J. B. RUNNER.

STARTER FOR HYDROCARBON ENGINES.

APPLICATION FILED JUNE 20, 1910.

974,525.

Patented Nov. 1, 1910.

2 SHEETS—SHEET 1.

Fig. 1.

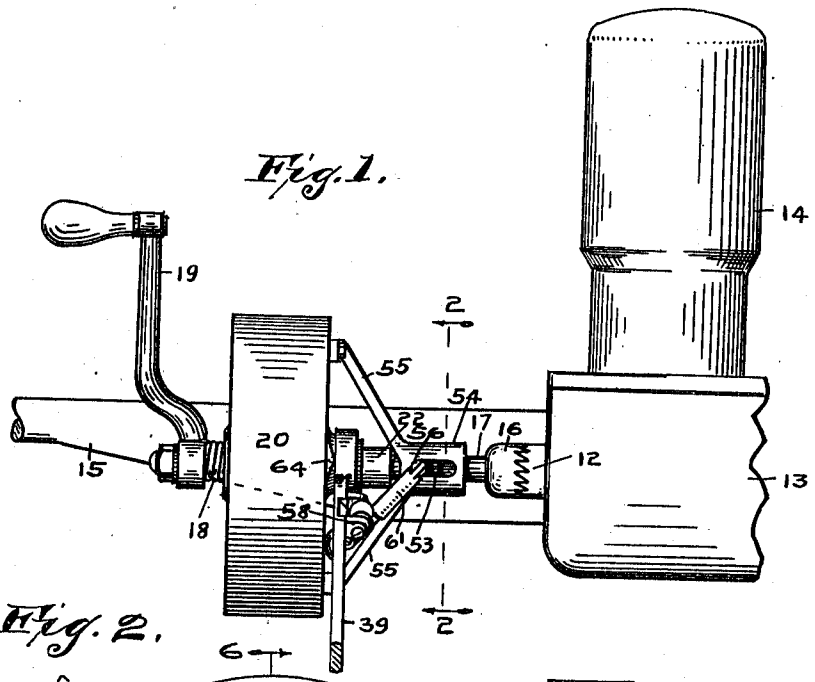


Fig. 2.

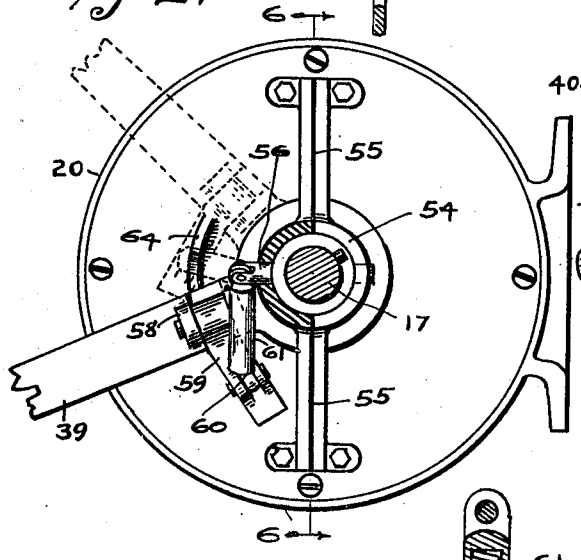


Fig. 3.

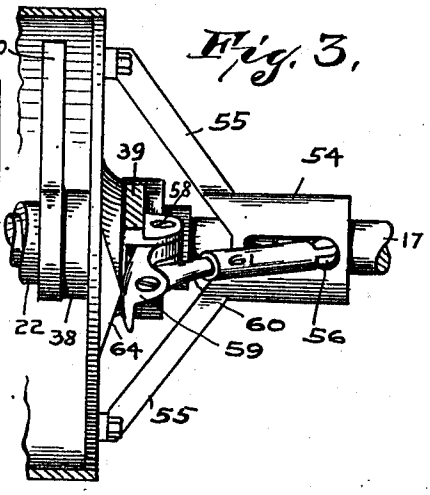
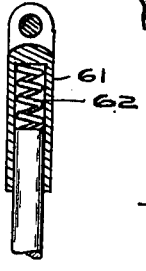


Fig. 4.



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2 SHEETS—SHEET 2.

Fig. 6.

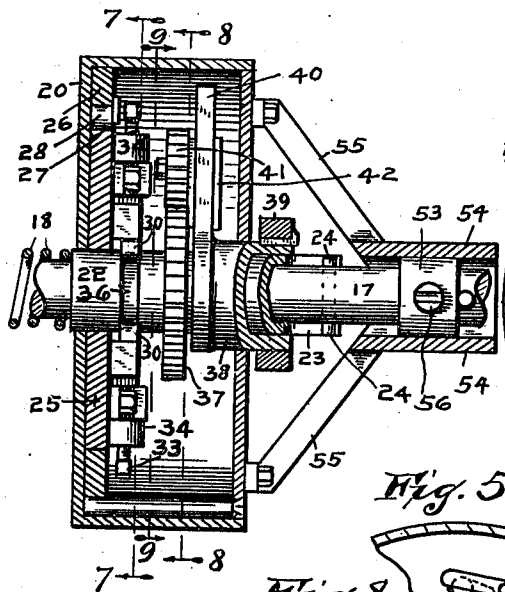


Fig. 7.

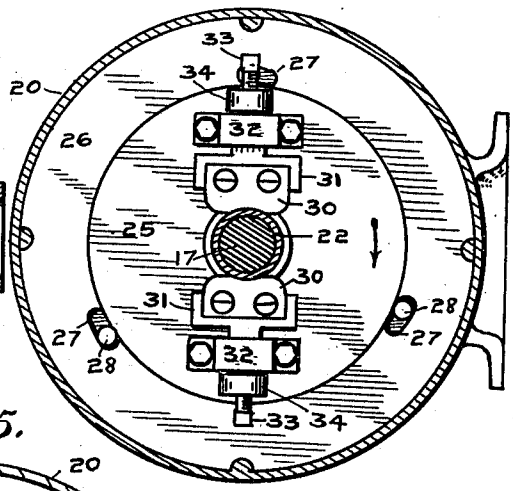


Fig. 5.

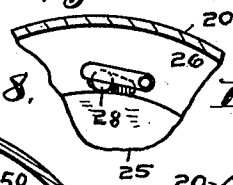


Fig. 8.

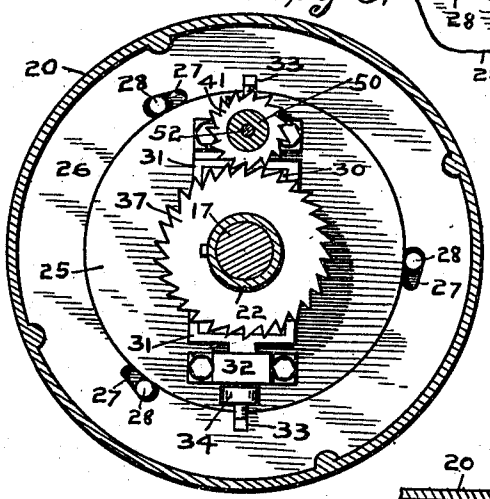


Fig. 9.

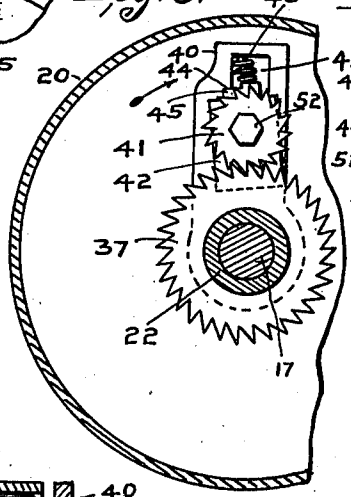


Fig. 10.

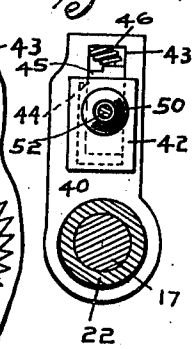
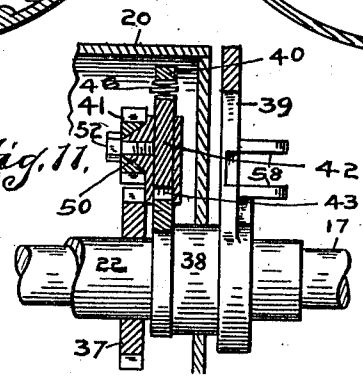


Fig. 11.



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UNITED STATES PATENT OFFICE.

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STARTER FOR HYDROCARBON-ENGINES.

974,525. Specification of Letters Patent. Patented Nov. 1, 1910.

Application filed June 20, 1910. Serial No. 567,968.

To all whom it may concern:

Be it known that I, JOHN B. RUNNER, a citizen of the United States, residing at Indianapolis, in the county of Marion and State of Indiana, have invented certain new and useful Improvements in Starters for Hydrocarbon-Engines, of which the following is a specification.

This invention relates to improvements in starters for hydrocarbon explosive engines, and is particularly adapted to such engines used on automobiles and boats.

The object of the invention is to provide a safety means to prevent injury to the operator and to the machine caused by back-firing in the cylinder while the engine is being cranked in starting it.

The object, also, is to provide a simple and practicable mechanism whereby the initial rotation of the crank shaft in starting the engine of an automobile may be secured by the operator while he remains in his seat in the machine.

These and other objects of the invention are accomplished by the mechanism illustrated in the accompanying drawing, in which—

Figure 1 is a side elevation of my invention showing it in operative relation with the engine cylinder and crank-case of an automobile; Fig. 2 is a section on the line 2—2 of Fig. 1, looking in the direction of the arrows; Fig. 3 is a detail on a larger scale than shown in Fig. 1 of the mechanism for throwing the clutch coupling on the crank-shaft into engagement; Fig. 4 is a detail in longitudinal section of the spring-barrel in said mechanism for operating the clutch-coupling; Fig. 5 is a detail showing the manner of retaining the locking rollers in their seats; Fig. 6 is a section on the line 6—6 of Fig. 2; Fig. 7 is a section on the line 7—7 of Fig. 6; Fig. 8 is a section on the line 8—8 of Fig. 6; Fig. 9 is a section on the line 9—9 of Fig. 6 part of the case being broken away; Fig. 10 is a view of the arm which carries the small ratchet wheels, showing both ratchet wheels removed, and Fig. 11 is a view showing both ratchet wheels and supporting arm for the small one in section.

Like characters of reference indicate like parts throughout the several views of the drawings.

Referring first, particularly to Fig. 1, 12 is a half-clutch on the end of the crank-shaft of the engine which shaft (not shown) is located within the casing 13. 14 is a cylinder of an explosive engine and 15 is part of the frame of an automobile, said frame, cylinder and crank-case being of any suitable and usual construction. 16 is a clutch-half mounted on a shaft 17 and which mates with the part 12 to couple shaft 17 with the engine crank shaft when the two parts 12 and 16 are mutually engaged. The shaft 17 is longitudinally adjustable and is moved normally outward by a spring 18 to separate the coupling. A crank 19 on the outer end of shaft 17 serves the usual purpose for normally rotating the crank shaft of the engine, through shaft 17, for starting the engine.

The operative parts of my invention are assembled within or secured to a drum-like case 20 with flat heads and cylindrical sides which case is fastened to the frame 15, and surrounds shaft 17. Loosely mounted on the shaft 17 and passing through the case 20 is a sleeve 22, the walls of which at its inner end are slotted on two diametrical sides at 23 to receive the ends of a pin 24 carried by shaft 17, whereby motion of translation is transmitted to the shaft independently of the sleeve, but both sleeve and shaft must rotate together.

Mounted on the sleeve 22 in a fixed manner within the case against the outer head of the latter is a circular disk 25 which makes a close fit within a ring 26 which is rigidly secured to or is an integral part of the said outer head of case 20. The ring 26 is provided with recesses 27 to receive rollers 28 which bear against the edges of the disk 25. The recesses taper toward the rear or in the opposite direction from the rotary travel of the shaft 17 in properly cranking the engine. The purpose of this is to act as an automatic lock to the plate 25 and prevent its back movement, while permitting its unrestricted forward movement. When the back pressure, however, exceeds a limit of safety so as to endanger the mechanism, I provide a friction release. This comprises a pair of brake shoes 30 held in radially adjustable holders 31 mounted on diametrically opposite sides of sleeve 22. These holders have stems which are slidingly held

by blocks 32, and the pressure of the shoes against sleeve 22 is regulated by set screws 33 passing through threaded openings in lugs 34 of plate 25, and bearing against the ends of the stems of said holders. The shoes will preferably be of indurated fiber, wood or other material than metal and will enter an annular channel 36 in the sleeve.

Mounted in a fixed manner on the sleeve 22 is a ratchet wheel 37, and mounted on sleeve 22 on the opposite side of the ratchet wheel 37 from brake shoes 30 is an elongated hub 38 one end of which terminates on the outside of the case 20, and is provided with a lever 39 by means of which a rocking movement may be transmitted to the hub 38. The lever 39 will generally be connected by the usual rods with a hand or foot lever (not shown), conveniently mounted in the body of the machine near the operator's seat.

Mounted on the inner end or that end of the hub 38 which is within the case 20, is an arm 40 which carries a small ratchet wheel 41, the function of which is to serve as a pawl to engage the teeth of the ratchet wheel 37, by the rocking of hub 38, and impart a progressive rotary movement to the sleeve 22, and through sleeve 22 to the shaft 17. To avoid a lock between the two wheels 37 and 41 when the arm 40 is moved in a direction to secure a new hold of ratchet wheel 41 on wheel 37, and also to release the two ratchet wheels in case of backfiring of the engine, I mount the ratchet wheel 41 on a block 42 which is slidingly mounted in a slot 43 extending longitudinally of the arm 40, and provide a shoulder 44 in the slot to engage a corner 45 of the block when the movement of arm 40 is in the direction to cause its wheel 41 to normally rotate wheel 37. The block will be pressed down constantly by a spring 46. When the arm 40 is moved in the direction of the arrow, Fig. 9, the block 42 will engage the shoulder of slot 43 and the teeth of wheel 41 will drivingly engage those of wheel 37, but when the movement of arm 40 is in a direction opposite that indicated by the arrow the block will be released and will move out in its slot as shown in Figs. 10 and 11, thereby releasing the wheel 37. As an additional safe guard against injury to the mechanism by back-firing, I provide a cone projection 50 on block 42, on which the ratchet wheel 41 is mounted. The wheel 41 has a corresponding conical hole to receive the cone 50 and is retained thereon by a bolt 52 by means of which the frictional engagement between the wheel and cone may be regulated so as to cause the wheel 41 to slip on the cone above a predetermined strain.

I will now describe the means for so moving the shaft 17 longitudinally in opposition to spring 18, as to unite the clutch members 12 and 16 and couple the shaft 17 to the crank shaft of the engine. The shaft 17 is provided with a radially projecting pin 52, and loosely mounted on the shaft between said pin and the pins 24 is a collar 53 which is surrounded by a sleeve 54. The sleeve 54 is supported in a fixed manner by arms 55 from the adjacent drum of the case 20 and for convenience in assembling, the sleeve 54 and arms 55 will be split, as shown in Fig. 2. The sleeve has a longitudinal slot for the projection therethrough of a pin 56 carried by the collar 53. The lever 39 has a pair of integral ears 58, between which a shoe 59 is pivoted, and this shoe is connected with the pin 56 on collar 53 by a telescoping rod 60. The barrel 61 of this telescoping rod contains a spring 62 which normally elongates the rod but allows it to shorten when an abnormal strain as from back-firing is delivered to it. A cam flange 64 projecting from the adjacent head of case 20, in the path of shoe 59, moves the shoe outwardly, and by its connection through the rod 60 with collar 53 moves the latter toward the crank-case 13 and thereby moves shaft 17 longitudinally coupling the shaft 17 to the crank-shaft of the engine. The position on the case-head of the cam-flange 64 depends upon when in the movement of lever 39 it is desired to couple shaft 17 to the engine shaft. If it be so placed that the shoe will be thrown out and the coupling made during the first period of travel of the lever then the remaining travel of the lever will operate through the mechanism as described, in case 20, to crank the engine, making it unnecessary for the operator to leave his seat for this purpose. The lever 39 can be moved back to first position and a new hold taken for cranking purposes, and this repeated until the engine has started properly. Every forward movement of shaft 17 will be held by the cam-lock rollers 28 and in case of back-firing, injury to person and machinery is obviated at three places (1) at the brake-shoe connection between plate 25 and sleeve 22, (2) by the disengagement of ratchet wheel 41 from its mate 37 and (3) by the easement and uncoupling afforded by spring 62 in barrel 61.

The operation of my invention is as follows: When the shaft 17 is disconnected from the crank shaft of the engine and it is desired to bring the starting device into use, the lever 39 is moved toward cam-flange 64, causing the shoe 59 to be thrown out sufficiently to press collar 53 against the radial pins on shaft 17, and move the shaft longitudinally into clutch connection with the engine crank shaft, and the engine is cranked by the continued movement of lever 39. This continued movement of the lever 39 also rotates sleeve 38 on which it is mounted, thereby oscillating arm 40 and

engaging ratchet wheel 37 by ratchet wheel 41 carried by arm 40. The sleeve 22 on which wheel 37 is mounted is thus rotarily moved and by the friction engagement of shoes 30 in holders 31, which holders are carried by disk 25, the disk 25 will be rotarily moved. When the lever 39 is moved on its return travel the sliding block on which wheel 41 is mounted is thrown out of engagement with shoulder 44 in slot 43, allowing the wheel 41 to move up out of engagement with wheel 37 and enable wheel 41 to get a new hold on wheel 37. Back movement of the disk 25 is prevented by rollers 28 in the rearwardly tapering recesses 27. Injury caused by back-firing is prevented by the release afforded by the regulated engagement between the wheel 41 and its cone mounting 50; also by the predetermined friction of shoes 30 against sleeve 22, allowing the release of disk 25 above certain strains, and still again by the compression of spring 62 in the connection between the shoe 59 and sleeve 53.

Having thus fully described my invention what I claim as new and wish to secure by Letters Patent of the United States, is—

1. The combination, with an engine, of a shaft, a coupling for detachably connecting the engine and shaft, a sleeve mounted on the shaft, a ratchet wheel mounted on the sleeve, means for permitting rotation in only one direction of the sleeve on the shaft, a lever having a hub through which the shaft passes, an arm on the hub of the lever, and means on the arm for drivingly engaging the ratchet wheel as the hub is rocked by the lever.

2. The combination, with an engine, of a shaft, manual means for rotating the shaft, a coupling for detachably connecting the engine and shaft, a fixed ring, a circular disk rotating with the shaft and making a close working fit in the ring, said ring having rearwardly tapering recesses next to the disk, rollers in said recesses to lock the disk against back travel, and means for permitting the shaft to turn in the disk at a predetermined back strain comprising radially adjustable brake-shoes secured to the disk, and means for regulating the inward pressure of said shoes.

3. The combination, with an engine, of a shaft, a coupling for detachably connecting the engine and shaft, a fixed ring, a circular disk rotating with the shaft and making a close working fit in the ring, said ring having rearwardly tapering recesses next to the disk, rollers in said recesses to lock the disk against back travel, a lever having a hub through which the shaft passes, a ratchet wheel, means for rotating the disk by the rotation of the ratchet wheel, an arm on the hub of the lever and means on the arm for drivingly engaging the ratchet wheel as the hub is rocked by manually operating the lever.

4. The combination, with an engine, of a shaft, a coupling for detachably connecting the engine and shaft, a fixed ring, a circular disk rotating with the shaft and making a close working fit in the ring, said ring having rearwardly tapering recesses next to the disk, rollers in said recesses to lock the disk against back travel, a lever having a hub through which the shaft passes, a ratchet wheel, means for rotating the disk by the rotation of the ratchet wheel, an arm on the hub of the lever, a ratchet wheel on the arm, and means for causing driving engagement between the two wheels at one travel of the arm and disengagement at the other.

5. The combination, with an engine, of a shaft, a coupling for detachably connecting the engine and shaft, a fixed ring, a circular disk rotating with the shaft and making a close working fit in the ring, said ring having rearwardly tapering recesses next to the disk, rollers in said recesses to lock the disk against back travel, a lever having a hub through which the shaft passes, a ratchet wheel, means for rotating the disk by the rotation of the ratchet wheel, an arm on the hub of the lever, a ratchet wheel on the arm, means for causing driving engagement between the two wheels at one travel of the arm and disengagement at the other, and means connecting the coupling and lever to connect the shaft by a movement of the lever.

6. The combination, with an engine, of a shaft, a coupling for detachably connecting the engine and shaft, a fixed ring, a sleeve mounted on and rotating with the shaft, a circular disk loosely mounted on the sleeve and making a close working fit in the ring, said ring having rearwardly tapering recesses next to the disk, rollers in said recesses to lock the disk against back travel, a friction means for securing the disk to the sleeve to permit its movement on the latter under a predetermined strain, a ratchet wheel mounted in a fixed manner on the sleeve, a lever having a hub loosely mounted on the sleeve said hub having an arm, and means carried by the arm for actuating the ratchet wheel.

7. The combination, with an engine, of a shaft, a coupling for detachably connecting the engine and shaft, a fixed ring, a sleeve mounted on and rotating with the shaft, a circular disk loosely mounted on the sleeve and making a close working fit in the ring, said ring having rearwardly tapering recesses next to the disk, rollers in said recesses to lock the disk against back travel, a friction means for securing the disk to the sleeve to permit its movement on the latter under a predetermined strain, a ratchet

wheel mounted in a fixed manner on the sleeve, a lever having a hub loosely mounted on the sleeve said hub having an arm, means carried by the arm for actuating the ratchet wheel, and means connecting the lever with said coupling to operate the latter.

8. The combination, with an engine, of a shaft, a coupling for detachably connecting the engine and shaft, a fixed ring, a sleeve mounted on and rotating with the shaft, a circular disk loosely mounted on the sleeve and making a close working fit in the ring, said ring having rearwardly tapering recesses next to the disk, rollers in said recesses to lock the disk against back travel, a friction means for securing the disk to the sleeve to permit its movement on the latter under a predetermined strain, a ratchet wheel mounted in a fixed manner on the sleeve, a lever having a hub loosely mounted on the sleeve said hub having an arm, said arm having a longitudinal slot, a block slidingly mounted in the slot, means for locking and unlocking the block in the slot by the movement of the arm, and a ratchet wheel mounted on the block to engage said first ratchet wheel.

9. The combination, with an engine, of a shaft, a coupling for detachably connecting the engine and shaft, a fixed ring, a sleeve mounted on and rotating with the shaft, a circular disk loosely mounted on the sleeve and making a close working fit in the ring, said ring having rearwardly tapering recesses next to the disk, rollers in said recesses to lock the disk against back travel, a friction means for securing the disk to the sleeve to permit its movement on the latter under a predetermined strain, a ratchet wheel mounted in a fixed manner on the sleeve, a lever having a hub loosely mounted on the sleeve said hub having an arm, said arm having a longitudinal slot, a block slidingly mounted in the slot, means for locking and unlocking the block in the slot by the movement of the arm, a ratchet wheel mounted on the block to engage said first ratchet wheel, and means carried by the lever for operating said coupling.

In witness whereof, I have hereunto set my hand and seal at Indianapolis, Indiana, this 28th day of May, A. D. one thousand nine hundred and ten.

JOHN B. RUNNER. [L. S.]

Witnesses:
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L. B. WOERNER.