig. 1 is a side view, partly in side elevation and partly in section, of a centrifugal hydro-extractor;

Fig. 1^a is a fragmentary detail showing part of the cover latching devices;

Fig. 2 is a top plan view, with parts broken away, showing a portion of the apparatus disclosed in Fig. 1;

Fig. 3 is a top plan view similar to Fig. 2, but showing movable parts in different relative positions;

Fig. 4 is a top plan view of apparatus similar to that shown in Fig. 1, showing a modified form of cover operating apparatus;

Fig. 5 is a detail side elevational view of the cover shown in Fig. 4 and some of the parts associated therewith;

Fig. 6 is a fragmentary top plan view showing some of the parts illustrated in Figs. 4 and 5;

Fig. 7 is a detail section, to larger scale, taken substantially on the line 7—7 of Fig. 4;

Fig. 8 is a fragmentary side elevation illustrating the operation of the apparatus shown in Figs. 4, 5 and 6;

Fig. 9 is a top plan view of one embodiment of my control device;

Fig. 10 is a section taken substantially on the line 10—10 of Fig. 9;

Fig. 11 is a sectional elevation of a modified form of control device;

Fig. 12 is a section taken substantially along the line 12—12 of Fig. 11;

Figs. 13 and 14 are side elevations showing portions of the apparatus shown in Figs. 11 and 12;

Fig. 15 is a side elevation showing a different

embodiment of the invention as applied to a centrifugal machine equipped with an overhead belt drive;

Fig. 16 is a fragmentary top plan view of the centrifugal machine and cover control apparatus shown in Fig. 15;

Fig. 17 is a fragmentary side elevation of the apparatus as shown in Fig. 16;

Figs. 18 and 19 are views similar to Fig. 16 but showing the movable parts in different relative positions;

Figs. 20 and 21 are diagrammatic fragmentary plan views illustrating simple arrangements in which the machine brake is actuated by the same handle which controls the carrier locking means; and

Fig. 21^a is a detail view illustrating a brake actuating cam.

The invention as illustrated in the drawings is embodied in a centrifugal hydro-extractor comprising the exterior housing or curb member 10 which is suspended by means of the pivotal links 11 from the pedestals 12, the latter being mounted upon the bed plate 13. The housing encloses a rotary member or basket 16 which may or may not have a perforated outer wall as desired, and a central, more or less conical hub 14 which is fast on the vertically disposed shaft 17, the latter being rotatably supported in bearings 18, 19 carried by the curb member. At its lower end the shaft 17 has fixed thereto a pulley 21 which transmits power delivered by the driving belt 22 from the driving motor 23 to the shaft 17 for effecting rotation of the basket.

The curb member 10 has an opening in its top wall for affording access to the basket member 16, and this opening is closed by a removable closure member, guard, or cover 24. A rod 26 extends transversely across the cover at the under side of the latter, and at one end is provided with a conical end portion or locking pin 26^a, which engages a complementary recess or socket in a bracket 27 fixed to the curb member. A spring 26^b tends to retract the pin 26^a so as to avoid damage in closing the cover, and the rod 26 carries an operating handle 28 for engaging the locking pin 26^a with the recess in the bracket 27, or for use in retracting the pin if the spring fails to act.

The other end of the rod 26 is pivotally connected to an arm 29 (Fig. 2) which is fast on a shaft 31. This shaft is rotatably mounted in bearings 32 carried by the curb member and constitutes a hinge pin which is received in eyes 33 on the cover so as to provide a hinged connection between the cover and the curb member. The shaft 31 also carries at one end a lever 34. This lever has an arm 34^a constituting an abutment and provided with an under surface which, when the cover is closed, is substantially horizontal, and overlies a pivotally mounted segmental latch or retaining member 36. So long as the latch underlies the arm 34^a it is impossible to swing the lever 34 or to turn shaft 31, and thus the latch pin 26^a can not be released from the socket in bracket 27. To open the cover it is necessary therefore to swing the latch 36 out from under the lever arm 34^a so that the latter may be swung in a counterclockwise direction as viewed in Fig. 1.

To facilitate withdrawal of the latch 36, the latter is provided with an arm 37 pivotally connected to a link 38, the other end of which is pivotally connected to a crank arm 39 carried by the vertically disposed shaft 41 (Fig. 1) support-

ed in bearings 40 on the curb member. This shaft is provided at its upper end with an operating handle 42 and at its lower end with a crank 43 (Fig. 1) which is pivotally connected to a link 44.

To prevent actuation of the handle 42 to retract the latch 36 while the basket is rotating, the other end of the link 44 is connected to a control device, indicated generally at 45.

As shown in Figs. 9 and 10, this control device is mounted upon a movable frame or supporting arm 46 which is mounted to pivot on a stud 47 (Fig. 1) depending from the lower side of the curb member. A vertically disposed shaft 48 (Fig. 10) is fixedly connected to the supporting arm 46 and carries a rotatable part comprising the loose pulley 49 preferably provided with a friction band on its rim. This pulley is disposed in substantially the same horizontal plane as the basket driving pulley 21 and is normally spaced therefrom; by swinging the arm 46 the pulley 49 may be caused to engage the belt which drives pulley 21 and is thereby caused to rotate at high speed. The pulley 49 carries a plurality of bell crank levers 51 (three being shown) which are pivotally mounted to swing outwardly under the action of centrifugal force. The lower ends of these levers have inwardly directed toes 51^a which engage a slidable collar 52 which is mounted upon the rotatable part 49. Just above the slidable collar 52, the non-rotatable shaft 48 is enlarged and has an axially slidable abutment member 53 keyed thereon. The uppermost portion of the shaft is somewhat smaller than the intermediate enlarged portion and carries another abutment member 54 which is free to rotate on the shaft 48 and is provided with a radial arm 61. Another radial arm 56 is fixed on the shaft 48 by means of a set screw 57.

The juxtaposed abutment members 53 and 54 carry opposed interengageable projections or teeth 58 and 59 respectively. The arm 61 (Fig. 9) is preferably integral with the abutment member 54, and the link 44 is connected to the outer end of this arm. A spring 62 connects the arms 56 and 61 and tends to keep them in the relative position shown in Fig. 9.

The modified form of control device shown in Figs. 11 and 12 is similar in many respects to the one just described, comprising a pulley 49^a mounted to turn freely on a shaft 48^a fixed to the arm 46. The pulley 49^a carries a friction plate 64 on its upper surface. The shaft 48^a is provided, near its upper end with a fixed but adjustable collar 67 (Figs. 13 and 14). A coil spring 68 embraces the shaft 48^a between the collar 67 and the friction plate 64. The collar 67 is fixed in position on the shaft 48^a by means of a set screw 70. This collar carries depending pivotally mounted lifting dogs 69 which have depending arms 71 normally disposed between spaced lugs 72 on the upper surface of the friction plate 64. Each dog 69 has spaced upwardly extending ears disposed at opposite sides of its pivot, both ears normally engaging the under surface of an abutment member 53^a which is slidably mounted on the shaft 48^a and kept from turning by means of key 74. Whenever one of the dogs 69 is tilted in either direction, it will lift the abutment member 53^a, carrying its teeth or projections into engagement with those of the upper abutment member 54^a, these abutment members being similar to the members 53 and 54 of Fig. 9.

Preferably the dogs 69 are disposed approximately 180° apart and midway between these members the collar 67 is provided with rigid depending legs 77 (Fig. 13) which are adapted normally to be disposed between the lugs 78 carried by the upper surface of the friction plate.

A modified form of cover locking apparatus is shown in Figs. 4 to 8, the cover 81 (Fig. 7) in this instance being provided with a fixed latch pin 82 having a conical end which is received in the complementary socket formed in the juxtaposed bracket 83 carried by the curb member. At its opposite edge the cover 81 is provided with spaced pairs of webs 84 which are provided with aligned elongate slots 86 (Fig. 8). A hinge pin 87 is rotatably mounted in these slots and in bearings 88 carried by the curb member. An operating lever 89 is fixedly mounted upon the outer end of the rotatable shaft 87, said lever having an arm 89^a (Fig. 5) adapted to overlies a segmental latch member 91 which is similar in all respects to the latch member 36 shown in Fig. 2 and which is connected in the same manner through the arm 37 and the link 38 to the operating shaft 41. Between each pair of webs 84, an arm 92 (Fig. 6) is fixedly mounted on the shaft 87. The end of this arm is slotted, as indicated at 93 (Fig. 8), slidably to receive a pin 94 by which the arm is connected to the adjacent webs 84.

Referring to the construction shown in Figs. 1, 2, 3, 9 and 10, it is necessary, in order to remove the cover, to turn the operating handle 42 in a counterclockwise direction, as viewed in Fig. 2. Such motion of the handle, if permitted, will withdraw the segmental latch 36 from the path which the lever arm 34^a must take to permit opening of the cover. However, counterclockwise movement of the handle 42 is also transmitted through the link 44 to the arm 61 (Fig. 9) and thus to the rotatable abutment member 54 (Figs. 9 and 10). Since the contractile spring 62 resists separation of the arms 61 and 56, the first effect of swinging the arm 61 is to swing the entire control device 45 on its pivotal support 47 so as to bring the pulley 49 into engagement with the driving belt 22, thereby effecting rapid rotation of the rotatable part 49. The parts are so arranged that the rotatable part 49 is brought into engagement with the driving belt before the latch member 36 can be removed from engagement with the lever arm 34^a. As soon as the pulley 49 is set in rotation, centrifugal force is effective to cause the bell cranks 51 to swing their longer arms outwardly and thereby to cause their toes 51^a to raise the collar 52 and to effect engagement between the interengageable abutments 58 and 59 carried by the opposed abutment members 53 and 54 respectively. As the member 53 is held from rotation on the non-rotatable shaft 48 by the key 50, it will be seen that rotation of the upper abutment member 54 will be prevented whenever the interfitting abutments 58 and 59 are engaged and as the upper abutment 54 is connected through the arm 61 to the link 44, it follows that further movement of the operating handle 42 will be effectively prevented, and consequently the latch 36 can not be removed from beneath the lever 34^a.

On the other hand, when the basket, and the parts associated therewith, is not in motion, it will be seen that engagement of the pulley 49 with the driving belt 22 will not disturb the bell cranks 51 and consequently the abutment members 53 and 54 will remain in spaced relation, as

shown in Fig. 10. Under these conditions the spring 62 will yield sufficiently to permit the necessary rotation of the rotatably abutment member 54, arm 61, and operating handle 42 to permit removal of the latch 36 from the path of the lever 34^a. This having been accomplished, the arm 34 may be swung backwardly to withdraw the plunger 26 and thereby to permit opening of the cover 24.

The apparatus shown in Figs. 11 and 12 operates in the same general manner as that just described except that friction clutch means is substituted for the centrifugally operated bell cranks. Thus, on rotation of the pulley 49^a, there is a corresponding tendency for the friction plate to rotate and to carry the lugs 72 (Fig. 14) against the depending arms 71 of the dogs 69, and thereby to swing the dogs about their pivots, this motion being effective, as shown in Fig. 14, to raise the abutment member 53^a into engagement with the abutment 54^a.

The cover operating apparatus shown in Figs. 4 to 6 may be associated with either of the control devices previously described. To remove the cover 81, as shown in these latter figures, it is necessary to turn the operating handle 89 in a counter-clockwise direction, as viewed in Fig. 8, and this can be effected only after the latch 91 has been moved out of the path of movement of this lever. When this has been accomplished, movement of this lever backwardly is effective (through the rotatable shaft 87 and the fixed arms 92 carried thereby) to move the pins 94 carried by the spaced webs 84 backwardly. This movement results in arranging this mechanism in the position shown in the dotted lines in Fig. 8 from which it will be seen that the rotary hinge pin is disposed in the forward end of the slots 86. As this hinge pin is carried by fixed bearings 88, it will be evident that the movement just described results in displacing the cover 81 sufficiently to the left, as viewed in Fig. 4, to remove the latch pin 82 from the socket in the abutment 83 (Fig. 7) so that the cover may be swung about the hinge pin 87 to its open position.

In the installation shown in Figs. 15 to 19 the invention is illustrated as applied to a centrifugal machine having an overhead, belt drive. The machine illustrated comprises a curb member 101 provided with a number of pads or feet 102 by means of which it is supported upon the operating floor 103. The curb member 101 encloses a rotary basket (not shown) which is mounted upon a vertically disposed shaft 104, the latter extending downwardly through a suitable opening 106 in the floor and carrying a fixed pulley 107 disposed above the lower shaft bearing. Power for operating the machine is transmitted to the fixed pulley through the belt 108 which is trained over the fast pulley 109 on the counter shaft 110 and passes through a suitable opening 111 in the floor and around a pair of guide pulleys 112, only one of the latter pulleys being shown in Fig. 15. These guide pulleys 112 are mounted in a suitable bracket 113 which rests on a foundation structure 114. The counter shaft 110 is equipped with a fixed pulley 116 and a loose pulley 117. Power is transmitted to the counter shaft by means of a power belt 118, this belt being operated continuously and being shiftable from the loose pulley 117 to the fast pulley 116, as shown in Fig. 15, by means of the belt shipper comprising the shifter rod 119 and the spaced fingers 121 and 122 mounted upon the rod, as shown more clearly in Figs. 16, 17 and 18. The rod 119 carries a fixed collar 123

to which a link 124 is pivotally connected. The other end of this link is pivotally connected to an arm 126 which is slidable longitudinally in aligned recesses in the ends of a U-shaped bracket member 127, which embraces a vertical rotary rock-shaft 128. This U-shaped bracket is adapted to be held in fixed position on the shaft 128 by means of a set screw 129, and it will also be seen that adjustment of the set screw also locks the arm 126 in adjusted position against the shaft 128. This rock-shaft 128, which may conveniently be a length of pipe, is journaled at its upper and lower ends in suitable bearings 131 and 132.

The curb member is provided with a cover 133 which is mounted on the curb by means of the hinges 134. In order to control the opening of this cover, an elongate finger or bar 136 is arranged to extend transversely across the upper side of the cover in a position to prevent opening of the latter when the parts are arranged as shown in Figs. 15, 16 and 17. At its outer end the finger 136 carries a depending arm 137 which is adjustably held in fixed position with respect to a movable block 138 by means of a pin and slot connection 139 (Fig. 17) uniting the arm 137 and an upwardly projecting arm 141 carried by the block 138. An elongate substantially horizontal bar 142 is fixedly connected to the block 138 by a bolt 143. This bar has an offset 144 intermediate its ends providing the elongate abutment portion 142^a to cooperate with a cam 146.

A bracket 147 is mounted upon any fixed support as upon the curb member 101 and has parallel upper and lower openings therein forming bearings for a pair of sliding rods 148 which pass through similar aligned openings in and slidably support the movable block member 138. The bracket 147 extends outwardly beyond the bar 142 and provides a bearing for the upper part of the vertically disposed operating shaft 149 which carries the cam 146. A handle 151 is fixedly mounted on the upper end of the shaft 149 and this shaft also carries another cam 152 which is disposed above the cam 146 so as to be out of the path of movement of the abutment 142^a of the bar 142.

A bracket having a handle 153 unites the rods 148 at their left-hand ends as viewed in Fig. 17 and at their other ends these rods are fixedly connected to a bracket 154 which is pivotally connected to an arm 156 (Fig. 16). This arm is adjustably secured to the vertically disposed rock shaft 128 by means of a U-shaped bracket 157 and a set screw 158 in the same manner that the arm 126 is mounted upon the upper portion of the same shaft. The handle 153 also carries a fixed abutment 159 which has a flat side adapted to fit squarely against the body of the bracket 147 and an arcuate side arranged to permit the cam 152 to move behind this abutment when the latter is positioned against the bracket 147.

The lower end of the operating shaft 149 is supported in bearings carried by fixed arms 161, 162 (Figs. 16 and 18) mounted upon the foundation structure. At this lower end the shaft 149 also carries a fixed arm 163 (Fig. 16) which is pivotally connected to a link 164. This link is connected at its other end to the arm 61 of the control device 45 previously described, the control device being movably mounted upon a fixed shaft 166 carried by any stationary portion of the apparatus, preferably by the curb member.

The operation of this rotary control device is pre-

cisely the same in this relationship as in previously described embodiments of the invention, the rotatable member 49 being adapted to engage the belt 108 as the handle 151 is moved to release the cam 146 from the offset 144.

Referring to the apparatus shown in Figs. 15 to 19 and assuming that the parts are arranged as shown in Figs. 15, 16 and 17 and that the belt 118 is on the fast pulley 116, power is transmitted through the counter shaft 110, the pulley 109, belt 108, to the pulley 107 on the shaft 104 which operates the basket within the curb member 101. While power is thus being transmitted to operate the machine, the locking finger 136 is disposed across the top of the cover 133 in position to obstruct opening movement of the latter. The retaining finger 136, due to its connection with the bar 142, is held in this position by engagement of the cam 146, carried by the shaft 149 with the offset 144 of the bar 142. Due to the connection of the rotary control device 45 with the operating shaft 149, it will be seen that before the necessary movement of the handle 151 can be made to remove the cam 146 from the path of the offset 144, the control device 45 will be actuated by engagement with the driving belt 108 to lock the operating shaft 149, thereby locking the cam 146 in the path of movement of the offset 144. To remove the retaining finger 136 from its position above the cover it is necessary therefore first to move the handle 153 to the right as shown in the drawings until the abutment member 159 reaches the bracket 147. This movement of the handle 153 is transmitted through the rods 148 and the arm 156 to the rock shaft 128 and effects such rotation of the latter shaft as is required to operate the belt shifter 119 to shift the belt from the fast pulley 116 to the loose pulley 117.

The parts are shown in this position in Fig. 18. At this time the rotary control device still functions to lock the cam 146 in the path of the offset 144 as long as the driven pulley 107 is in motion and therefore locks the retaining finger 136 in position to obstruct opening movement of the cover as shown in Fig. 18 until such time as the machine has practically come to rest. When the basket no longer has any appreciable motion, the operating handle 151 may be turned in a counter-clockwise direction from the position shown in Fig. 18 to the position shown in Fig. 19. This movement of the operating handle removes the cam 146 from the path of the offset 144 so that the retaining finger 136 may be moved to the right to a position such as that shown in Fig. 19 where this finger no longer obstructs opening of the cover. Moreover, movement of the handle to the position shown in Fig. 19 brings the cam 152 behind the abutment 159 in a position to lock the latter against the bracket 147. The portion 142^a of the bars 142 at this time engages the straight side of the cam 146 so as to lock this cam and the operating handle 151 and the cam 152 in the position shown in Fig. 19 as long as the retaining finger is in a position shown in this figure. It will be seen therefore that the belt 118 can not be shifted from the loose pulley, due to the fact that the belt shifter 119 is locked by cam 152.

Before operation of the machine can be resumed, it is necessary first to close the cover and to move the retaining finger 136 to the extreme left, as shown in Figs. 15 and 16. This permits the cam 146 to move in behind the offset 144 and at the same time the cam 152 moves out of the

path of the abutment 159. At the same time that the cam 146 moves to its position to lock the retaining finger 136 in the position shown in Figs. 15 and 16, the arm 163 carried by the operating shaft 149 moves the rotary control device 45 to its inoperative position. The abutment 159 is now free to move, and by moving the handle 153 to the left to the position shown in Figs. 15 and 16 the belt may be shifted to the fast pulley and thus the machine may be set in motion.

Under certain circumstances it may be preferred to keep the rotary element 49 (or 49^a) of the control device constantly in operative engagement with the driving element, this being permissible since the device is yieldably mounted and thus not injured by the passage of belt lacings or the like, but as the constant drive of these controller parts at high speed requires great care in lubrication and involves rapid wear even under the best conditions, I prefer the arrangement above described and illustrated.

In the arrangement illustrated in Figs. 20 and 21, I provide for the actuation of the machine brake by the same handle which controls the cover locking means, thus reducing the number of parts to a minimum. Since it is often desirable, for example, to facilitate loading or unloading the basket to have the basket free to turn after the machine has stopped, I preferably employ brake actuating means which causes the brake to act only long enough to stop the basket, whereupon the brake is released, and when such an arrangement is employed, the cover locking means is so combined with the brake operating device that the cover can not be opened until the basket is definitely stopped and the brake released.

In Fig. 1 a brake actuating handle 165 is indicated in dotted lines in addition to the cover latch releasing shaft 41, but in Figs. 20 and 21 a single shaft 166, provided with a handle 167, is employed for actuating the brake shoe or band as well as the cover releasing connections. The drive pulley 21 is provided with a brake drum 168 (Figs. 1 and 20) embraced by a brake band 169 (Fig. 20) which may be supported, and confined if desired, in any suitable way, for example as disclosed in my copending application Serial No. 449,466, filed May 3, 1930, such supporting means comprising a fixed annular flange 170 concentric with the axis of the basket shaft and having a series of holes for the reception of bolts permitting the angular adjustment of the flange.

An anchor rod 171 is attached at one end to the brake band and passes through a fixed apertured abutment 172 depending from the flange 170. This rod is provided with a stop 173 to prevent excess movement of the brake rod relative to the lug 172, and a coiled spring 172^a encircles the rod, bearing at one end against the abutment 172 and at its other end against an adjustable nut 174 on the end of the rod.

The opposite end of the brake band is secured to an actuating rod 175 normally disposed substantially at right angles to the rod 171 and connected (preferably adjustably) at its end to a lever 176 adapted to swing on a fixed pin 177. A spring 178 anchored to a convenient fixed part normally tends to swing the lever 176 so as to release the brake.

The lever 176 is provided with an offset arm 179 at its free end, said arm carrying an adjustable cam follower shoe 180 adapted to engage a cam 181 on the vertical shaft 166. This cam, as more clearly shown in Fig. 21^a, comprises a concentric or dwell portion 182, active or inclined

portions 183 and 184 respectively, and a second concentric dwell or idle portion 181^a of greater radius than the part 182.

The shaft 166 also carries a fixed arm 185 corresponding to the arm 43 of Fig. 2 and a third arm 186 corresponding to the arm 39 of Fig. 1. A link 187 corresponding to the link 44 of Fig. 2 connects the arm 185 to the controller device 45 while a link 188 corresponding to link 38 of Fig. 2 connects the arm 186 to the latch operating arm 37.

In the normal position of the parts, with the machine in operation, the handle 167 is disposed substantially as shown in Fig. 20, the cam follower 180 resting upon the dwell portion 182 of the cam 181 and the rotating element 49 of the control device 45 being spaced from the drive belt 22. When the machine is to be stopped, the power is cut off in any desired manner, either before, concomitantly with, or after actuation of the brake applying handle. To apply the brake, the handle 167 is swung in the direction of the arrow A, causing the cam follower 180 to ride up the active cam surface 183 onto the dwell portion 181^a where it is held with the brake in operative position.

During this movement the arms 185 and 186 move in a counterclockwise direction, as viewed in Fig. 20, causing the links 187 and 188 to swing, but without substantial operative effect upon the control device 45 or on the latch 36.

If now it be attempted, with the brake, set to move the handle 167 further while the basket is rotating, the link 187 will be moved before the cam follower 180 leaves the dwell 181^a so as to bring the control device 45 into operation. If the basket is still turning, the control limits further movement of the handle 167 and thus prevents withdrawal of the latch 36, but when the basket has stopped, the handle 167 may be moved further to a point such as to withdraw the latch 36 and permit the cover to be opened. Substantially at the same time the cam follower 180 rides down the cam incline 184 onto the dwell 182, releasing the brake and permitting the basket to be turned freely by hand, which facilitates loading and unloading.

In Fig. 21 the parts correspond to those of Fig. 20 except that in place of a brake band 169, a brake shoe 190 is employed, said shoe being connected directly to a lever 176^a corresponding to the lever 176 of Fig. 20.

As shown in Figs. 20 and 21, the control device is moved into operation by a thrust of the link 187, instead of by a pull on the link, as in the arrangement of Fig. 2, for example, but these different arrangements are regarded as full equivalents of one another.

I claim:

1. A centrifugal apparatus comprising a curb 60 having an open top, a rotary basket within the curb, a cover for the top opening of the curb, means comprising a latch for locking the cover in closed position while the basket is rotating, a handle for releasing the latch, a latch controller 65 having a normally stationary but rotatable member and parts which become effective upon rotation of said member to prevent completion of the latch releasing movement of said handle, a driven element rotatable with said basket, said element being engageable with said rotatable member but normally held disengaged therefrom, and means actuatable upon attempted latch releasing movement of the handle to bring the rotatable member of the latch controller into engagement 75

with said driven element thereby to initiate rotation by the latter.

2. The combination with a rotary member, a housing for the rotary member, the housing having an opening for affording access to the rotary member, and a removable closure for the opening, of a rotatable part, means providing a driving connection between the rotary member and the rotatable part, releasable means for holding the closure over the opening, means effective on movement of the releasable means for effecting said driving connection, opposed members having interengageable abutments, means for supporting the opposed members for relative movement toward and from each other to effect engagement and disengagement of the interengageable abutments, connections for moving one of the opposed members with the releasable means, and means effective on rotation of the rotatable part for producing relative motion of the opposed members to cause engagement of the abutments for locking the releasable means.

3. The combination with a rotary member, a housing for the rotary member, the housing having an opening for affording access to the rotary member, and a removable closure for the opening, of a rotatable part, means providing a driving connection between the rotary member and the rotatable part for driving the latter, opposed interengageable abutment members, means for holding one of the abutment members from rotation, means responsive to rotation of the rotatable part for effecting engagement of the abutment members, releasable means for holding the closure over the opening, and means responsive to attempted release of the releasable means for effecting rotary movement of the other of the abutment members.

4. The combination with a rotary member, a housing for the rotary member, the housing having an opening for affording access to the rotary member, and a removable closure for the opening, of a non-rotatable shaft, a rotatable part on the shaft, means providing a driving connection between the rotary member and the rotatable part for driving the latter, opposed relatively movable abutment members mounted on the shaft, means effective on rotation of the rotatable part for effecting relative movement of the abutment members axially of the shaft for effecting engagement of the abutment members, means for holding one of the abutment members from rotary movement relative to the shaft, releasable means for holding the closure over the opening in the housing, and means responsive to attempted release of the releasable means for effecting rotary movement of the other of the abutment members relative to the shaft.

5. The combination with a rotary member, a housing for the rotary member, the housing having an opening for affording access to the rotary member, and a closure for the opening, of releasable means for holding the closure in closed position, a non-rotatable shaft, a rotatable part on the shaft, means for supporting the shaft for movement to a position for driving the rotatable part with the rotary member, relatively fixed and rotatable arms on the shaft, an extensible and contractible connection between the arms, means effective on movement of the releasable means for moving the relatively rotatable arm about the shaft, and means effective on rotation of the rotatable part for locking the relatively rotatable arm to the shaft.

6. The combination with a rotary member, a housing for the rotary member, the housing having an opening for affording access to the rotary member, and a closure for the opening, of releasable means for holding the closure in closed position, a non-rotatable shaft, a rotatable part on the shaft, an arm for supporting the shaft, a pivotal support on the housing for the arm, the arm being movable on this pivotal support to a position where the rotatable part may be driven with the rotary member, relatively fixed and rotatable arms on the shaft, an extensible and contractible spring connecting these arms, means effective on movement of the releasable means for moving the relatively rotatable arm about the shaft, and means effective on rotation of the rotatable part for locking the relatively rotatable arm to the shaft.

7. Control apparatus for locking cover retaining means of enclosed rotary machines while such machines are in motion, said apparatus comprising a rotatable part adapted to be driven by engagement with a driving member, a movable support for the rotatable part, a connection comprising a spring and a rigid member for transmitting initial releasing movement of the cover retaining means to the movable support for moving the latter to effect driving engagement between the rotatable part and a member driven with the machine, the spring being extensible to provide for release of the cover retaining means when the machine is not in motion, means for locking the rigid member of said connection, and means effective on rotation of the rotatable part for rendering the locking means effective.

8. Control apparatus for locking cover retaining means of enclosed rotary machines while such machines are in motion, said apparatus comprising releasable retaining means for holding the cover in closed position, means for locking the releasable retaining means, centrifugally acting means for rendering the locking means effective, and means operable while the machine is in motion and effective on attempted movement of the releasable means for actuating the centrifugally acting means.

9. In an apparatus for controlling opening of a cover for an enclosed power-driven rotary machine, the combination of a movable member for holding the cover in closed position, means for controlling the application of power to the machine, movable abutment means effective in one position to lock the power controlling means and in another position to lock the movable member, pivotally mounted rotatable means constructed and arranged to be swung into engagement with a rotary member driven with the machine, said means being effective while rotating to arrest movement of the abutment means, and means effective upon attempted movement of the latter means while the machine is running for swinging said rotatable means into engagement with said rotary member, thereby to arrest further movement of said abutment means.

10. In an apparatus for controlling opening of the cover of enclosed rotary machine, the combination of a movable member for holding the cover in closed position, movable abutment means for locking the movable member in position to obstruct opening movement of the cover, pivotally mounted rotatable means constructed and arranged to be swung into engagement with a moving part of said machine, said means being effective while rotating for interrupting movement of the abutment means, and means effective upon

attempted movement of the latter means while the machine is running for swinging said rotatable means into engagement with said moving part, thereby to arrest further movement of said latter means.

11. In an apparatus for controlling opening of a cover for an enclosed power-driven rotary machine, the combination of a movable member for holding the cover closed, means for controlling the application of power to the machine, rotary locking means constructed and arranged to control the operation of said movable member and power controlling means, said locking means comprising relatively fixed abutments, one of the abutments being effective in one position to lock the power controlling means, the other abutment being effective in another position to lock the movable member, and means for holding the abutment means in one of these positions.

12. In an apparatus for controlling opening of a cover for an enclosed power-driven rotary machine, the combination of a movable member for holding the cover closed, means for controlling the application of power to the machines, movable locking means constructed and arranged to control the operation of said movable member and power controlling means, said locking means comprising relatively fixed abutments, one of the abutments being effective in one position to lock the power controlling means, the other abutment being effective in another position to lock the movable member, rotary means engageable with a member driven with the machine and effective while in motion to hold said locking means in position to lock the power controlling means, and means effective upon movement of said locking means for effecting driving engagement between said driven member and the rotary means.

13. In an apparatus for controlling opening of the cover of enclosed rotary machines, the combination of separately movable cover retaining and power control members, means for locking the cover retaining member in position to obstruct opening of the cover, means for concomitantly locking the power control member in position to shut off the power and for unlocking the cover retaining member, pivotally mounted rotatable means effective while rotating for holding the locking means fixed while this machine is in motion, and means operable in response to initial release movement of said locking means for swinging said rotatable means into engagement with a moving part of the machine, whereby to effect rotation of said means and arrest further release movement of said locking means.

14. In an apparatus for controlling opening of the cover of enclosed rotary machines, the combination of relatively movable cover retaining and power control members, a fixed support for these members, an offset bar carried by one of said members and disposed substantially parallel to the other of said members, and movable abutment means on the fixed support, the abutment means being constructed and arranged to cooperate when in one position with the offset portion of the bar to lock said one of the members and when in another position to cooperate with another portion of the bar to lock the other of said members against the fixed support.

15. In an apparatus for controlling opening of the cover of enclosed rotary machines, the combination of relatively movable cover retaining and power control members, an offset bar carried by one of said members and disposed substantially parallel to the other of said members, and

movable means cooperating with the offset portion of the bar when in one position to lock said one of said members and when in another position cooperating with another portion of the bar to lock the other of said members.

16. A centrifugal machine having a driven shaft carrying a basket, a curb for housing the basket, a cover for the curb, means including a latch for holding the cover in closed position, a brake for stopping the basket shaft, means including a cam for applying the brake, a handle for moving the cam, the cam being so shaped that a given movement of the handle in one direction sets the brake, while further movement of the handle in the same direction releases the brake, and means operable by the handle during such further brake releasing movement for releasing the latch.

17. A centrifugal machine having a driven shaft carrying a basket, a brake for stopping the shaft, means including a cam for applying the brake, a handle for moving the cam, the cam being so shaped that a given movement of the handle in one direction sets the brake, while further movement of the handle in the same direction releases the brake, and means to prevent such further brake releasing movement of the handle so long as the basket is turning.

18. The combination with a rotary member, a housing for the member, the housing having an opening to provide access to the rotary member, a movable closure for the opening, means including a latch for holding the closure in closed position, a brake for stopping the rotary member, a handle for applying the brake, connections between said handle and the latch for releasing the latter, said connections being such as to become effective to release the latch only on further movement of the handle in excess to that necessary to apply the brake, and means operative to prevent such further movement of the handle so long as the rotary member is turning.

19. A centrifugal machine having a driving shaft carrying a basket, a curb for housing the basket, a cover for the curb, means including a latch for holding the cover in closed position, a brake for stopping the basket shaft, a handle and means operated thereby for applying the brake, connections between the handle and the latch, said connections being such as to become effective to release the latch handle on further movement of the handle in excess of that necessary to apply the brake, and means to prevent such further movement of the handle so long as the rotating member is turning, the brake operating means becoming effective to release the brake upon such further movement of the handle.

20. The combination with a rotary member, a housing for the member, the housing having an opening to provide access to the rotary member, a movable closure for the opening, means including a latch for holding the closure in closed position, a brake for stopping the rotary member, a handle for applying the brake, connections between said handle and the latch for releasing the latter, said connections being such as to become effective to release the latch only on further movement of the handle in excess to that necessary to apply the brake and controller mechanism, comprising an element turning with said rotary member, operative to prevent such further movement of the handle so long as the rotary member is turning.

21. A centrifugal machine having a driving

shaft carrying a basket, a curb for housing the basket, a cover for the curb, means including a latch for holding the cover in closed position, a brake for stopping the basket shaft, a handle, and means operated thereby for applying the brake, connections between the handle and the latch, said connections being such as to become effective to release the latch handle on further movement of the handle in excess of that necessary to apply the brake, and controller mechanism comprising a rotary element driven in consonance with the basket shaft, operative to prevent such further movement of the handle so long as the drive shaft is turning.

22. A centrifugal machine having a driving shaft carrying a basket, a curb for housing the basket, a cover for the curb, means including a latch for holding the cover in closed position, a brake for stopping the basket shaft, a handle and means operated thereby for applying the brake, connections between the handle and the latch, said connections being such as to become effective to release the latch handle on further movement of the handle in excess of that necessary to apply the brake, and a controller for the latch actuating connections comprising a normally stationary but rotatable element, and parts which are effective when said element is rotating to prevent latch releasing movement of said connections, and means actuable by said handle, substantially at the completion of the brake settling movement of the latter for causing said rotatable element to rotate until the basket shaft stops.

23. A centrifugal machine having a driven shaft carrying a basket, a curb for housing the

basket, a cover for the curb, means including a latch for holding the cover in closed position, a brake for stopping the basket shaft, means including a cam for applying the brake, a handle for moving the cam, the cam being so shaped that a given movement of the handle in one direction sets the brake, while further movement of the handle in the same direction releases the brake, connections between the handle and latch, the connections being such as to become effective to release the latch only during such further brake release movement of the handle, and means operative to prevent such further brake release movement of the handle so long as the basket is turning.

24. Centrifugal apparatus comprising a curb having an open top, a rotary basket within the curb, a cover for the top opening of the curb, locking means for holding the cover in closed position while the basket is rotating, a lever for releasing said locking means, and control mechanism for said locking means, said mechanism comprising a normally stationary but rotatable member, means associated with said member and constructed and arranged to become effective upon rotation of said member to prevent completion of the lock-releasing movement of said lever, a driven element rotatable with said basket and engageable with said member but normally held disengaged therefrom, and means operative upon attempted lock-releasing movement of said lever to effect engagement between said rotatable member and said driven element, thereby to initiate rotation of said rotatable member by said driven element.

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