R. McKEE.

STARTING MECHANISM FOR EXPLOSIVE ENGINES.

APPLICATION FILED JULY 6, 1909.

979,530.

Patented Dec. 27, 1910.

2 SHEETS—SHEET 1.

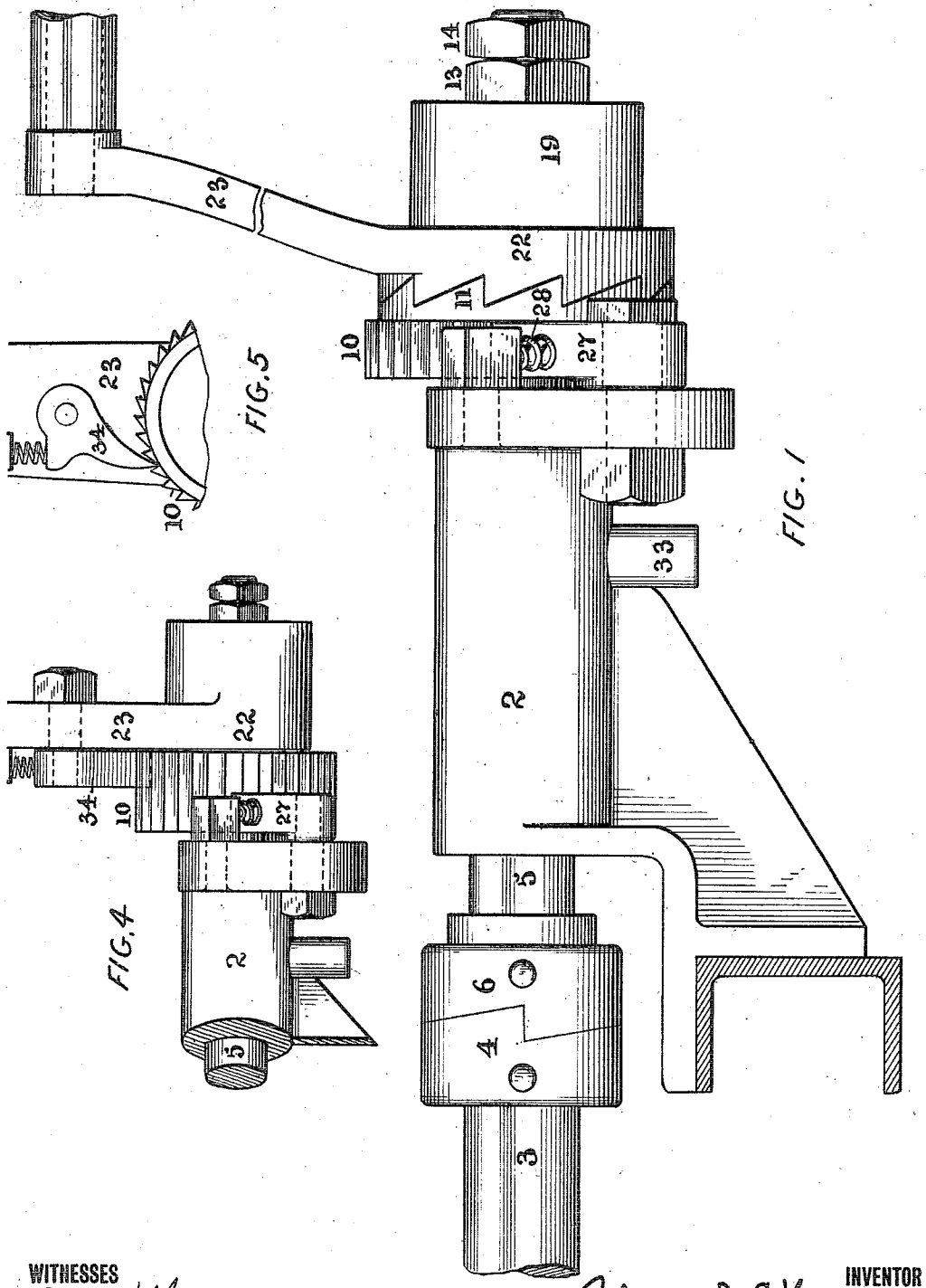

FIG. 1

FIG. 5

FIG. 4

WITNESSES

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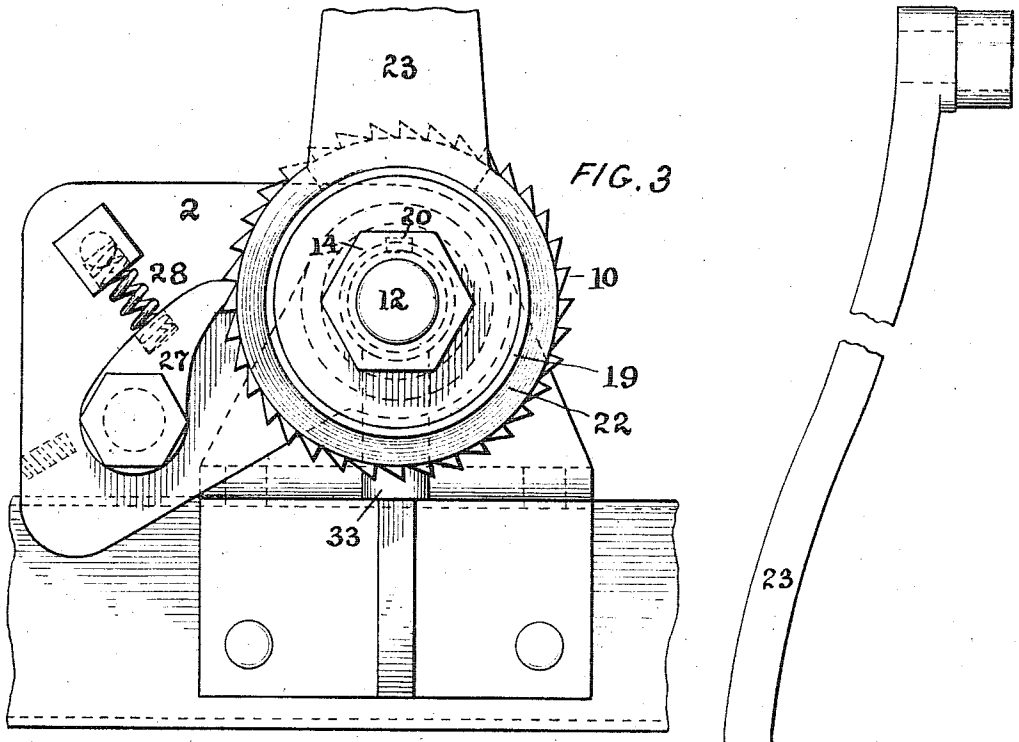

FIG. 3

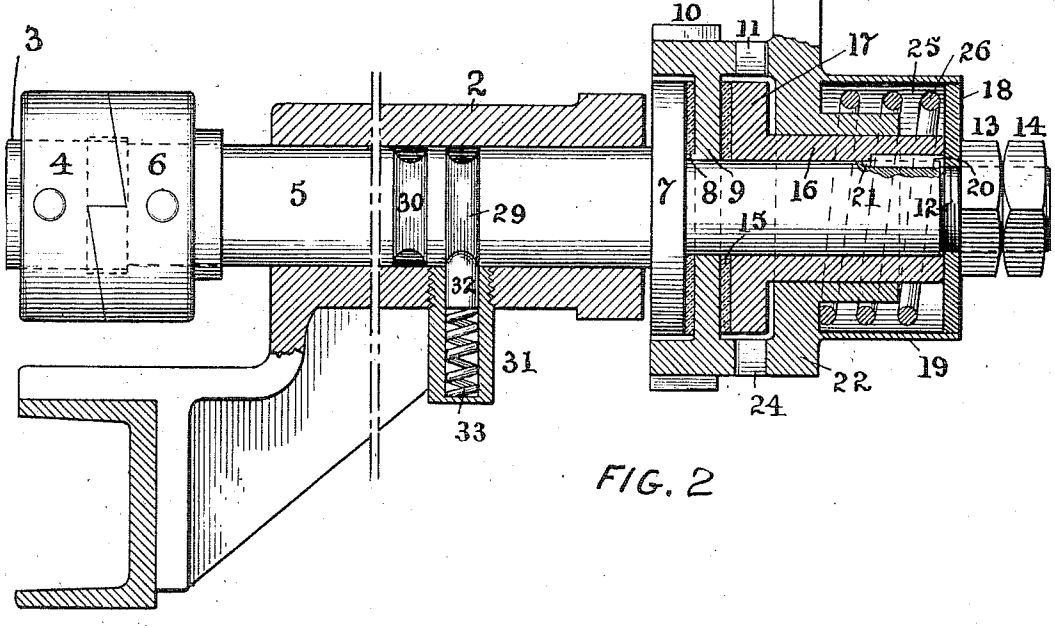

FIG. 2

WITNESSES

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STARTING MECHANISM FOR EXPLOSIVE-ENGINES.

979,530. Specification of Letters Patent. Patented Dec. 27, 1910.

Application filed July 6, 1909. Serial No. 506,015.

To all whom it may concern:

Be it known that I, ROBERT McKEE, a citizen of the United States, and a resident of the city and county of Philadelphia and State of Pennsylvania, have invented an Improvement in Starting Mechanism for Explosive-Engines, of which the following is a specification.

My invention has reference to starting mechanism for explosive engines and consists of certain improvements which are fully set out in the following specification and shown in the accompanying drawings which form a part thereof.

The object of my invention is to provide a construction of starting mechanism which may be applied to explosive engines employed on automobiles and for other purposes whereby a premature explosion and backward starting of the engine crank shaft cannot injure the operator when starting the engine.

My object is also to provide a construction of starting mechanism which may be applied to automobiles now in existence and without the necessity of making special construction in the engine.

My invention comprehends the employment of intermediate mechanism between the crank handle or lever of the starting mechanism and the engine shaft which, while adapted to rotate the engine shaft and overcome the compression within the cylinder of the engine, will yield under certain strains such a premature explosion and quick reversal of the engine shaft, said intermediate means embodying a yielding friction device and a non-yielding connecting clutch mechanism between the friction device and the operating crank or lever.

My invention consists of certain improvements for starting mechanism in explosive engines which are fully described hereinafter and more particularly defined in the claims. These improvements will be better understood by reference to the drawings, in which:

Figure 1 is a side elevation of a starting mechanism in explosive engines embodying my improvements; Fig. 2 is a sectional elevation thereof; Fig. 3 is a front elevation of the same with the upper part of the hand crank or lever broken away; and Figs. 4 and 5 are elevations showing a modification of my invention.

2 is a main bearing which is adapted to be bolted to a cross bar connecting the chassis or main frame of the automobile. This bearing may be shaped to suit any automobile structure to which my invention is to be applied; 3 is an engine crank shaft and is provided on the end with the usual ratchet clutch 4; and 5 is a starting shaft journaled in the bearing with provisions for rotary motion and longitudinal adjustment and the end of this shaft is provided with a ratchet clutch part 6, which is the counter part of the clutch part 4 of the engine shaft and with which it engages in starting the rotation of the engine.

The shaft 5 has, formed upon it, a collar 7 and is extended beyond the collar a considerable distance, the end terminating in a screw-threaded part 12 provided with a nut 13 and a lock nut 14. Sleeved upon the shaft 5 between the collar and the lock nut, are the following parts, namely; a friction washer 8 preferably formed in vulcanized fiber resting against the collar 7, a friction disk 9 resting against the friction washer and having upon its periphery ratchet teeth 10 and upon its forward face an annular row of ratchet teeth 11, a second friction washer 15 also preferably of vulcanized fiber and resting against the friction disk, a clamping sleeve 16 having a flange 17 pressing against the last mentioned friction washer 15, and a large washer 18 pressing upon the end of the sleeve 16 and adapted to receive the pressure of the nut 9. By tightening the nuts 13 and 14 the sleeve 16 and its flange 17 may be forced with more or less pressure upon the remaining parts sleeved upon the shaft 5 so as to clamp the friction disk 9 with greater or less pressure to create the necessary amount of gripping action between the ratchet disk and the shaft and its connections. To prevent the sleeve from rotating upon the shaft 5, a key or feather 20 is secured to the inner part of the sleeve and works in a slot 21 on the shaft 5 so that the sleeve and its flange, as well as the collar 7, are required to rotate as a unit. This manner of rotation of the friction disk 9 will cause the shaft 5 to be rotated with a proper amount of power of transmission.

Journaled upon the sleeve 16 is the hub 22 of a hand crank 23. This hub has freedom of rotation and of longitudinal recipro-

cation upon the sleeve; it further has upon one face ratchet teeth 24 which engage the ratchet teeth 11 of the friction disk 9 so as to rotate the said disk to the right when the crank is rotated to the right and when standing in front of the nut end of the shaft 5; and the opposite face of the hub is provided with an outwardly extending tubular flange 19 which loosely fits over the washer 18 so as to form an annular chamber 25 in which is located a coil spring 26 one end of which presses against the washer and the other end against the hub of the hand crank or lever so as to normally keep the ratchet teeth thereof in engagement with the ratchet teeth 11 of the friction disk, while permitting the said hand crank to be adjusted to any position desired with respect to the circumference of the said friction disk to enable the operator to get a proper purchase in starting the rotation of the engine.

27 is a pawl pivoted to the main bearing 2 and is spring pressed into engagement with the teeth 10 of the friction disk 9 by a spring 28 so as to prevent the friction disk from turning backward, or to the left.

It will now be understood that, if the hand crank or lever is rotated to the right, it will revolve the friction disk 9 with it, by means of the friction devices, the shaft 5 and thereby, through the clutches 4 and 6, rotate the engine shaft 3. During this action, the ratchet teeth 10 of the friction disk pass freely under the spring actuated pawl. Should the engine start up properly the shaft 5 and the friction disk travel freely under the pawl and with respect to the hand crank or lever. If the engine has premature explosion and kicks backward, the pawl 27 will hold the friction disk 9 from rotating backward whereas the shaft 5 will revolve by overcoming the friction between the friction disk 9 and the collar 7 and the flange 17 together with the washers 8 and 15. By the friction disk being held against backward motion it is evident that no strain will come upon the hand crank or lever due to the backward rotation or kick of the engine.

The shaft 5 is provided within the bearing 2 with two annular grooves 29 and 30, and the bearing 2 is provided with a cup 31 which acts as a guide for a detent plug 32 and a spring 33 which forces the detent plug into engagement with the grooves 29 and 30. As shown in Fig. 2 the detent is in engagement with the groove 29 and normally holds the clutches 4 and 6 in contact during the starting of the engine. When the engine rotates under its own explosion the cam surfaces of the parts 4 and 6 force the shaft 5 longitudinally so that the annular groove 29 is forced out of engagement with the spring actuated detent plug 32 and the annular groove 30 is brought into alinement so as to be engaged by the said detent plug and thereby insure the clutch part 6 being held out of engagement with the clutch part 4 during the normal running of the engine. When this action takes place, the entire shaft 5 and all of the mechanism carried with it are partly shifted with respect to the bearing 2 and the pawl 27. After stopping the engine, should it be desired to again start the engine, the shaft 5 is pushed backward until the detent engages the annular groove 29, as indicated in Fig. 2.

Broadly considered it will be evident that the hand crank or lever 23 and its hub might be made integral with the friction disk 9 but this would not give provisions for locking the crank in the best possible position for starting the engine, and hence I prefer to make it independent of the said friction disk and provide connecting means in the form of the ratchet teeth or some other equivalent device. As another mode of making this connection, I have shown in Figs. 4 and 5 a modification in which the ratchet teeth 10 of the friction disk 9 are made wider and in which the crank lever 23 is provided with a spring pawl 34 which engages the said ratchet teeth on the friction disk. I prefer however, the form of construction as shown in Figs. 1, 2 and 3.

The friction disk 9 is preferably formed with a recess on one face so that the peripheral flange thereof will extend over the washer 8 and the collar 7 and shield them in turning; and the lock caused by forming the teeth 11 of the friction disk and the teeth 24 of the crank lever hub to engage all the way around, an annular chamber will be provided which shields the friction washer 15 and the flange 17 of the sleeve 16. All of the parts are constructed so as to be compact, well protected and easily repaired. By simply removing the two nuts 13 and 14 the entire operative parts may be stripped from the shaft for cleaning or other purposes.

While I have shown my invention in the form which I have employed it for actual use and which preferred construction embodies my invention in a satisfactory manner, I do not restrict myself to the details shown as these may be modified in various ways without departing from the spirit of the invention.

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

1. In a starting device for explosive engines, the combination of a rotatable shaft, a friction disk sleeved upon the shaft and having annular friction surfaces, friction devices in annular form for clamping the opposite annular surfaces of the friction disk and frictionally holding it to the shaft

whereby they may be rotated together, means to prevent the friction disk rotating in one direction while permitting it to rotate freely in the other direction, and hand operated means independent of the friction disk for rotating it in one direction but free to rotate relatively to the disk in the other direction at all times.

2. In a starting device for explosive engines, the combination of a rotatable shaft having an annular flange, an annular friction disk loosely sleeved upon the shaft and coacting with the annular flange thereof, friction devices in the form of an annular disk adjustable lengthwise upon the shaft and adjusting means therefor for clamping the friction disk to the annular flange of the shaft whereby they may be rotated together, means to prevent the friction disk rotating in one direction while permitting it to rotate freely in the other direction, and hand operated means for rotating the friction disk consisting of a lever and mechanical devices between the said lever and friction disk for rotating the friction disk in one direction while permitting it to rotate freely in the other direction without rotating the lever.

3. In a starting device for explosive engines, the combination of a rotatable shaft, a friction disk sleeved upon the shaft, friction devices for clamping the friction disk to the shaft whereby they may be rotated together, means to prevent the friction disk rotating in one direction while permitting it to rotate freely in the other direction, and hand operated means for rotating the friction disk consisting of a lever, pawl and ratchet means between the friction disk and lever and a spring device for maintaining said pawl and ratchet devices in normal engagement.

4. In a starting device for explosive engines, the combination of a rotatable shaft, a friction disk sleeved upon the shaft and providing an annular surface transversely to the shaft, friction devices rotating with the shaft and having annular surfaces for clamping the friction d sk to the shaft whereby they may be rotated together, means to prevent the friction disk rotating in one direction while permitting it to rotate freely in the other direction consisting of ratchet teeth on the friction disk, a pawl device for preventing the ratchet teeth and friction disk from rotating in one direction only, and hand operated means for rotating the friction disk.

5. In a starting device for explosive engines, the combination of a rotatable shaft, a friction disk sleeved upon the shaft, friction devices for clamping the friction disk to the shaft whereby they may be rotated together, means to prevent the friction disk rotating in one direction while permitting it to rotate freely in the other direction, hand operated means for rotating the friction disk, a bearing for the shaft in which it may rotate and reciprocate longitudinally, the detent mechanism for holding the said shaft in either of two longitudinal adjustments while permitting free rotation, whereby the clutch on the shaft may engage the engine shaft or be held out of engagement therewith.

6. In a starting device for explosive engines, the combination of a rotatable shaft having a clutch for engaging the engine shaft having two parallel annular grooves about its circumference, a friction disk sleeved upon the shaft, friction devices for clamping the friction disk to the shaft whereby they may be rotated together, means to prevent the friction disk rotating in one direction while permitting it to rotate freely in the other direction, hand operated means for rotating the friction disk, a bearing for the shaft in which it may rotate and reciprocate longitudinally, the detent mechanism consisting of a spring actuated detent plug adapted to engage the annular grooves of the shaft for holding the said shaft in either of two longitudinal adjustments while permitting free rotation, whereby the clutch on the shaft may engage the engine shaft or be held out of engagement therewith.

7. In a starting mechanism for explosive engines, the combination of a starting shaft having an annular collar, with a flanged sleeve carried by the shaft, a friction disk sleeved upon the shaft intermediate of the collar and the sleeve and having its periphery formed with ratchet teeth, adjusting means on the shaft for creating a friction upon the friction disk to normally prevent rotation thereof relatively to the shaft, a pawl engaging the ratchet teeth of the friction disk to prevent rotation of the disk in one direction and a hand operated lever having a mechanical connection with the friction disk to rotate it.

8. In a starting mechanism for explosive engines, the combination of a starting shaft having an annular collar, with a flanged sleeve carried by the shaft, a friction disk sleeved upon the shaft intermediate of the collar and the sleeve and having its periphery formed with ratchet teeth, adjusting means on the shaft for creating a friction upon the friction disk to normally prevent rotation thereof relatively to the shaft, a pawl engaging the ratchet teeth of the friction disk to prevent rotation of the disk in one direction a hand operated lever provided with ratchet teeth engaging the friction disk to rotate it, and spring devices for pressing the hand operated lever into engagement with the friction disk.

9. In a starting mechanism for explosive engines, the combination of a starting shaft

having an annular collar, with a flanged sleeve carried by the shaft, a friction disk sleeved upon the shaft intermediate of the collar and the sleeve and having its periphery formed with ratchet teeth, friction washers between the collar and the friction disk and between the flanged sleeve and friction disk, adjusting means on the shaft for creating a friction upon the friction disk to normally prevent rotation thereof relatively to the shaft, a pawl engaging the ratchet teeth of the friction disk to prevent rotation of the disk in one direction, and a hand operated lever having a mechanical connection with the friction disk to rotate it.

10. In a starting mechanism for explosive engines, the combination of a starting shaft having an annular collar, with a flanged sleeve carried by the shaft, a friction disk sleeved upon the shaft intermediate of the collar and the sleeve and having its periphery formed with ratchet teeth, adjusting means on the shaft for creating a friction upon the friction disk to normally prevent rotation thereof relatively to the shaft, a pawl engaging the ratchet teeth of the friction disk to prevent rotation of the disk in one direction, a hand operated lever having a mechanical connection with the friction disk to rotate it journaled upon the flange sleeve and having a tubular flange, a washer clamped in position between the end of the sleeve and the adjusting means, and a coil spring within the tubular flange and pressing at one end upon the hand operated lever and at the other end upon the washer.

11. In a starting device for an explosive engine, a bearing, a shaft supported in the bearing with provision for rotary and longitudinal movement and having upon its end a clutch device for engagement with the engine, and automatic means for holding the shaft in two positions of longitudinal adjustment while permitting it to freely rotate whereby the shaft may be held in or out of engagement with the engine, combined with a hand operated friction disk, means to prevent the friction disk rotating in one direction while allowing it to rotate in the opposite direction, and friction devices between the friction disk and the shaft whereby the hand operated devices may normally rotate the shaft in one direction through the friction devices, and whereas the rotation of the shaft in the opposite direction cannot rotate the hand operated devices.

12. In a starting device for explosive engines, the combination of a rotatable shaft having an annular radial surface, a friction disk sleeved upon the shaft and adjustable axially thereon, friction devices for clamping the friction disk against the annular radial surface of the shaft with a constant pressure whereby they may be rotated together from all circumferential positions, means to prevent the friction disk rotating in one direction while permitting it to rotate freely in the other direction, and hand operated means for rotating the friction disk.

13. In a starting device for explosive engines, the combination of a rotatable shaft, a friction disk sleeved upon the shaft, friction devices secured to and rotating with the shaft for clamping the friction disk to the shaft whereby they may be rotated together means to prevent the friction disk rotating in one direction while permitting it to rotate freely in the other direction, hand operated means for rotating the friction disk consisting of a lever and mechanical devices between the said lever and friction disk for rotating the friction disk in one direction while permitting it to rotate freely in the other direction without rotating the lever, and spring devices for keeping the hand lever in engagement with the friction disk.

14. In a starting device for explosive engine, the combination of a rotatable shaft having an annular projecting part and an end cylindrical extension beyond the annular part, an annularly shaped friction creating device arranged concentric to the shaft and creating a constant friction with the annular projecting part thereof, means to prevent the annularly shaped friction device rotating in one direction while permitting it to freely rotate in the other direction, a crank handle having a cylindrical hub by which it is journaled concentric with respect to the cylindrical extension of the shaft and provided with means for engaging the annular friction device to rotate it.

In testimony of which invention, I hereunto set my hand.

ROBERT McKEE.

Witnesses:
R. M. KELLY,
R. M. HUNTER.