

W. L. McKISSICK.  
 STARTING DEVICE FOR EXPLOSIVE ENGINES.  
 APPLICATION FILED NOV. 13, 1911.

1,045,422.

Patented Nov. 26, 1912.

5 SHEETS—SHEET 1.

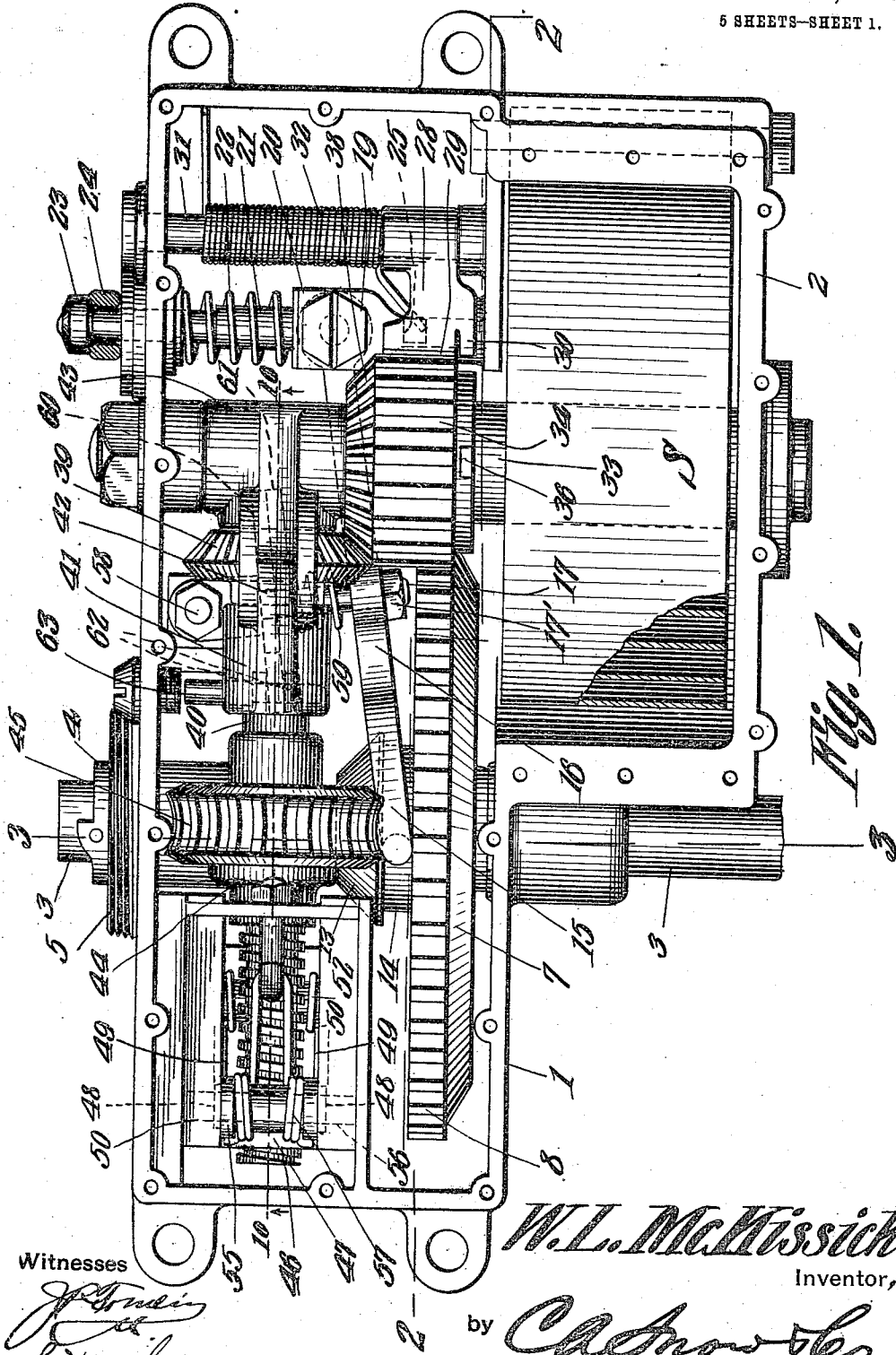


Fig. 1.

Witnesses

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*L. H. H. H.*

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by

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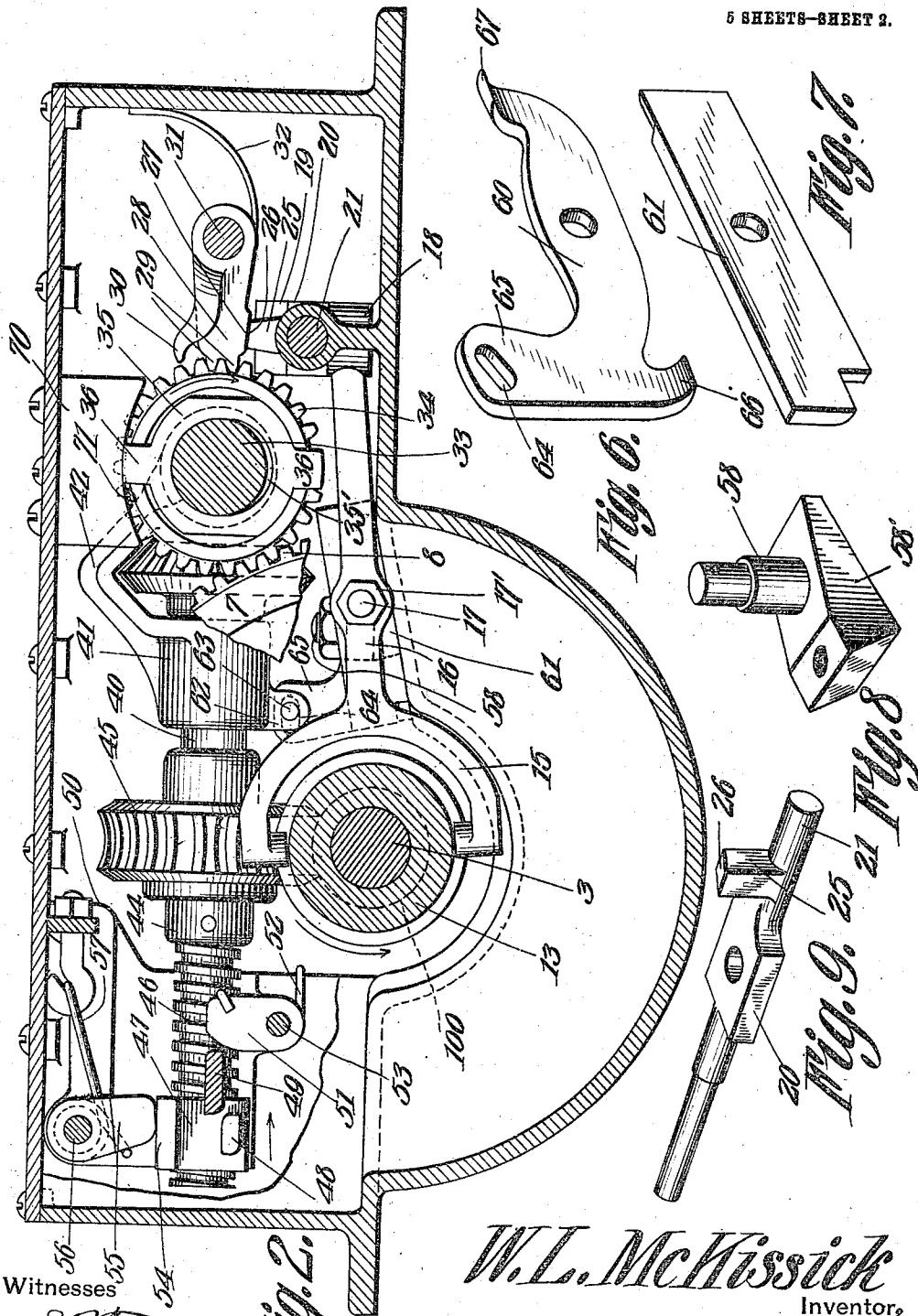
Attorneys.

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5 SHEETS-SHEET 2.



Witnesses

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*Fig. 2.*

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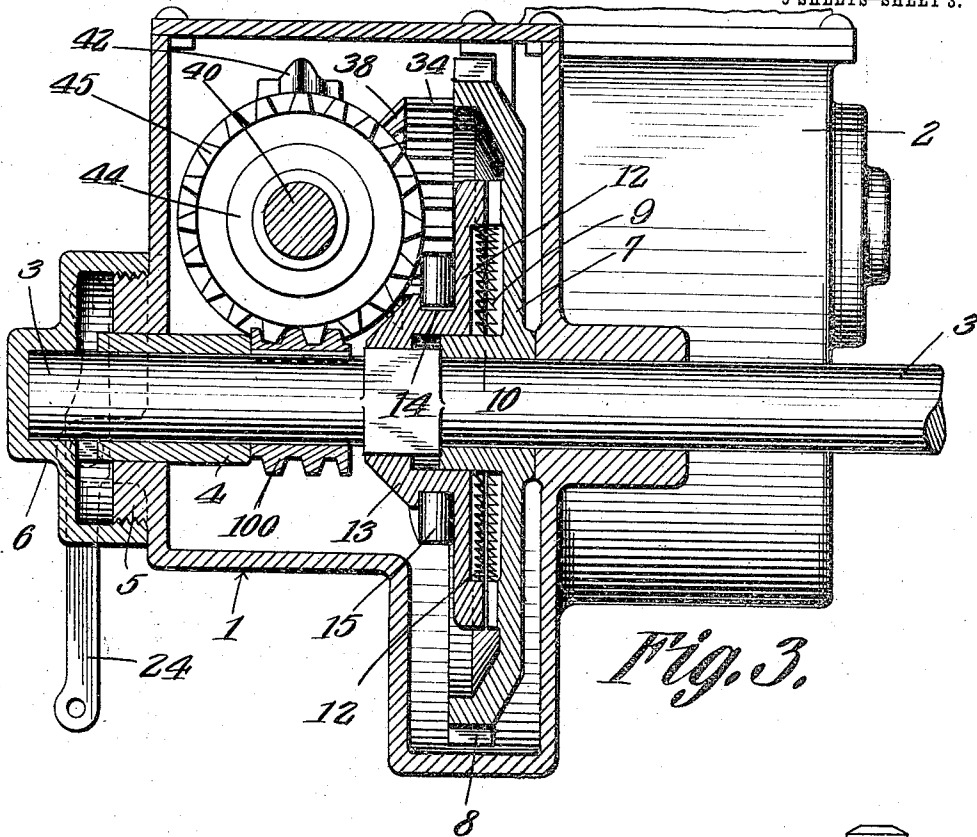
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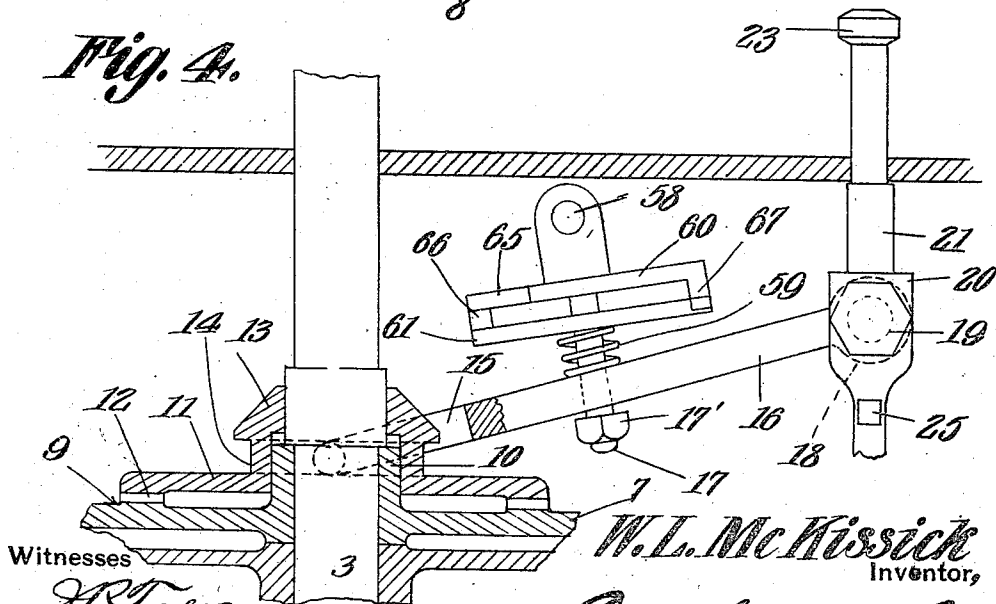
Patented Nov. 26, 1912.

5 SHEETS—SHEET 3.



*Fig. 3.*

*Fig. 4.*



Witnesses

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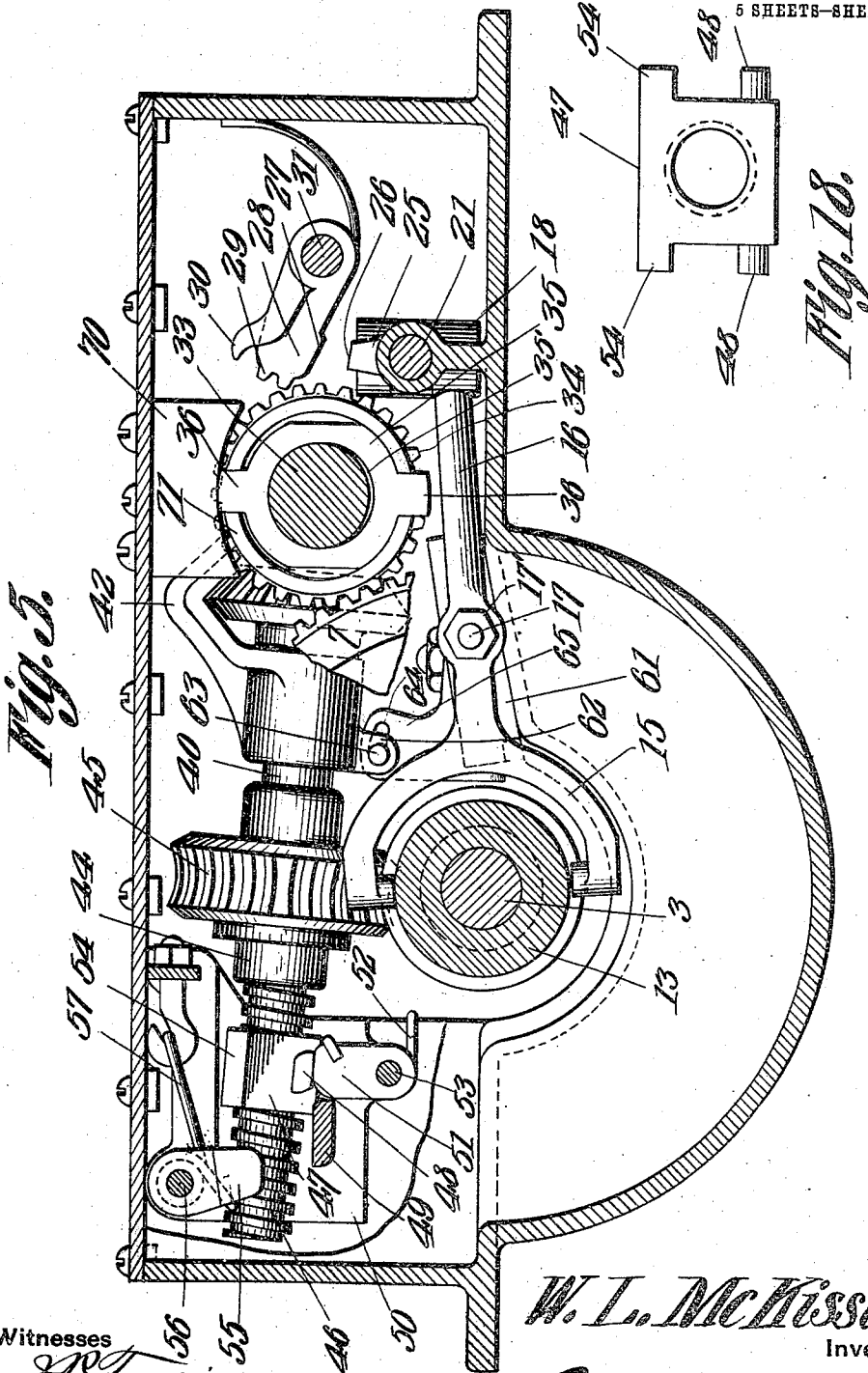
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5 SHEETS—SHEET 4.



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5 SHEETS—SHEET 5.

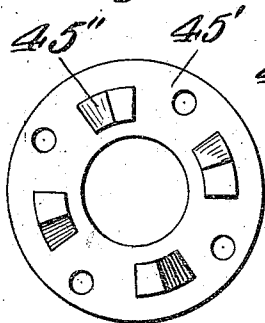
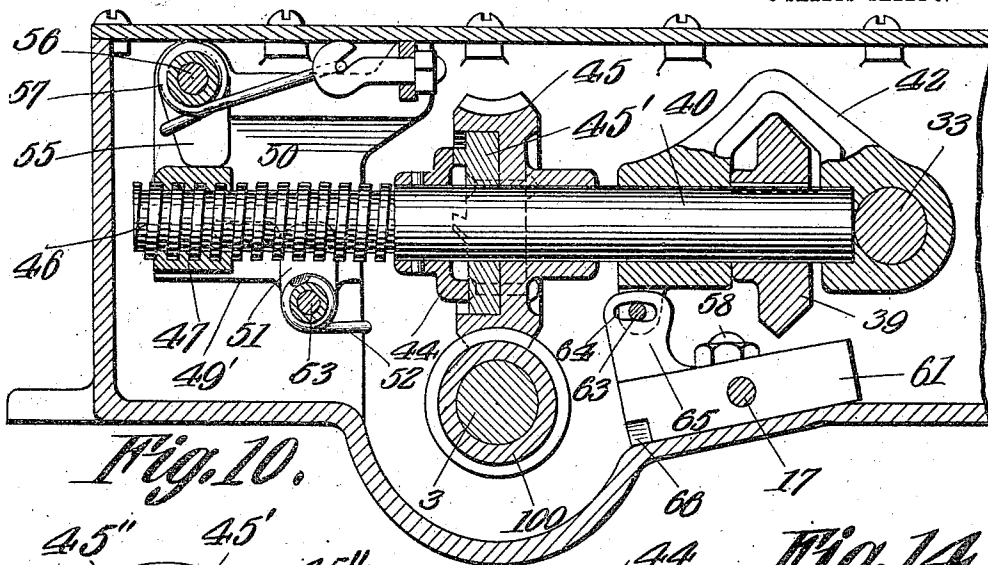


Fig. 11.

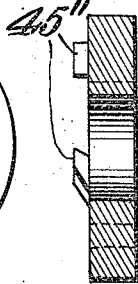


Fig. 12.

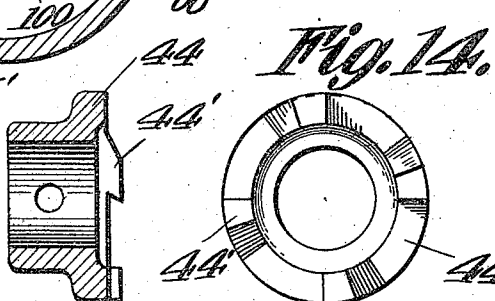


Fig. 13.

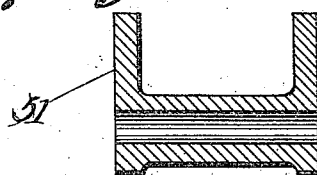


Fig. 14.

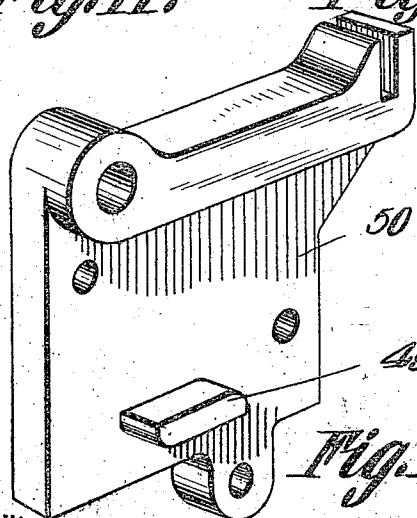


Fig. 15.

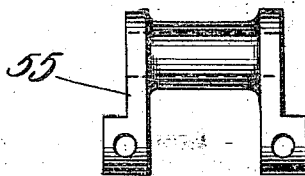


Fig. 16.

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# UNITED STATES PATENT OFFICE.

WILLIAM L. McKISSICK, OF CARLISLE, IOWA.

STARTING DEVICE FOR EXPLOSIVE-ENGINES.

1,045,422.

Specification of Letters Patent.

Patented Nov. 26, 1912.

Application filed November 13, 1911. Serial No. 660,004.

*To all whom it may concern:*

Be it known that I, WILLIAM L. McKISSICK, a citizen of the United States, residing at Carlisle, in the county of Warren and State of Iowa, have invented a new and useful Starting Device for Explosive-Engines, of which the following is a specification.

The present invention relates to improvements in starting devices for explosive engines, the primary object of the present invention being the provision of a spring motor adapted to be operably connected to the driving shaft of an explosive engine to be released to rotate the engine during the starting operation thereof, the same being provided with mechanism for reversing a clutch device to wind the spring after the same has started the engine through the operation of the engine itself, said clutch mechanism being so constructed as to automatically, when the spring motor has been wound to the proper tension be thrown out and retained in said wound condition.

A further object of the present invention is the provision of a novel form of release and clutch throwing device whereby a wound spring motor is released to rotate the engine shaft at the starting thereof, combined with mechanism operated from the shaft of the engine or motor after the spring motor has started the engine, to reverse the action of the shaft carrying the spring motor to wind the spring, a lock and release device being provided to be thrown in at the proper time to disengage the spring winding mechanism from the motor shaft and to lock the spring against a retrograde movement.

With the foregoing and other objects in view which will appear as the description proceeds, the invention resides in the combination and arrangement of parts and in the details of construction hereinafter described and claimed, it being understood that changes in the precise embodiment of invention herein disclosed can be made within the scope of what is claimed without departing from the spirit of the invention.

In the drawings—Figure 1 is a top plan view of the complete mechanism with the top of the casing removed therefrom to

show the internal mechanism, the parts being in the position they assume when the spring motor has started the engine shaft and is about to be rewound. Fig. 2 is a section taken on line 2—2 of Fig. 1. Fig. 3 is a section taken on line 3—3 of Fig. 1. Fig. 4 is a top plan somewhat in diagram showing the normal position of the parts when the release mechanism has been operated to permit the motor to start the engine. Fig. 5 is a section similar to Fig. 2 the parts being in the position they assume when the motor is operating to start the engine, the rewinding mechanism of the spring being thrown out of engagement. Figs. 6 and 7 are detail perspective views of the wedge plates disposed between the winding shaft of the apparatus and the clutch throwing lever. Fig. 8 is the pivoting lug for the fulcrum of said clutch throwing lever. Fig. 9 is a detail perspective view of the spring releasing rod. Fig. 10 is a cross section taken on line 10—10 of Fig. 1 the parts being in the position they assume when the operating rod is in the position as shown in Fig. 4. Figs. 11 and 12 are detail views of the clutch member carried by the spring winding gear of the pivoted shaft. Figs. 13 and 14 are detail views of the other clutch member keyed upon said shaft. Fig. 15 is a detail perspective view of one of the plates carrying the lug for imparting the tilting movement to the spring winding shaft. Figs. 16 and 17 are detail views of the cams used in connection with said plate shown in Fig. 15 for imparting the desired movement to the spring winding shaft. Fig. 18 is a detail view of the carrier mounted upon the feed screw of said spring winding shaft.

Referring to the drawings, the numeral 1 designates the main casing which is provided with the off-set portion 2, the engine or motor shaft 3 being journaled in the casing to one side of the off set 2, and provided with the annular starting sleeve 4 at its outer end, the threaded portion 5 surrounding the outer end of the shaft being for the reception of the removable cap 6 which seals the rotatable end of the shaft during the operation of the motor.

Mounted to normally loosely rotate upon

the shaft 3 intermediate of its ends is the large gear 7 provided with the peripheral teeth 8, and the internal clutch or ratchet teeth 9, the hub 10 of the said loosely rotatable wheel 7 fitting within the socketed portion of the keyed clutch disk 11, which is keyed upon the shaft 3 for sliding movement to and from the rotatable disk or gear 7, the said clutch member being provided with teeth 12 adapted to operate with the teeth 9 of the gear 7 when it is desired to rotate the shaft 3 in starting the engine. The slidably mounted clutch member 11 is provided with the annular shoulder portion 13 provided with the recess 14 for the reception of the actuating yoke 15 of the main clutch actuating lever 16, which is loosely mounted upon the pivotal stud of pin 17, and held thereon against outward movement by means of the lock nut 17'. Mounted on the extreme outer end of the clutch actuating lever 16 is a collar 18 which is mounted on the lower end of the stud 19 carried by the shouldered head 20 of the releasing and starting device operating rod or pin 21, which has mounted thereon between said head 20 and the adjacent portion of the casing 1, the coiled spring 22 which normally holds the shouldered head 20 so that the yoke portion 15 of the clutch actuating lever will hold the clutch out of operation. In order to oscillate the said starting rod or stud 21 the head 23 is disposed exteriorly of the casing and has connected thereto an operating lever 24 which may be operated by a handle or a foot lever disposed in the proper operable and accessible position.

Adjacent to the shouldered portion 20 of the operating stud or rod 21 is a lug 25 which is provided with the inclined face 26 to normally engage the inclined face 27 at the under side of the locking pawl 28, which is provided with the two teeth 29 and with the curved end or lip 30, the said pawl 28 being mounted upon the shaft 31 and held normally in the position as viewed in Fig. 2 by means of the coiled spring 32, the lug 25 limiting the downward movement of the said pawl 28 and holding the teeth thereof in mesh with the teeth of the gear 34, the teeth of the gear 34 and the teeth of the pawl 28 having a radius of the same length, the gear 34 being keyed and mounted upon the shaft 33 journaled in the casing 1 and the enlarged portion 2 thereof. Carried by the face of the gear 34 is a disk 35 capable of a sliding movement, as it is provided with the elongated bore 35'. The disk 35 is also provided with the oppositely disposed lugs 36, which engage the curved surface 71 of the lug 70, the purpose of which will later appear.

The gear 34 is provided upon its inner face with the beveled gear 38, which is in

mesh at all times with the beveled gear 39 keyed to one end of the shaft 40, the said shaft 40 being journaled for rotation in the sleeve 41 carried by the yoke or frame 42 whose bushing or sleeve 43 surrounds the shaft 33, with the said shaft 33 providing the pivotal point for the said yoke 42 and the shaft 40. Keyed upon the said shaft 40 is a disk 44 which coacts with the worm gear 45 mounted upon the shaft 40 while the extreme end of the shaft 40 beyond the disk 44 is provided with threads 46 which has mounted for movement thereupon the threaded nut or follower 47, which as clearly shown in Fig. 2 is provided with a lug or projection 48 from each side thereof which is adapted when in the position as shown in Fig. 2 and when the shaft 40 is rotated to move toward the lug 49 upon the under side thereof, said lug 49 preventing the free end of the shaft 46 from moving upward and permitting the lug 48 to engage the cam 51 to rock said cam upon its shaft against the tension of the spring 52, so that when the lug 48 has passed beyond the inner end of the lug 49, the said lug 48 will be raised so that the under side thereof will be opposed to the upper side of the lug 49 to lift the free end of the shaft 40 upwardly and the worm gear 45 out of mesh with the gear 100 keyed upon and rotatable with the shaft 3. The lugs 49 are carried by the plates 50 which are secured to the inner faces of the casing as shown in Fig. 1 and at the same time prevent the follower nut 47 from being rotated with the shaft 40 when the same is rotated. Disposed in the path of the upper face of the follower 47 as the said follower is moved in the opposite direction and when the lugs 48 are upon the lugs 49, is a cam 53 whose lower end is adapted to abut the upper face 54 of the follower 47 and be moved against the tension of the spring 57 so that the said cam 53 is rocked upon its shaft 56 and as the lugs 48 pass the respective lugs 46, the spring action from the cam 53 will tend to throw the free end of the shaft 40 downwardly and cause the same to assume the position as shown in Fig. 2.

The head of the pin or stud 17 is pivoted upon a stud 58 carried by the support 58' which is mounted in the casing 1, and upon the said stud is mounted a coiled or spiral spring 59 interposed between the inner face of the actuating lever 16 and the two plates 60 and 61. The plates 60 and 61 are disposed and provided with means to produce a wedging action as the shaft 40 is lowered so that its worm 45 will engage the worm 100 of the shaft 3 when it is desired to rewind the motor spring S which is connected to the shaft 33 and mounted in the projecting portion 2 of the main casing. Formed integral with and depending from the un-

der side of the bushing 41 of the frame 42 are two lugs 62 provided with a pin 63 mounted in the slot 64 of the projection 65 of the plate 60, said plate 60 being provided with a hooked cam portion 66 which is normally disposed below the inner free end of the plate 61 and with the cam hook 67 which is adapted to be opposed to the upper portion of the other free end of the plate 61, so that when the shaft 40 is lowered and carries with it the bushing or collar 41, the plate 60 is rotated upon the pin 17 so that the said plate 60 will present its hooked or cam portions 66 and 67 against the inner face of the plate 61 wedging said plate 61 thereaway from against the tension of the spring 59, thus presenting a yielding pressure against the lever 16 at this point and still retaining the clutch sleeve or member 11 in mesh with the rotatable clutch member or gear 7.

In order to prevent any injury to the main gear 45 of the shaft 40 should a back fire occur during the time that said gear is in mesh with the worm and also to permit the same to be placed in engagement with the worm of the main shaft 3 without injury thereto in movement to and from said worm gear upon the shaft 3, the said gear 45 is rotatably mounted upon the shaft 40 and has mounted in the cavity thereof the clutch disk 45' provided with the teeth 45'', which are disposed in operable relation to the clutch teeth 44' of the sleeve 44, said sleeve 44 being keyed upon and rotatable with the shaft 40 as clearly indicated in Figs. 10, 11, 12, 13 and 14.

Presuming that the motor spring S is wound and that the parts are in the position as shown in Fig. 5, that is the pawl 28 held in a horizontal position by the lug 25 carried by the actuating rod 21, the outer free end of the shaft 40 then being in a raised position so that the worm gear 45 will be out of mesh with the worm 100. In order to start the explosive motor and rotate the shaft 3, it is necessary to actuate the lever 24 so as to pull the actuating rod or stud 21 outwardly removing the lug 25 from engagement with the underside 27 of the actuating pawl 28, and as the tension of the motor spring is such as to rotate the shaft 33 and gear 34 in the direction of the arrow, Fig. 2, the pawl 28 will be moved downwardly and release the gear 34 this same action moving the sleeve 18 of the actuating lever 16 toward the front of the casing 1 so that the yoke member 15 will be moved inwardly and carry with it the slidably mounted clutch member 11 so that its clutch teeth 12 will engage the clutch teeth 9 of the rotatable gear or clutch member 7, and as the gear 34 is rotated, power or motion is transmitted through the gear 34 to

the teeth 8 of the rotatable clutch member 7 65 and by reason of the fact of the engagement of the clutch teeth 9 and 12, the member 11 will have motion transmitted to it through said member 7 carrying the teeth 9. The slidably mounted keved clutch member 11 70 transmits the desired motion to the shaft 3 and its pistons so that the engine is started. After the spring motor S has rotated the shaft 3 the proper distance, the shaft 40 having been rotated through the medium 75 of the gears 38 and 39, the lugs 48 are slid over and beyond the lug 49, so that the free end of the shaft 40 falls in the position as shown in Fig. 2 and by reason of the fact that the worm 45 meshes with the worm 80 100, motion is transmitted to the shaft 40 to pull the follower 47 in the direction of the arrow, Fig. 2, so that the lug 48 will ride below the lugs 49, and simultaneously with this movement of the worm gear 45 85 into mesh with the worm gear 100, the collar or bushing 41 moves the plate 60 downwardly so as to hold the plate 61 against the action or the tension of the spring 59, and thus provides the spring fulcrum upon 90 the pin 17 for the actuating lever 16.

As the lugs 48 approach the cam 51 the same are locked until the said lugs 48 pass beyond the faces or edges of the lugs 49, at which time the spring 52 causes the cam 51 95 to raise the lugs 48 and consequently lift the free end of the shaft 40 upwardly and lift the worm 45 out of mesh with the worm 100. The shaft 40 due to the operation of the spring motor S during the starting of 100 the engine will be rotated in a reverse direction through the gears 39 and 38 so as to move the follower 47 in an opposite direction to the arrow, Fig. 2, until it is actuated to be moved downwardly by means of the 105 spring cam 55 as shown in Fig. 2. During the rotation of the shaft 33 to wind the spring of the spring motor S, the clutch teeth 9 and 12 of the respective clutch members 7 and 11, ride without interlocking, 110 thus permitting the member 7 to be free. At this time the pawl 28 and the lip 30, due to the removal of the lug 25 from below the pawl 28, is in such a position that the lugs 36, rotating will strike the lip 30 and 115 thus lift the pawl 28 to the position, as shown in Fig. 2, so that the operating stud or rod 21 will be moved inwardly under the tension of the spring 22 to again bring the lug 25 below the pawl 28 and thus lock the 120 gear 34 and the spring motor S against a retrograde movement, as the follower 48 has partly lifted the free end of the shaft 40, consequently moving the wedging plate 60 to engage the plate 61, the spring 59 will 125 be moved over against the actuating lever 16 to provide a cushioned fulcrum for said lever at this time.

By means of the elongated slot 35' of the disk 35, the outer face of the lugs 36, are brought into sliding contact with the curved face 71 of the lug 70 supported in the casing 1, this action causing the lug engaged to be moved toward the shaft 33, and the opposite lug 36' projected, so that the lip 30 will not be struck by the upper lug after leaving the lug 70.

What is claimed is:—

1. The combination with the shaft of an explosive motor, of a starting device therefor, comprising a spring motor, a clutch upon the engine shaft, one member of said clutch being connected to and operable by the spring motor, and free to rotate in two directions, a yoke pivoted to the shaft of the spring motor, a shaft mounted in said yoke and operably connected to the spring motor shaft, the outer free end of said shaft being free to have a vertical movement, a clutch operating lever connected to the other member of the clutch, an arresting pawl for the spring motor, means for holding same in arresting position, means for releasing said holding means to actuate the clutch lever and transmit motion from the spring motor shaft to the shaft of the engine, means for permitting the free end of the pivoted shaft to operably engage the engine shaft to rewind the spring motor, and means carried by the pivoted frame for regulating the movement of the actuating lever at its fulcrum.

2. An explosive engine starting device, comprising a casing, an engine shaft journaled in the casing, a slidably mounted clutch member keyed upon said shaft, a rotatable clutch member mounted upon the shaft and provided with peripheral teeth, another shaft, a spring motor connected to said shaft, a gear carried by said spring motor shaft and in mesh at all times with the rotatable gear of the clutch member, a frame pivoted upon the spring motor shaft, a shaft journaled in said frame and having one end operably connected with the gear upon the spring motor shaft, and a worm gear mounted upon the engine shaft, another worm gear mounted upon said yoke carried shaft to be moved into and out of mesh with the worm gear of the engine shaft, a lever connected to the slidable member of the clutch, a sliding rod connected to the free end of said lever, a spring thereon for normally exerting tension to hold the slidable member out of engagement with the rotatable member, means for locking the spring motor gear to retain the motor in wound position, carried by said slidable rod, means for operating said rod against the tension of the spring to operate the sliding clutch and release the gear locking device, means for throwing the worm gear of the

yoke carried shaft into and out of mesh with the worm gear of the engine shaft automatically, and means carried by the pivoted frame for regulating the movement of the actuating lever at its fulcrum.

3. The combination with the shaft of an explosive motor, of a starting device therefor, comprising a spring motor, a clutch upon the engine shaft, one member of said clutch being connected to and operable by the spring motor, and free to rotate in two directions, a yoke pivoted to the shaft of the spring motor, a shaft mounted in said yoke and operably connected to the spring motor shaft, the outer free end of said shaft being free to have a vertical movement, a clutch operating lever connected to the other member of the clutch, and a resting pawl for the spring motor, means for holding same in a resting position, means for releasing said holding means to actuate the clutch lever and transmit motion from the spring motor shaft to the shaft of the engine, means for permitting the free end of the pivoted shaft to operably engage the engine shaft, to rewind the spring motor, a pin forming the fulcrum for the actuating lever mounted in the casing below the pivoted yoke, a spring and two wedge plates mounted upon said pin, and means for connecting one end of one of said plates to the pivoted yoke whereby each respective plate is moved into wedging action and from wedging action with relation to the other plate.

4. An explosive engine starting device, comprising a casing, an engine shaft journaled in the casing, a slidably mounted clutch member keyed upon said shaft, a rotatable clutch member mounted upon the shaft and provided with peripheral teeth, another shaft, a spring motor connected to said shaft, a gear carried by said spring motor shaft and in mesh at all times with the rotatable gear of the clutch member, a frame pivoted upon the free spring motor shaft, a shaft journaled in said frame and having one end operably connected with the gear upon the spring motor shaft, and a worm gear mounted upon the engine shaft, another worm gear mounted upon said yoke carried shaft to be moved into and out of mesh with the worm gear of the engine shaft, a lever connected to the slidable member of the clutch, a sliding rod connected to the free end of said lever, a spring thereon for normally exerting tension to hold the sliding member out of engagement with the rotatable member, means for locking the spring motor gear to retain the motor in wound position, carried by said slidable rod, means for operating said rod against the tension of the spring to operate the sliding clutch and release the gear locking device, means for throwing the worm gear of the

yoke carried shaft into and out of mesh with the worm gear of the engine shaft automatically, a pin forming the fulcrum for the actuating lever mounted in the casing below the pivoted yoke, a spring and two wedge plates mounted upon said pin, and means for connecting one end of one of said plates to the pivoted yoke whereby each respective plate is moved into wedging action and

from wedging action with relation to the 10 other plate.

In testimony that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

WILLIAM L. MCKISSICK.

Witnesses:

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GEO. MYERS.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."