A. V. WINEGARDEN.

STARTING DEVICE FOR EXPLOSION ENGINES.

APPLICATION FILED MAY 16, 1911.

1,052,782.

Patented Feb. 11, 1913.

2 SHEETS—SHEET 1.

Fig. 1.

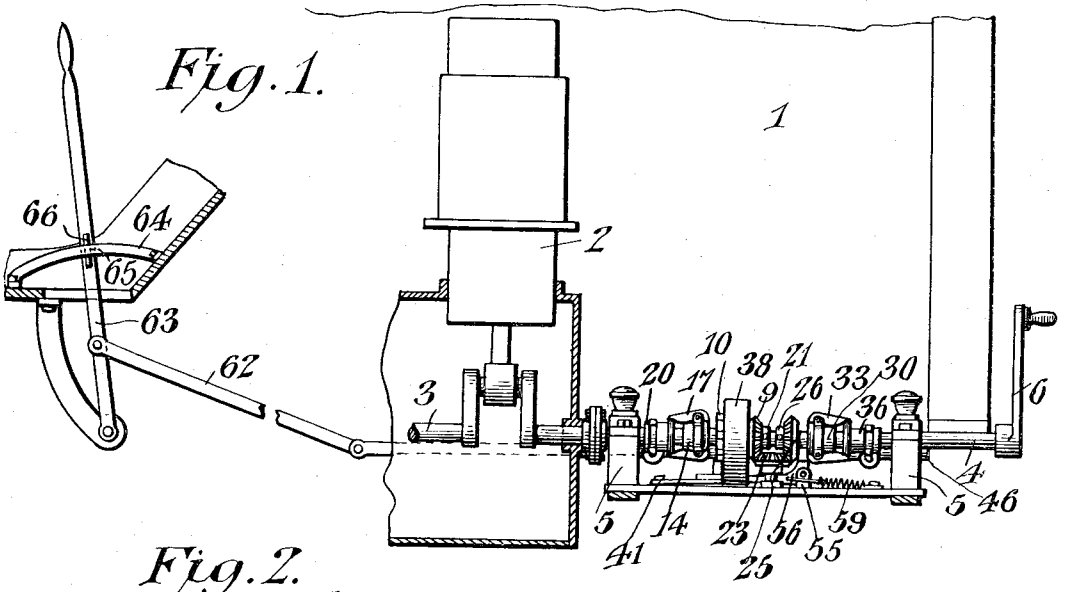


Fig. 2.

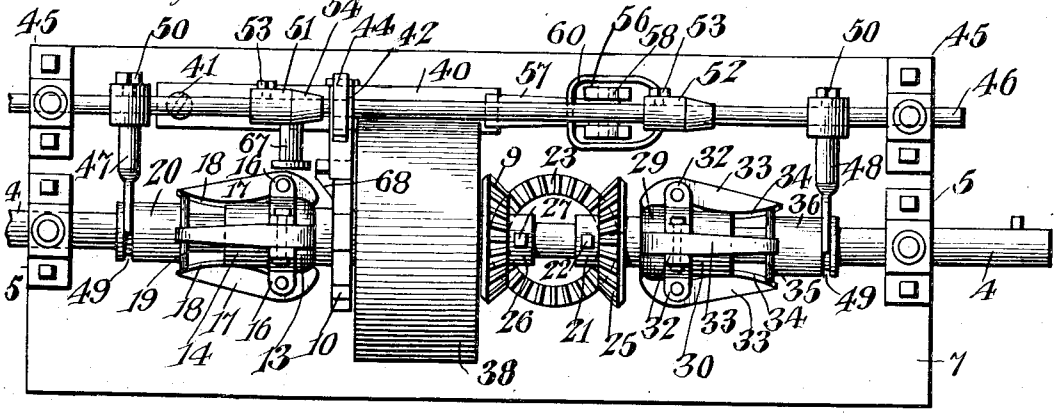


Fig. 5.

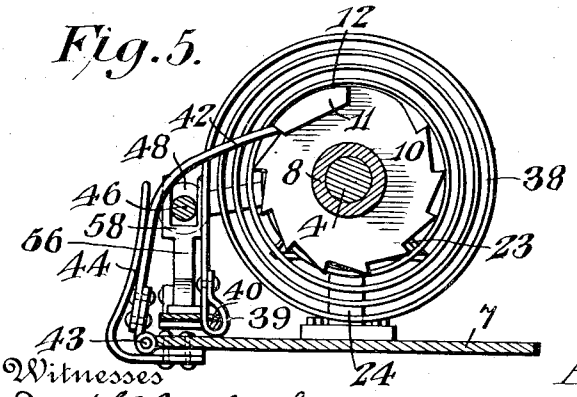
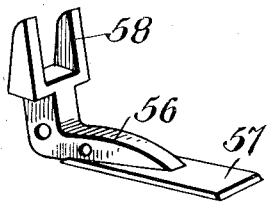


Fig. 6.



Witnesses

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2 SHEETS—SHEET 2.

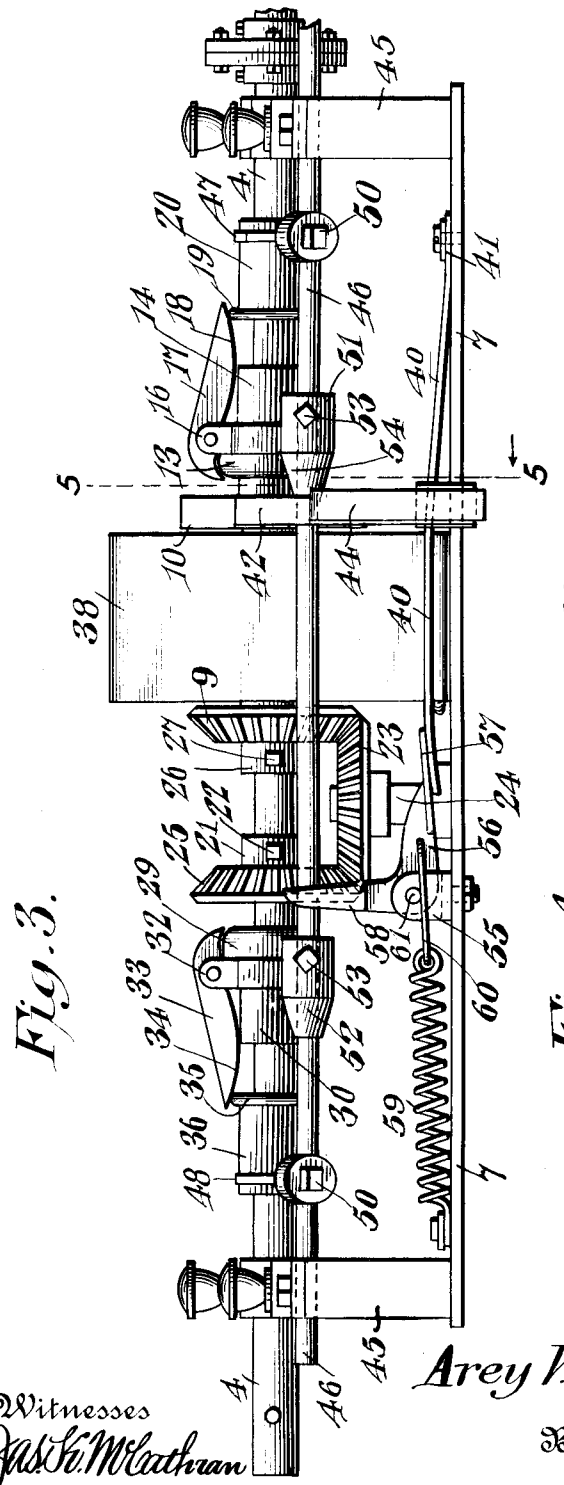

Fig. 3.

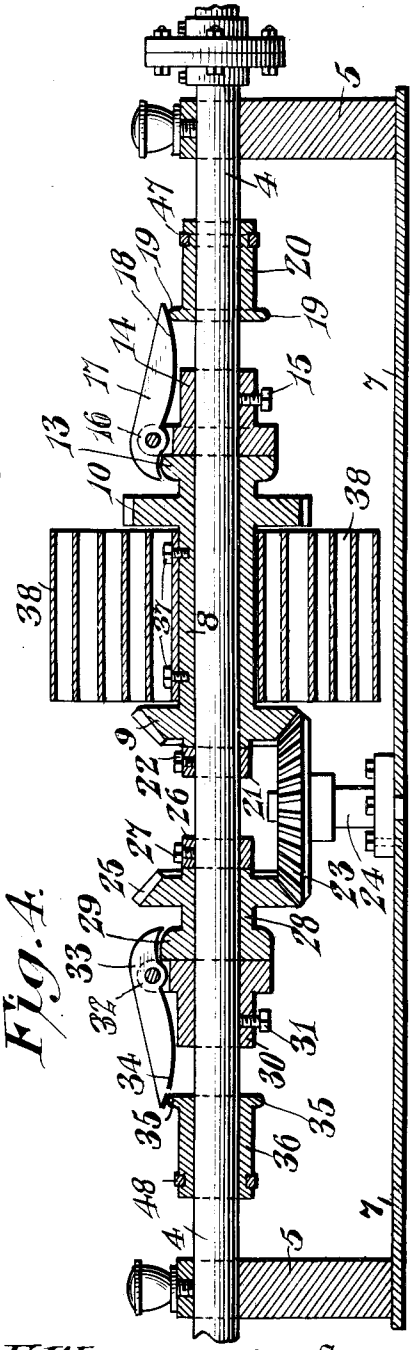

Fig. 4.

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UNITED STATES PATENT OFFICE.

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STARTING DEVICE FOR EXPLOSION-ENGINES.

1,052,782. Specification of Letters Patent. Patented Feb. 11, 1913.

Application filed May 16, 1911. Serial No. 627,584.

To all whom it may concern:

Be it known that I, AREY V. WINEGARDEN, a citizen of the United States, residing at Eldorado, in the county of Butler and State of Kansas, have invented a new and useful Starting Device for Explosion-Engines, of which the following is a specification.

This invention has reference to improvements in starting devices for explosion engines, and its object is to provide a means whereby power may be stored to be utilized when desired to impart to the crank shaft of an explosion engine one or more rotations in order to establish the power cycle, whereafter the engine will continue to run in the usual manner, while the power may be again stored in the power storing mechanism by the running engine, and the device be automatically cut out from connection with the running engine when the capacity of the power storing means has been reached.

The invention comprises a device to be attached to an explosion engine, and more particularly to the engine of an automobile, whereby cranking is avoided, except under emergency conditions, when the engine may be cranked through the device the same as though the latter were not present. The power storing means employed is by preference a spring carried by a shaft, which in turn is coupled to the crank shaft of the engine, but the spring is connected to the shaft carrying it only at the will of the operator through suitable clutch mechanisms, while the arrangement is such that when the initial rotary impulse has been imparted to the engine shaft, the spring is disconnected automatically, but may be again put into service at the will of the operator if the initial impulse proves insufficient, it being customary to make the spring of such capacity as to be capable of imparting two or more starting impulses to the engine without rewinding. Furthermore, the construction is such that at the will of the operator the device may be so set that the running engine will cause a winding of the spring for the storing of power, and when the capacity of the spring is reached, it will operate a trip, which will cause the engine to be disconnected from the spring, but the latter is held against return movement to its initial unwound condition until purposely released by the operator.

The invention will be best understood from a consideration of the following detailed description, taken in connection with the accompanying drawings forming a part of this specification, with the understanding, however, that while the drawings show a practical form of the invention, it is susceptible of various modifications and changes while still retaining the salient features of the invention, and, therefore, the invention is not limited to the exact showing of the drawings.

In the drawings:—Figure 1 is an elevation with parts in section of the starting device with so much of the showing of an explosion engine and adjacent parts of an automobile as will illustrate the application of the invention. Fig. 2 is a plan view on a larger scale than Fig. 1 of the starting device. Fig. 3 is an elevation of the starting device on a scale somewhat larger than that of Fig. 2. Fig. 4 is a longitudinal section with some parts in elevation of the structure of Fig. 3. Fig. 5 is a section on the line 5—5 of Fig. 3. Fig. 6 is a perspective view of a trip device used in connection with the structure.

Referring to the drawings, there is shown in Fig. 1 in outline a portion of a hood 1 of an automobile without any attempt to illustrate any special form of hood or any details of the structure, and there is shown also an engine 2 likewise illustrated indicatively and without attempt to show any details, it being understood that the engine is, as is customary, of the explosion type and is provided with a crank shaft 3, it being immaterial whether the engine be of the single or multi-cylinder form.

Coupled to and in line with the shaft 3 is another shaft 4 constituting the shaft of the starting device, and this shaft is provided with journal bearings 5 of any suitable type in which it may rotate freely. The end of the shaft 4 remote from that connected to the shaft 3 is sufficiently extended to receive a crank 6, whereby the shaft may be rotated to impart an initial rotative movement to the engine shaft 3 should under any circumstances such procedure become necessary. The bearings 5 are shown as mounted upon a base or support 7 in the form of a plate, but it will be understood that this is largely indicative and the support for these bearings will depend entirely

upon the particular type of automobile in which the device is installed. At a point about midway of the distance between the bearings 5 the shaft carries a sleeve 8 which may terminate in or have attached to it at one end a bevel gear 9, while at the other end the sleeve has formed on it or attached to it a ratchet wheel 10, this ratchet wheel, however, having on one side an offset 11, adjacent which latter the ratchet wheel may have a smooth peripheral section 12 for a purpose which will presently appear. The sleeve 8 is continued beyond the ratchet wheel 10 and terminates in a radial rib 13 adjacent which there is secured a hub 14 on the shaft 4 in any suitable manner, as by a set screw 15. The hub 14 is provided with a suitable number of radial pairs of ears 16, between which are pivoted dogs 17, each with one end formed to engage the rib 13, which latter may be rounded or be of any other appropriate shape, so that the ends of the dogs 17 designed to engage the rib 13 may have a sufficient expanse of engaging surface to provide an appropriate frictional engagement to cause the dogs and flange to move together under circumstances to be described. The ends of the dogs 17 remote from the flange engaging ends are elongated and formed with cam surfaces 18 designed to be engaged by an annular rib 19 on a sleeve 20 capable of sliding longitudinally of the shaft 4. The hub 14 being secured to the shaft 4 by a set screw 15 acts as a stop or confining member for the sleeve 8, preventing it from moving longitudinally of the shaft 4 in one direction, while a set collar 21 held to the shaft 4 by a set screw 22 is so located as to engage the corresponding face of the gear 9 and thus prevent longitudinal movement of the sleeve 8 in the other direction along the shaft 4.

The bevel gear 9 meshes with an idler bevel gear 23 mounted on a post 24 carried by the base 7, and this idler gear has meshing with it another bevel gear 25 mounted on the shaft 4 and held against movement in one direction along said shaft by a set collar 26 held in place by a set screw 27. The bevel gear 25 has formed on it on the face remote from the collar 26, a hub 28 terminating in an annular radial flange 29 similar to the flange 13. Mounted on the shaft 4 is a hub 30 similar to the hub 14, and like the latter held to the shaft by a set screw 31. The hub 30 is formed with pairs of radial ears 32, each pair carrying a dog 33 like the dog 17 and for a similar purpose, each dog having at the end remote from that designed to engage the flange 29 an inner bevel edge 34 in the path of an annular rib 35 on a sleeve 36 similar to the sleeve 20 and capable of sliding longitudinally of the shaft 4.

The purpose of the sleeves 20 and 36 is to engage the respective dogs 17 and 33 and cause them to grip the respective flanges 13 and 29 and as the hubs 14 and 30 are fast to the shaft 4 the sleeve 8 will either be directly coupled as when coupled to the hub 14, or through the idler gear 23, as when coupled to the hub 30, the arrangement being such that only one set of dogs is active at a time to couple the sleeve 8 to the shaft 4.

Secured to the sleeve 8 by screws 37 or in any other appropriate manner is one end of a spring 38, which may be a flat spring of the spiral type of sufficient power for the purposes of the present invention. The other end of the spring 38 is shown in the drawings as formed into a loop 39 made fast to a spring 40 near the free end of the latter, the spring being of the leaf type with the end remote from that connected to the spring 38 secured to the base 7, as indicated at 41. The spring 40 is of such strength that the spring 38 may be wound to the full extent desired before the spring 40 will yield to any material extent, and it is only when the spring 38 is practically wound up that the spring 40 will yield sufficiently for the purposes of the present invention.

The ratchet wheel 10 is under the control of a pawl 42 which may be pivoted to the base 7 as indicated at 43, and is held to the ratchet wheel by a spring 44, whereby the pawl 42 is of the spring type, yielding to the passage of the teeth of the ratchet wheel, which latter are one-way teeth, and the pawl will by engaging these teeth prevent the spring from unwinding under the effect of the stored power.

Adjacent the bearings 5 are other bearings 45 carrying a longitudinally movable rod 46, this rod and the pawl 42 being so related that it extends between the pawl 42 and the ratchet wheel 10. Fast to the rod 46 are two forks 47, 48, respectively, in straddling relation to the respective sleeves 20 and 36, the latter being each provided with an annular groove 49 for the lodging of the forks. By this means the sleeves 20 and 36 will participate in longitudinal movements of the rod 46, the forks holding the rod against rotative movements, since these forks are made fast to the rod by suitable set screws 50, and the forks permit the sleeves 20 and 36 to rotate with the shaft 4 when such movement is necessary. It will be observed that the two sleeves move simultaneously in the same direction, but are presented oppositely to the respective dogs 17 and 33, so that when the sleeve 20 is moved into operative relation to the cam edges 18 of the dogs 17 the sleeve 36 is moved away from the cam edges 34 of the dog 33, and the contrary is also true, from which it will be seen that but one set of dogs

is movable actively into engagement with the respective flanges 13 or 29, as the case may be, to couple the sleeve 8 to the shaft 4. Since the spring on being wound must receive motion in one direction and on unwinding the same part of the spring moves in the opposite direction, it follows that since the shaft 4 must always rotate in the same direction as is the case in automobile engines, the motion imparted to the sleeve 8 by being coupled to the shaft 4 through the intermediary of the dogs 17 is contrary to that imparted to the sleeve 8 on being coupled to the shaft 4 by the dogs 33, the difference in motion being provided for by the idler gear 23.

Carried by the rod 46 are two blocks 51, 52, respectively, each fixed to the rod by a set screw 53 or by any other appropriate means, and one of these blocks, the block 51, has one end tapered, as indicated at 54.

Fast to the base 7 is a yoke 55 in which is pivoted an angle lever 56 having an arm 57 in overriding relation to the free end of the spring 40 and another arm 58 forked and straddling the rod 46 in position to engage the block 52. The lever 56 is under the control of a spring 59 connected at one end to the base 7 and at the other end by a link 60 to the lever 56 to one side of the pivot of this lever, which pivot is indicated at 61, and the arrangement is such that as the lever 56 is rocked on its pivot the link 60 will pass to one side or the other of the pivot in accordance with the direction of rocking of the lever.

It has already been stated that the rod 46 is movable longitudinally and to cause this movement there is provided a link 62 connecting the rod to a lever 63 which may be of the hand type and located within easy reach of the operator of the automobile. This lever is made to play along a segment 64 which at an intermediate point may be provided with a notch 65 designed to receive a tongue 66 carried by the lever to lock the latter in an intermediate position, the resiliency of the lever being sufficient to cause it to seat in the notch, but permitting the displacement of the tongue 66 from the notch at the will of the operator.

When the rod 46 is moved in a direction to cause the dogs 33 to grip the flange 29, the block 52 is moved toward the arm 58 of the lever 56 and will act on this lever to cause the arm 57 to move toward the spring 40, the link 60 ultimately passing the pivot pin 61, and so acting as an elastic lock for holding the lever 56 in the new position, this position being shown in Fig. 3. At the same time the block 51 is carried in a direction away from the pawl 42. The clutch formed of the dogs 33 and associated flange 29, the dogs being under the control of the sleeve 36, operates to wind the spring 38, the idler gear 23 transmitting the motion from the gear 25 to the gear 9 and the latter being connected to the sleeve 8 winds the spring from the interior, while the outer end of the spring 38 is connected to the leaf spring 40. The winding continues until the spring has been put under its full tension, the ratchet 10 turning idly with relation to the pawl 42. Ultimately the tension of the spring 38 exceeds the resistance of the spring 40 and the latter follows the free end of the spring 38, but because the free end of the spring 40 is in underriding relation to the arm 57 the lever or trip 56 is moved toward and into engagement with the block 52, and this block is moved in a direction to cause a movement of the rod 46, which will move the sleeve 36 out of active engagement with the dogs 33, and the latter will ungrip from the flange 29, so that the shaft 4 is uncoupled from the spring and the winding ceases. The movement just described of the rod 46 is participated in by the lever 63, and after the clutch dogs 33 have become inactive but before the clutch dogs 17 can become active, the lever 63 has reached the central locking position and the tongue 66 is dropped into the notch 65, thus stopping the rod 46 and holding it in the intermediate or neutral position, the trip 56 being now elastically locked by the link 60 and spring 59.

Suppose now that it is desirable to start the engine, the latter having in the meantime been stopped. The operator grasps the lever 63 and moves it in the appropriate direction, which is the opposite to that first considered, and is in the same direction as the movement of the rod 46 just described. The continued movement of the rod 46 in the one direction brings the taper end 54 of the block 51 into engagement with the pawl 42 and the latter is lifted away from locking engagement with the teeth of the ratchet 10, thus releasing the latter, but simultaneously with this movement the fork 47 has caused a movement of the sleeve 20 to actively engage the dogs 17. Since the pawl 42 has been moved out of holding relation to the ratchet 10, the spring is free to expand, but since the hub 14 is locked to the sleeve 8 by the clutch dogs 17, the expansive force of the spring is communicated to the shaft 4 and the latter is rotated. This rotative movement continues until the block 11 on the ratchet 10 is brought into engagement with the block 51, which latter carries an offset 67 in the path of this block and the said block is formed with a beveled face 68 so as to engage the offset to move the block 51 in a direction the reverse of which it was moved to bring it into engagement with the pawl 42 and the effect of this movement is to return the lever 63 to the neutral locked position with the rod 46 also in the

neutral or central position, this movement causing the uncoupling of the hub 14 from the sleeve 8 and the release of the pawl 42 which at once returns into engagement with the periphery of the ratchet 10, but in order to permit the action of the cam portion 68 of the block 11, the smooth peripheral surface 12 is provided and the ratchet wheel 10 continues to rotate until the tooth beyond the smooth portion 12 is engaged by the pawl.

By suitably proportioning the parts the shaft 4 may be given a single rotation each time the spring is released and by making the spring of appropriate size it may be made to give several successive rotative movements to the shaft 4 at the will of the operator, the said operator releasing the spring to impart a single rotative movement to the shaft each time the lever 63 is manipulated in the proper direction. When the parts are in the intermediate or neutral position the shaft 4 is wholly disconnected from the spring and may be rotated by the crank 6 to crank the engine in the usual manner, but such cranking is only necessary should some accident happen to the rest of the device, and is provided simply as an emergency means so that the breaking down of any part of the starting device will not interfere with the starting of the engine by hand by means of the crank.

It will be understood that when the device is installed in an automobile a suitable casing is provided, so that dust and dirt is excluded, but such casings being commonly used, it is not deemed necessary to show one in the drawings.

What is claimed is:—

1. In an engine starting device, a shaft adapted to be coupled to the engine to be started, power storing means on and normally disconnected from the shaft and having a power storing capacity and power movement to impart a plurality of starting impulses to the engine, oppositely operating means manually controllable in both directions for coupling the power storing means to the shaft and having an intermediate inactive position, and means for automatically throwing out of operation the manually controllable means for coupling the power storing means to the shaft to start the engine when the power storing means has moved actively to a predetermined extent for less than the full power movement thereof.

2. In an engine starting device, a shaft adapted to be directly coupled to the engine to be started, a power storing means on and normally disconnected from said shaft, oppositely operating means for coupling the power storing means to the shaft and having an intermediate inactive position, means for actuating the coupling means in either direction at will, means controlled by the power storing means for throwing one of the coupling means out of operation when the power storing means has reached a predetermined capacity, and means for throwing the other coupling means out of operation when the power storing means is moved actively to a predetermined extent for less than the full power movement thereof, whereby there may be successive startings of the engine at will for each power storing operation.

3. In an engine starting device, a shaft adapted to be directly coupled to the engine to be started, a power storing means on and normally disconnected from the shaft, means for normally holding the power storing means against active movement, a clutch carried by the shaft for coupling the power storing means thereto for movement in one direction by such power storing means, another clutch carried by the shaft for coupling the power storing means thereto for movement by said power storing means in the other direction, a reciprocatory member having means for controlling one clutch when moved in one direction and the other clutch when moved in the other direction, means for moving the reciprocatory member in either direction at will, automatic means for moving the reciprocatory member in one direction to unclutch the shaft from the power storing means on the attainment of a predetermined storage of power, and automatic means for moving the reciprocatory member to unclutch the power storing means from the shaft when the power storing means has moved actively to a predetermined extent for less than the full power movement thereof.

4. In an engine starting device, a shaft adapted to be directly coupled to the engine to be started, power storing means carried by said shaft and normally disconnected therefrom, oppositely acting clutches mounted on the shaft for coupling the power storing means to said shaft, one clutch operating to couple the power storing means to the shaft for storing power and the other clutch acting to couple the power storing means to the shaft for rotating the latter, a slidable actuating member for the clutch connected to the latter to operate one clutch on the movement of the slidable member in one direction and the other clutch on the movement of the said slidable member in the other direction, a retaining means for the power storing means for holding it normally against active movement, means on the slidable member for actuating the retaining means to release the power storing means when coupled to the shaft for actuating, the latter means controlled by the power storing means for moving the slidable member to inactive position when the capacity of the power storing means has been reached, and means also controlled by the

power storing means for moving the slidable member to inactive position to release the retaining member for the power storing means when the latter has driven the shaft to a predetermined extent.

5. In an engine starting device, a shaft adapted to be connected to the engine to be started, a sleeve mounted on said shaft for rotation thereon, said sleeve being provided at one end with a gear wheel and at the other end with a ratchet wheel, a spring connected at one end to the sleeve and at the other end to a relatively fixed part of the device, retaining means for normally holding the ratchet wheel and through it the spring under tension, means for moving the retaining means to release position, clutches mounted on the shaft on opposite ends of the sleeve, reversing gear connected between one of the clutches and the gear wheel of the sleeve, and means for moving the clutches into and out of operative position with relation to the sleeve in accordance with the direction of movement of said means.

6. In an engine starting device, a shaft adapted to be connected to the engine to be driven, a sleeve mounted thereon and provided at one end with a ratchet wheel and at the other with a gear wheel, a spring on said sleeve fast at one end thereto and at the other end fast to a relatively fixed part of the device, a pawl adapted to engage the ratchet wheel, means for moving the pawl to release the ratchet wheel, reversing gear connected to the gear wheel, clutches mounted on the shaft at opposite ends of the sleeve. the reversing gear being interposed between one of the clutches and the sleeve, and a slidable member for moving one clutch into active position and the other clutch out of active position in accordance with the direction of movement of said slidable member.

7. In an engine starting device, a shaft adapted to be coupled to the drive shaft of the engine, a spring loosely mounted on the shaft, means for holding the spring against reactive movement on being put under tension, another spring connected to a fixed portion of the device and having the end of the first named spring remote from the shaft connected thereto, coupling means carried by the shaft for connecting the first named spring thereto, means for moving the coupling means into and out of active position, and means other than the last named means and controlled by the second named spring for moving the coupling means to the inactive position when the first named spring has reached a predetermined state of tension.

8. In an engine starting device, a shaft adapted to be coupled to the power shaft of the engine to be started, a spring carried by the first named shaft in normally disconnected relation thereto, means for holding the spring against reactive movement on being put under tension, coupling means for connecting the said spring to the shaft and disconnecting it therefrom, another spring connected to the first named spring and resistant thereto until the first named spring has been put under a predetermined degree of tension, means for operating the coupling means, and a trip member in operative relation to the coupling operating means and also to the second named spring for operation by the latter to move the coupling means to the inactive position.

9. In an engine starting device, a shaft adapted to be coupled to the power shaft of the engine to be started, a spring carried by the first named shaft in normally disconnected relation thereto, coupling means for connecting the said spring to the shaft and disconnecting it therefrom, another spring connected to the first named spring and resistant thereto until the first named spring has been put under a predetermined degree of tension, means for operating the coupling means, and a trip member in operative relation to the coupling operating means and also to the second named spring for operation by the latter to move the coupling means to the inactive position, said trip member being provided with actuating means for moving it independently of the second named spring.

10. In an engine starting device, a shaft adapted to be coupled to the engine to be started, a spring carried by the shaft and normally disconnected therefrom, another spring connected to the end of the first named spring remote from the shaft and responsive to the first named spring only when the latter has received a predetermined tension, a coupling means for connecting the first named spring to and disconnecting it from the shaft, operating means for said coupling means, and a trip member adapted to move the operating means for the coupling means in a direction to uncouple the spring from the shaft, said trip member being responsive to the second named spring when the latter is moved by the first named spring, said trip member being provided with actuating means for moving it after it has received an initial impulse from the second named spring.

11. In an engine starting device, a shaft adapted to be coupled to the engine to be started, a spring mounted on the shaft and normally disconnected therefrom, a coupling means for connecting the spring to and disconnecting it from the shaft, a slidable member for operating the coupling means, another spring connected to the first named spring and movable by the latter when the said first named spring has

reached a predetermined degree of tension, a pivoted trip member in operative relation to the coupling operating member and also to the second named spring, and another spring controlling the trip member and movable to opposite sides of the pivot of the trip member for locking the latter in different positions and actuating the said trip member when its spring has moved to either side of the pivot of said trip member.

12. In an engine starting device, a shaft adapted to be connected to the engine to be started, an actuating spring for the shaft normally disconnected therefrom, means for holding the spring from reactive movement on being put under tension, clutch members carried by the shaft in fixed relation thereto and each in operative relation to the spring, one for winding the spring and the other for receiving motion from the spring, slidable members on the shaft for operating the clutches, a longitudinally movable member controlling the slidable members, and means adapted to be controlled by an operator for actuating said longitudinally movable member, the means under the control of an operator comprising a lever and a one point lock therefor, to opposite sides of which lock the lever is movable, said lock marking the neutral position of the lever.

13. In an engine starting device, a shaft adapted to be coupled to the engine to be started, a spring carried by the shaft and normally disconnected therefrom, a ratchet controlled by the spring, a pawl for said ratchet for holding the spring under tension, a coupling member for connecting the spring to the shaft, a slidable member controlling the coupling member and provided with means for moving the pawl out of engagement with the ratchet when the coupling member is moved into active position, and means carried by the ratchet for causing the movement of the coupling member to inactive position and to release the pawl to engage the ratchet.

14. In an engine starting device, a shaft adapted to be connected to the engine to be started, a spring on said shaft and normally disconnected therefrom, a coupling member for connecting the spring to the shaft, a ratchet constantly connected with the spring, a pawl for said ratchet for holding the spring under tension, a slidable member for controlling the coupling connecting the spring to and disconnecting it from the shaft, a cam block carried by the slidable member and movable thereby into engagement with the pawl to move the latter away from the ratchet, a cam member on the ratchet and a coacting member on the cam member carried by the slidable member for causing the movement of the slidable member in a direction to release the pawl and at the same time move the coupling member to inactive position at a predetermined point in the rotation of the ratchet.

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

AREY V. WINEGARDEN.

Witnesses:

V. P. MOONEY,

E. D. STRATFORD.