C. W. AVELING.

BRAKE.

APPLICATION FILED MAY 28, 1908.

956,263.

Patented Apr. 26, 1910.

2 SHEETS—SHEET 1.

Fig. 1

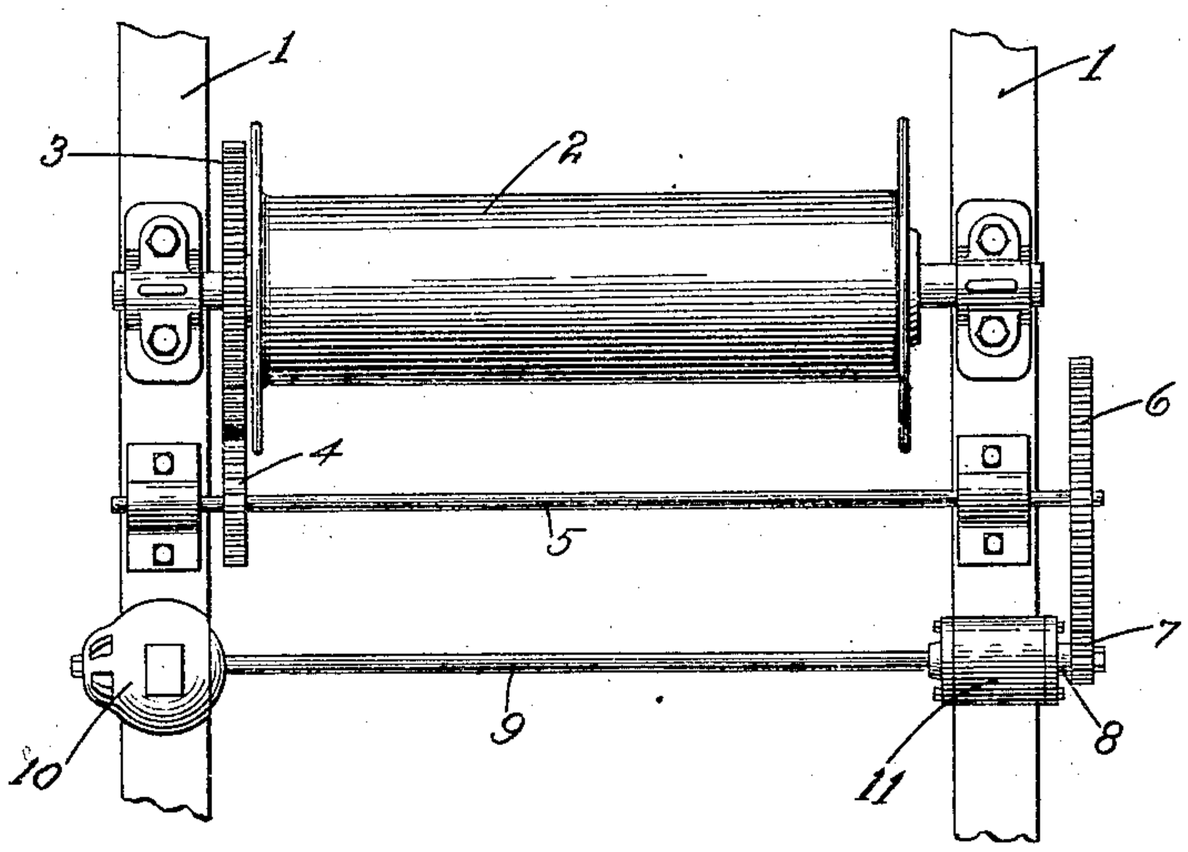
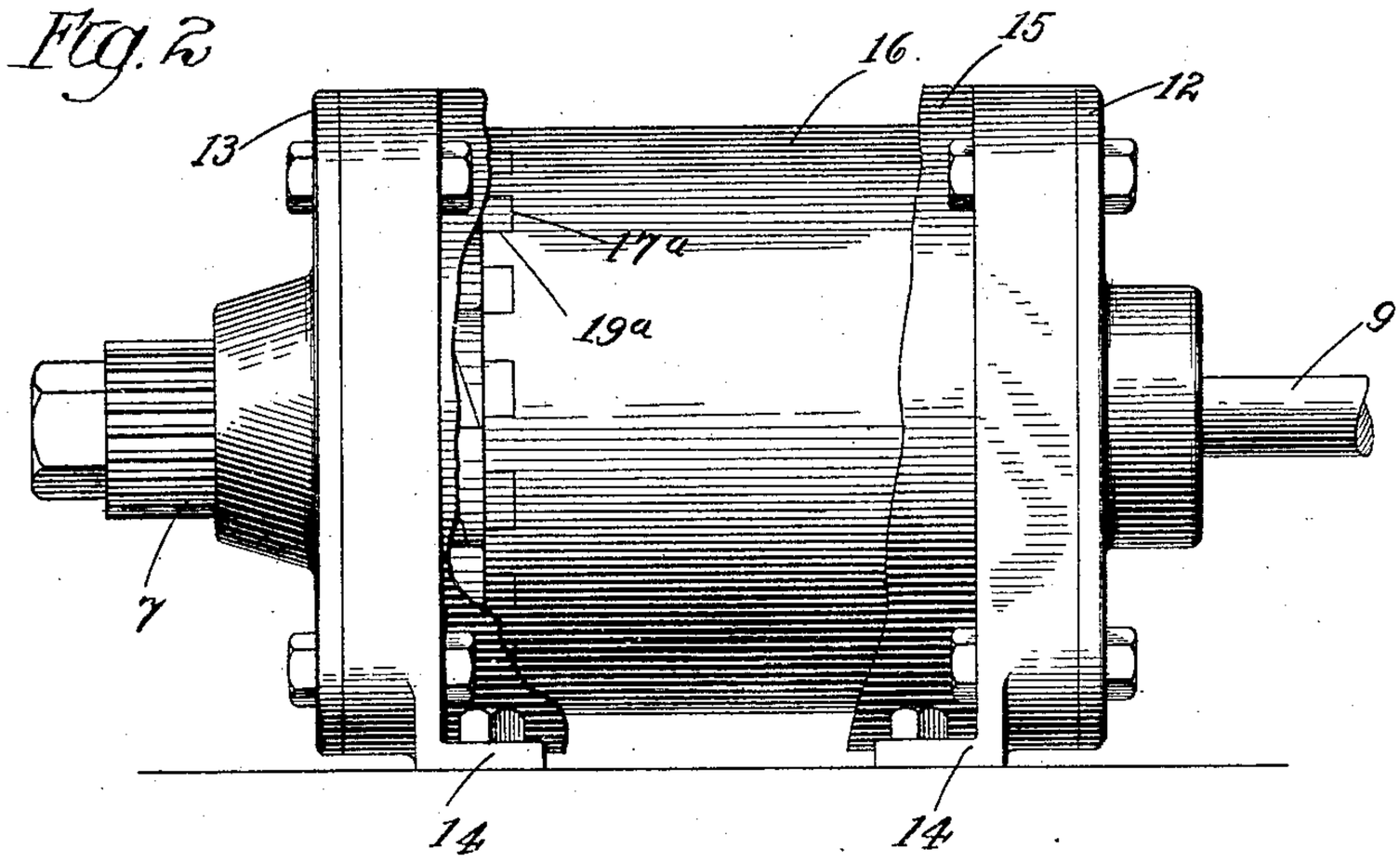


Fig. 2



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2 SHEETS—SHEET 2.

Fig. 3.

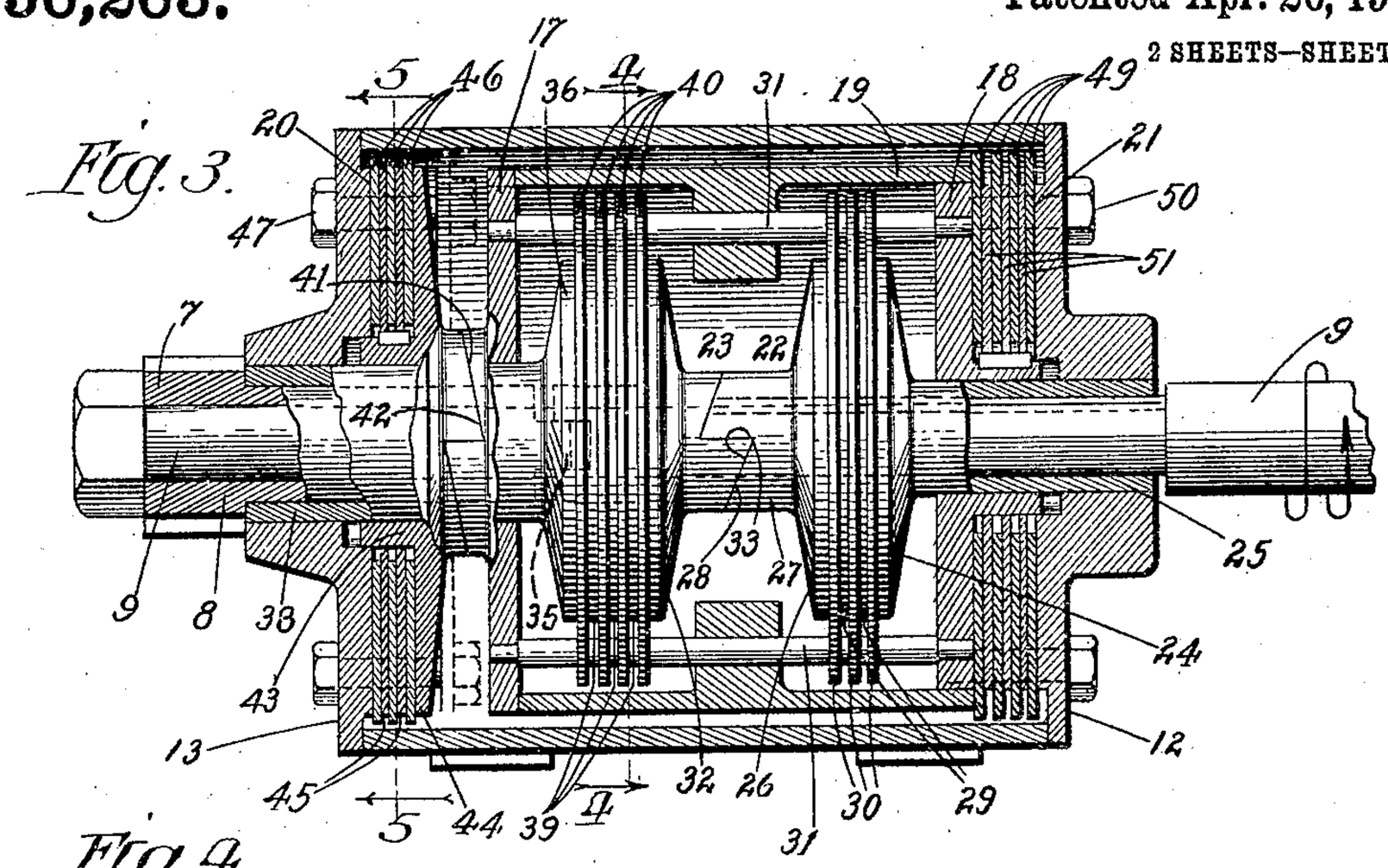


Fig. 4.

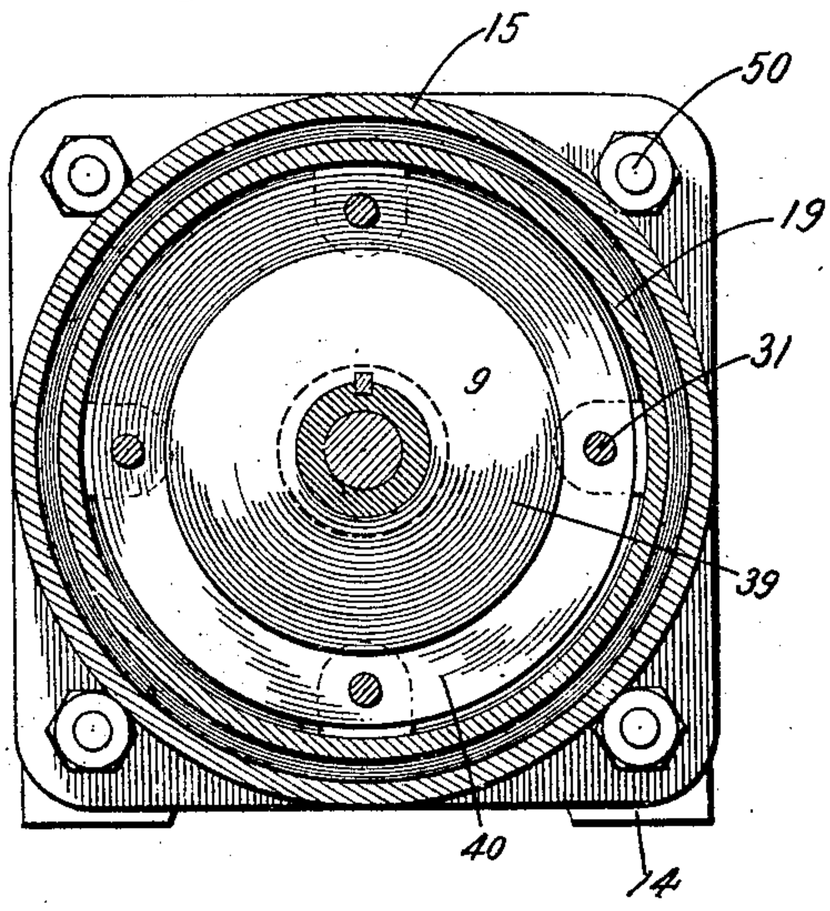
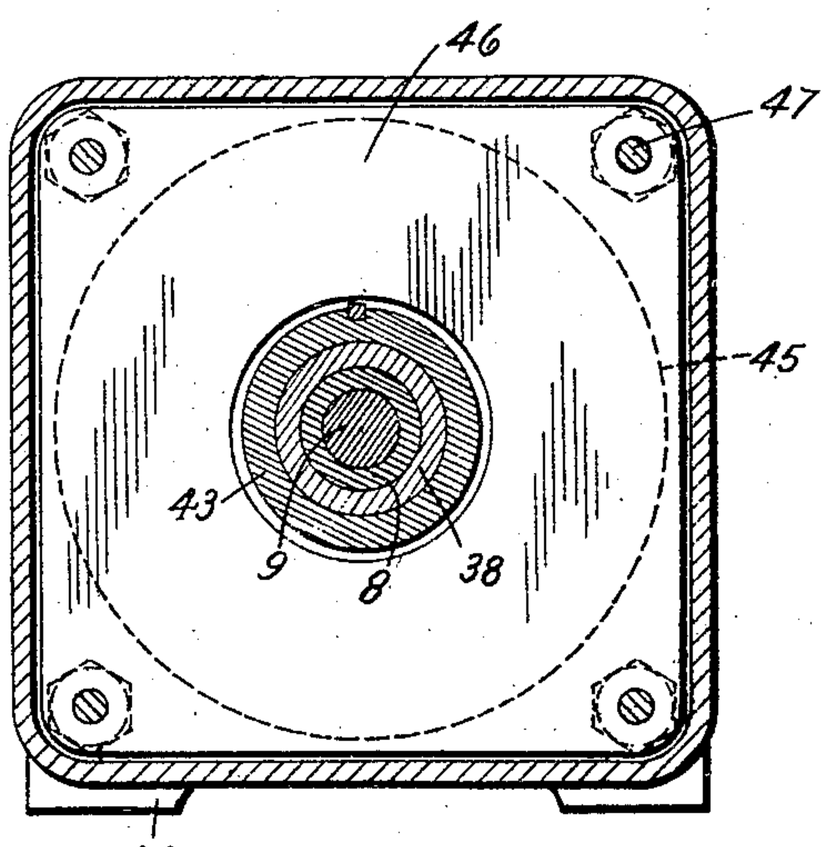


Fig. 5.



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BRAKE.

956,263. Specification of Letters Patent. **Patented Apr. 26, 1910.**

Application filed May 28, 1908. Serial No. 435,475.

To all whom it may concern:

Be it known that I, CHRISTIAAN W. AVELING, formerly a subject of the Queen of the Netherlands, and who am about to become a citizen of the United States, residing at Morgan Park, in the county of Cook and State of Illinois, have invented new and useful Improvements in Brakes, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawing, forming a part of this specification.

My invention relates to improvements in clutching mechanism, and particularly to improvements in that class of clutching mechanisms used in connection with hoisting machinery.

My invention is particularly adapted for use on electric traveling cranes, hoisting machinery, and the like, where it is desirable to automatically throw into operation a braking clutch when the hoisting movement is stopped, so that the load will be held in the position to which it has been moved. Heretofore in such apparatus, and especially in electric traveling cranes, it has been customary to use a pawl and ratchet mechanism for holding the rotating load drum in its stationary position when the load has been hoisted to a predetermined point. When a pawl and ratchet mechanism is used, one serious disadvantage is that as the load settles back after having been hoisted to a predetermined point, unless the pawl properly engages the teeth of the ratchet, the weight of the load will tend to break the teeth of the ratchet.

One of the objects of my invention is to dispense entirely with such forms of brakes as the pawl and ratchet structure, and also to dispense entirely with such forms of brakes as the so-called "band" brake.

A further object of my invention is to provide a structure in which, when used as above indicated, all the clutching stress will be axial with the shafts of the apparatus, so that the danger of the parts becoming broken will be reduced to a minimum.

Other objects of my invention will appear in the specification and claims.

I have illustrated in the accompanying drawings, for the purpose of disclosing my invention, one form which my invention may take.

In said drawings—Figure 1 is a semi-diagrammatic plan view of the hoisting mechanism of a traveling crane; Fig. 2 is an elevation of my braking or clutching mechanism, a part of the casing being broken away to show the interior thereof; Fig. 3 is a longitudinal section taken on the line 3—3 of Fig. 4; Fig. 4 is a transverse section taken on the line 4—4 of Fig. 3; and Fig. 5 is a transverse section taken on the line 5—5 of Fig. 3.

The structure shown in Fig. 1 is more for the purpose of illustrating one application of my invention than for showing in detail any of the parts of the hoisting mechanism. I have therefore merely illustrated the parts in diagram rather than showing the mechanism in detail. For the purpose of understanding the application of my invention, reference will be had to this figure first. In said figure I have shown the two side frames 1 of a hoisting mechanism, between which is adapted to be journaled a hoisting drum 2, provided with a driving gear 3. This gear 3 meshes with a pinion 4 of a countershaft 5, also journaled in the side frames 1. The countershaft 5 carries a gear 6, which meshes with a pinion 7 carried on the driven shaft 8, which shaft in turn is connected to the driving shaft 9 of the motor 10 by my improved clutching mechanism 11.

In the form of my invention which I have illustrated, I provide a relatively stationary inclosing frame which comprises a pair of heads 12 and 13, and a cylindrical inclosing casing 15 having squared end portions. The casing is provided with lugs or feet 14 by which they may be bolted to the hoisting frame. Mounted and adapted to rotate within this stationary casing is a drum 16, which comprises a pair of heads 17 and 18 and a cylindrical casing 19. The edges of the casing are provided with square recesses 19^a and the heads are provided with square projections 17^a, which fit in these recesses in much the same manner as a square-jawed clutch engages. By this arrangement I am able to dispense with bolts or other securing means which, if loosened, would drop into the clutch mechanism and cause damage. The drum is adapted to be connected to the relatively inclosing frame by means of a pair of holding clutches 20 and 21, and is adapted to be connected to the driving shaft 9 of the motor by means of a clutch 22 and with the driven shaft 8 by means of a clutch 23.

The clutch 22 preferably takes the form of

a friction disk clutch, one of the outside disks 24 of which is provided with a quill 25, keyed to the shaft 9. The head 18 rotates upon this quill 25. The other outside disk 26 of the clutch 22 is also provided with a quill 27, keyed to the shaft 9, and is provided with a helical surface 28. The disks 29 of the clutch are also keyed to the shaft 9. The other member of the clutch, formed by the disks 30, is connected to the heads 17 and 18, suitable rods 31 being adapted to pass through the rings 30 and have their ends fit in suitable sockets formed in the heads 17 and 18. The clutch 23 is likewise a disk friction clutch. The outside disk 32 of this clutch is mounted loosely on the shaft 9 and provided at one end with a helical surface 33. The opposite end of the disk 32 is adapted to be connected with the driven shaft 8 by a square-jawed clutch 35. The outside disk 36 of the clutch 23 is mounted on a quill 38, loosely mounted upon the shaft 8 and bearing at its outer end against the side of the pinion 7. The disks 39 of the clutch 23 are connected to the disk 32 by being keyed to the quill 32^a of said disk. The disks 40 of the clutch 23, which form the second member of the clutch, are connected to the heads 17 and 18 of the rotating drum by the same rods 31 which connect the rings 30 of the clutch 22.

The head 17 of the drum 16 is provided with a helical surface 41, which coöperates with a helical surface 42 formed on a quill 43, on which is mounted the outside disk 44 of the holding clutch 20. The friction disks 45 of this clutch are keyed upon the quill 43, while the friction disks 46, forming the second member of the clutch, are secured to the head 13 by suitable bolts 47. The clutch 21 comprises a plurality of disks 49, secured to the head 12 by bolts 50, a plurality of disks 51 keyed to the quill 18^a of the head 18, and the two heads 12 and 18.

I will now proceed to describe the operation of my invention. It will be assumed, for the purpose of description, that it is desired to raise the load. The motor is started in a forward direction, to rotate the shaft 8 from front to back, or in the direction of the arrow. The rotation of this shaft causes the helical surfaces 28 and 33 to move the two disks 26 and 32 away from one another and toward the relatively stationary disks 24 and 36 and throw the two clutches into operation. The raising clutches 22 and 23 being in engagement, the drum 16 is connected by the clutch 22 with the driving shaft and by the clutch 23 with the driven shaft. The driven shaft 8 is thus connected with the driving shaft and rotates therewith, operating the load drum 2, to raise the load. When the load is not being raised, the clutches 20 and 21 are always locked. As soon, however, as the raising operation starts, the helical surfaces 41 and 42 will permit the members 17 and 44 to draw together, releasing these clutches. It will be noted, however, that the members 44 and 45 of the clutch 20 rotate with the drum 16, due to the engagement of the helical surfaces 41 and 42. As soon as the motor is stopped, when the load has reached the predetermined point, the weight of the load will tend to rotate the driven shaft in a reverse direction, but as soon as this occurs the helical surfaces 41 and 42 will move the head 17 and disk 44 away from one another, throwing the holding clutches 20 and 21 into operation to connect the drum 16 with the stationary heads 12 and 13. As the drum 16 is connected by the clutch 23 with the driven shaft 8, this shaft will be held against rotation. When it is desired to lower the load the motor is reversed. The reversing of the direction of operation of the shaft 9 will permit the helical surfaces 28 and 33 to release the clutches 22 and 23, and as the driven shaft 8 is disconnected from the drum 16 it is free to rotate under the weight of the load in an opposite direction and follow the direction of rotation of the shaft, even though the drum 16 is still connected to the stationary frame. Due to the interposition of the members 49 and 51 of the clutch 21, and the members 44, 45 and 46 of the clutch 20, between the stationary heads 12 and 13 and the heads 17 and 18, the heads 17 and 18 will always be held close to the edges of the casing 19 and will thereby be prevented from being disconnected therefrom.

While I have shown and described one form of my invention, it will be understood that various modifications may be made therein without departing from the spirit of my invention as set forth in the appended claims.

Having described my invention what I claim as new and desire to secure by Letters Patent is:

1. The combination with a driving member, of a driven member, an autonatically operated friction clutch for connecting said members when the driving member is rotated in one direction, and a second automatic clutch operating through axial movement for connecting said driven member to a relatively stationary part when the load on said member tends to rotate the same in an opposite direction.

2. The combination with a driving member, of a driven member, an automatically operated friction clutch for connecting said members when the driving member is rotated in one direction, and a second automatic clutch operating through axial movement for connecting said driven member to a relatively stationary part when the load tends to rotate the same in an opposite direction, said second clutch being inoper-

ative for holding the driven member when the driving shaft is rotated in an opposite direction.

3. The combination with a driving member, of a driven member, a friction clutch for connecting said members, operated by the rotation of said driving member when the same is rotated in one direction, and a second automatic clutch operating through axial movement for connecting said driven member to a relatively stationary part when the load tends to rotate the same in an opposite direction.

4. The combination with a rotating member, of a driven member, an automatically operated friction clutch for connecting said members when the driving member is rotated in one direction and a second clutch operating through axial movement for connecting said member to a relatively stationary part, said second clutch being operated by the backward rotation of said driven member.

5. The combination with a driving member, of a driven member, a friction clutch for connecting said driven member to said driving member when the driving member is rotated in one direction and operated by the rotation thereof, and a second clutch operating through axial movement for connecting said driven member to a relatively stationary part when the load tends to rotate the same in an opposite direction, said second clutch being thrown into operative position by the backward rotation of said driven member.

6. The combination with a driving member, of a driven member, an automatically operated clutch for connecting said members when the driving member is rotated in one direction, and a second clutch for connecting said driven member to a relatively stationary part when the load tends to rotate the same in an opposite direction, the thrust of all of said clutches being axial of the driving and driven members.

7. The combination with a driving member, of a driven member, a holding clutch operating through axial movement for connecting said driven member with a relatively stationary part, an automatically operated friction clutch for connecting said driven member with the driving member, and means for automatically releasing said holding clutch and connecting said driving clutch when the driving member is rotated in one direction.

8. The combination with a rotating member, of a drum, a driven member, a clutch for connecting said drum to the rotating member, a second clutch connecting said drum to the driven member, and a third clutch for connecting said drum to a relatively stationary part, said two first mentioned clutches being adapted to be thrown in operation by a forward rotation of said driving member, said third clutch being adapted to be thrown out of operation when the driven member is rotated in a forward direction and into operation when the driven member is rotated in a backward direction.

9. The combination with a driving member, of a driven member, an intermediate member, means for connecting said driving member to the intermediate member and for connecting the driven member to said intermediate member when the driving member is rotated in one direction, and a clutch operating through axial movement for connecting said intermediate member to a relatively stationary member when the load tends to rotate the driven member in an opposite direction.

10. The combination with a driving member, of a driven member, an intermediate member, means for automatically connecting the driving member to the intermediate member, means for automatically connecting the driven member to the intermediate member when the driving member is rotated in one direction, a clutch operating through axial movement for connecting said intermediate member to a relatively stationary part when the load tends to rotate the driven member in an opposite direction, and means whereby said connecting means is rendered inoperative when the driving member is rotated in a reverse direction.

11. The combination with a driven member, of a driving member, an intermediate member, a clutch for connecting said driving member to the intermediate member, a second clutch for connecting the driven member to the intermediate member, a third clutch operating through axial movement for connecting the intermediate member to a relatively stationary part when the load tends to rotate the driven member, and means whereby said connecting clutches are rendered inoperative when the driving member is operated in a reverse direction.

12. The combination with a driving member, of a driven member, an intermediate member, friction clutches operating through axial movement for connecting said driving member and driven member to the intermediate member, a friction clutch operating through axial movement for connecting said intermediate member to a relatively stationary member when the load tends to operate the driven member, and means whereby said connecting clutches are rendered inoperative when the driving member is operated in a reverse direction.

13. The combination with a rotating member, of a drum, a driven member, a clutch for connecting said drum to the rotating member, a second clutch connecting said drum to the driven member, and a third clutch for connecting said drum to a rela-

tively stationary part, said two first-mentioned clutches being adapted to be thrown in operation by a forward rotation of said driving member, said third clutch being adapted to be thrown out of operation when the driven member is rotated in a forward direction and into operation when the driven member is rotated in a backward direction, the thrust of all of said clutches being axial of the rotating members.

14. In a device of the character described, the combination with an inclosing casing having removable ends, of a driven and driving member journaled therein, a rotating casing mounted within said inclosing casing, also having removable ends, clutching mechanism for connecting said inner casing to the inclosing casing, and a second clutching mechanism arranged within the inner casing for connecting the same to the driving and driven members.

15. In a device of the character described, the combination with an inclosing casing having removable ends, of a driven and driving member journaled therein, a rotating casing mounted within said inclosing casing, also having removable ends, and automatically operated clutching mechanism arranged within the inner casing for connecting the same to the driving and driven members.

16. In a device of the character described, the combination with an inclosing casing having removable ends, of a driven and driving member journaled therein, a rotating casing mounted within said inclosing casing, also having removable ends, automatically operated clutching mechanism for connecting said inner casing to the inclosing casing, a clutch arranged within said inner casing for connecting the same to the driving member, and a second clutch arranged within said inclosing casing for connecting the same with the driven member.

17. The combination with a driving member, of a driven member, an automatically operated clutch for connecting said members when the driving member is rotated in one direction, the stress of said clutch being axial and taken up by one of the members, and a second automatically operated clutch operating through axial movement for connecting said driven member to a relatively stationary part when the load on said member tends to rotate the same in an opposite direction.

18. The combination with a rotating member, of a drum, a driven member, a clutch for connecting said drum to the rotating member, a second clutch for connecting said drum to the driven member, the stress of said clutches being taken up by one of said members, and a third clutch for connecting said drum to a relatively stationary part, said two first-mentioned clutches being adapted to be thrown into operation by forward rotation of said driving member, said third clutch being adapted to be thrown out of operation when the driving member is rotated in a forward direction and into operation when the driven member is rotated in a backward direction.

19. In a device of the character described, the combination with an inclosing casing having removable ends, of a driven and driving member journaled therein, a rotating casing mounted within said inclosing casing, also having removable ends, boltless means for securing said ends in position, clutching mechanism for connecting said inner casing to the inclosing casing, said clutching mechanism being also adapted to maintain the removable ends of the inner casing in position, and a second clutching mechanism arranged within the inner casing for connecting the same to the driving and driven member.

In witness whereof, I have hereunto subscribed my name in the presence of two witnesses.

CHRISTIAAN W. AVELING.

Witnesses:
W. PERRY HAHN,
E. R. KING.