

1,060,487.

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GAS ENGINE STARTER.
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Patented Apr. 29, 1913.

2 SHEETS—SHEET 2.

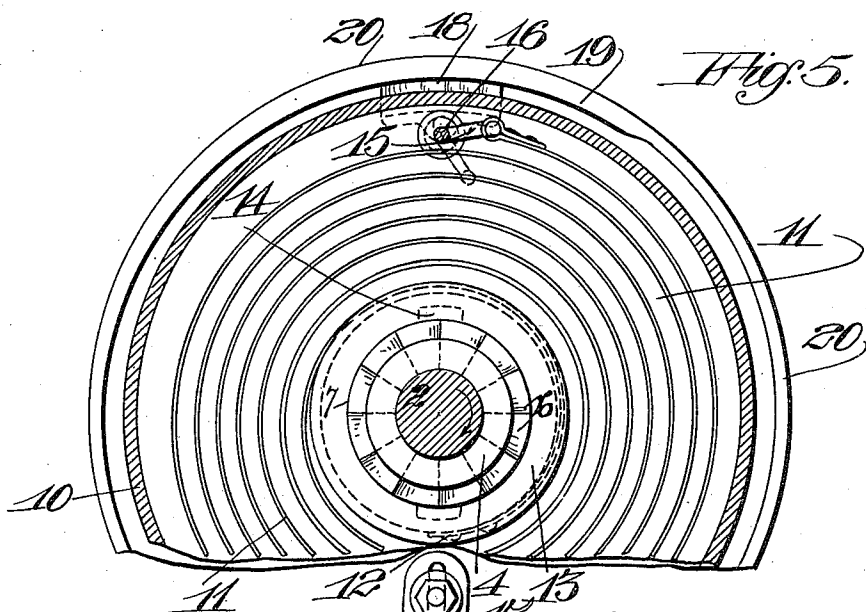
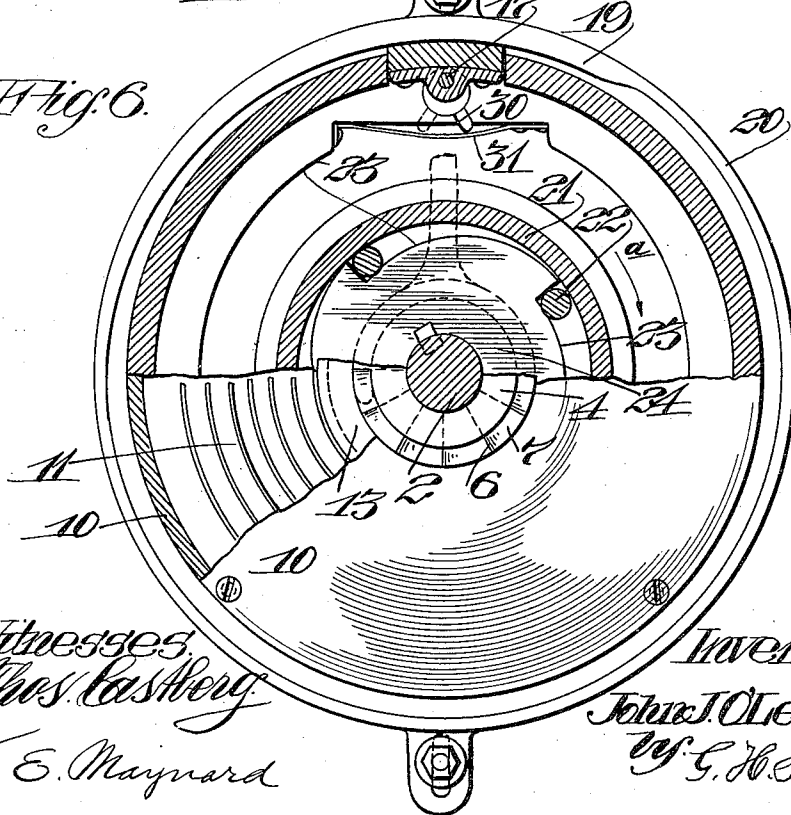


Fig. 6.



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UNITED STATES PATENT OFFICE.

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GAS-ENGINE STARTER.

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Specification of Letters Patent.

Patented Apr. 29, 1913.

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To all whom it may concern:

Be it known that I, JOHN J. O'LEARY, a citizen of the United States, residing at Healdsburg, in the county of Sonoma and State of California, have invented new and useful Improvements in Gas-Engine Starters, of which the following is a specification.

This invention relates to automatic starting devices for internal combustion engines.

It is the object of the present invention to provide a power conserving apparatus which may be mechanically energized by the driven shaft of the engine, to which the device is connectible, when the engine is running; which will automatically uncouple itself from the controlling device when the power conserving elements have been sufficiently tensioned; and which is simple, reliable and effective in operation.

The invention consists of the parts and the construction and combination of parts, as hereinafter more fully described and claimed, having reference to the accompanying drawings, in which—

Figure 1 is a vertical longitudinal section through the starting device with certain parts in elevation. Fig. 2 is a detail view of the spring end latch. Fig. 3 is a detail perspective view of the dogging hook. Fig. 4 is a detail perspective view of the brake-shoe eccentric and actuator. Fig. 5 is a section on line X—X, Fig. 1. Fig. 6 is a side elevation partly broken away to show the roller clutch.

In the illustrated embodiment of the present invention 2 is a shaft of an internal combustion engine which may be mounted upon a vehicle or other structure in a bearing 3; the shaft projecting somewhat forward of the bearing and having keyed or firmly secured on itself a clutch collar 4 having a series of ratchet teeth 5 normally in engagement with complementary teeth 6 on the end of a sleeve 7, which is loose on the shaft 2 and normally projected into mesh with the teeth 5 of the clutch 4 by an expansible spring 8. One end of the spring reacts against a wall 9, forming one part of a casing 10, in which is mounted a coil or spiral spring 11 one end of which is connected, as at 12, to a hub 13 to which is splined, as at 14, the sleeve 7. The inner end of the spring 11 being secured at 12 to the hub 13 and this being secured against circumferential movement relative the clutch sleeve 7, when the clutch member 4 is driven in the

direction of the arrow *a*, Fig. 1, the spring 11 will be wound or tensioned within the drum; the outer end of the spring being connected to a crank 15 secured to a shaft 16 journaled in the drum 10 and having an eccentric or crank portion 17 on the opposite side of the plate 9. When the spring is wound to the desired tension, through means of the clutch 4 driving the members 7 and 13, the crank 15 at the end of the spring will be drawn downwardly to the position indicated in Fig. 2, and the eccentric 17 shifted so as to carry a brake-shoe or block 18 out of the path of engagement with a cam surface 19, Fig. 5, formed on the inner surface of a stationary housing 20. When the brake is free, the spring tends to pull the drum around the shaft. Normally the clutch members 4—7 are in engagement while the shaft 2 is running and the housing or drum 10 is revolved, carrying around with it the eccentric shaft 16 and the eccentric 17 with its brake-shoe 18.

On one side of the wall 9 opposite to the spring 11 there is formed a flange 21 designed to incase a plurality of clutch rollers 22, which are effective, when the flange 21 is drawn in the direction of the arrow *a*, Fig. 1, to ride up over cam teeth 23 formed on the periphery of a collar 24 keyed on the shaft 2 between one face of the plate 9 and the opposite face or closure 25 of the drum 10, thus locking the drum 10 to the shaft and the inner end of the spring pulling clutch 7 anti-clockwise.

Having placed the starting spring 11 under the desired tension by revolving its winding hub 13 by means of the clutch members 4—7 and with the flange 21 holding rollers 22 tight on teeth 23, then when it is desired to start the shaft 2 from idle position, the operator presses on a lever 28 or other suitable device having teeth 29 engageable with the extremities of the teeth 6 on the slidable sleeve 7, thus shifting the sleeve into the drum 10, compressing the spring 8, and when the teeth 6 are shifted clear of the teeth 5 of the drum 4, then the tension of the spring 11 will be sufficient to revolve the casing 10 by reason of the connection of the spring through the crank 15 and the shaft 16. As the casing 10 revolves, the flange 21 of the wall 9 holding the rollers 22 into frictional binding contact with the teeth 23 the force of the spring will be applied to the collar 24,

which is keyed to and will revolve the shaft 2.

One of the important features of the present invention is the means whereby the movements of the spring at its upper end and the brake-shoe 18 are rendered automatic and locked in certain positions which the parts will attain during the operation of the device. This peculiar mechanism consists in the present instance of the crank 15 which, as stated before, will swing downwardly and rock the shaft 16 when the spring is under tension, thus drawing the brake-shoe 18 downwardly by the downward movement of the eccentric 17 which is formed with the shaft 16. During this lowered position of the brake-shoe 18, it may revolve freely within the stationary flange or ring 20, so long as the spring is under tension, but after the operator has actuated the lever 28 to disengage the clutch member 7 from the shaft clutch 4 and the tension of the spring has been expended in revolving the shaft 2 to start the engine, then at a certain period of unwinding of the spring 11, the end which is connected to the crank 15 will expand or move outwardly and lift the crank to rock the shaft 16, and this in turn will move the eccentric 17 outwardly to carry its shoe 18 into frictional engagement with the internal cam 19 of the ring 20. The operator, after having disconnected the clutch members 4—7, by shifting points 29 of the lever to disengage the teeth 5—6, will hold the clutch member 7 out of mesh with the shaft clutch 4, until the engine has obtained considerable speed, during which time the housing 10 will be checked against rotation by the engagement of the brake-shoe 18 with the fixed cam 19. Meanwhile the teeth 23 of the hub 24 will run freely within the flange 21 and the friction rollers 22 will be inoperative. When the operator releases pressure from the device 28, the clutch member 7 will automatically shift into mesh with the shaft clutch 4, and then the rotation of the clutch member 7 will be imparted through the hub 13 to wind the spring 11 until sufficient tension has been given the same to pull the crank 15 downwardly and simultaneously shift the brake-shoe 18 out of frictional engagement with the fixed cam 19 and pull drum 10 slightly around the collar 24 to lock rollers 22. It is desirable to prevent the shoe 18 from gradually running into engagement with the fixed cam 19 by the gradual unwinding of the spring 11, and it is also desirable to quickly snap the brake-shoe 18 out of engagement with its complementary cam surface 19 when the spring 11 has been given the desired tension. In order to accomplish this control of the movement of the outer end of the spring and its connected crank 15, there is provided as a part of the shaft

16 a pin or radial arm 30, which swings over a spring plate 31 secured to the end wall 25. The angular relation of the pin 30 to the eccentric 17 is such that when the main spring 11 is under sufficient tension, it will draw the crank 15 downwardly and likewise effect the eccentric 17 and force the pin 30 across the surface of the spring 31 by passing it beneath the center of the shaft 16 to the position indicated in Fig. 2; the pressure of the spring 31 being amply sufficient to prevent the return of the finger or arm 30 beneath the shaft until the spring 11 has again unwound and its force is sufficient to draw the pin 30 backwardly again across the spring 31, when the block 18 is shifted by its eccentric 17 outwardly to engage the fixed cam surface 19. The brake-shoe 18, after it has been thrust outwardly and stopped by the cam surface 19, is held in that position by the lock spring 31 acting upon the finger 30, until the spring 11 is again drawn or tensioned with sufficient pressure to force the finger 30 across the surface of its resistance spring 31. Thus it will be seen that there can be no movement of the brake-shoe 18 once it has been carried outwardly or downwardly until the end of the spring assumes certain positions with relation to the shaft 16 to draw the crank 15 to actuate the block 18 outwardly or downwardly and thereby avoid any danger of the brake block 18 snapping over the stationary cam 19.

The operation of the device is as follows: Assuming the spring to be untensioned and the clutch member 7 disengaged from the shaft clutch 4, at which condition of the spring the brake block 18 will be thrust or held outwardly against the stationary cam 19, then when the operator releases the lever 28 and allows the clutch member or sleeve 7 to shift into engagement with the clutch 4 if the shaft 2 be running, the spring will be wound by reason of its connection 12 to the hub 13 surrounding the inner end of the clutch 7. As the tension of the spring 11 increases, until it ultimately draws its end 15 downwardly to a certain position, then the pull of the spring 11 on the crank 15 will cause the shaft 16 to rock and swing the shoe 18 downwardly and force the shoe locking pin 30 across its restraining spring 31. The spring, when once wound, will continue to revolve, as will also the casing 10 with its connected parts, so long as the engine shaft is running, and when the latter is idle and the operator wishes to start the engine, a pull on the lever 28 will shift the clutch member 7 out of mesh with the clutch 4. When the teeth 6 have been released from the teeth 5, the tension of the spring 11 will cause the casing 10 and its connected parts, as, for instance, the flange 21, to revolve in the direction indicated by the arrow *b*, Fig. 1, when the rollers 22 will be

carried into binding engagement with the surface of the clutch hub 23 and the shaft 2 revolved. At a certain time in the unwinding of the spring, its outer end connected to the crank 15 will rock this to a position forcing the locking pin 30 across its restraining spring 31 and snapping the brake-shoe 18 into stopping engagement with the fixed cam 19, whereupon rotation of the housing and its contained elements will be impeded so long as the clutch member 7 is restrained to compress the spring 8 by reason of the pressure of the lever 28. The lever 28 can be held in shifted position, to hold the sleeve 7 in, by a rack 28'. When the spring 11 is being rewound, the shaft 2, the clutches 4-7, sleeve 13 and hub 24 are all turning together, but the outer end of spring 11 and drum 10 are restrained by the brake 18, the rollers 22 being inoperative. When the spring is tensioned, it pulls brake 18 in and the drum 10 will swing around at a greater speed than the shaft so that the clutch rollers lock up on hub 24. Since the ends of the spring are pulling in opposite directions, it is clear that the clutch 7 is held against collar 4, and when this is shifted to release the teeth by the lever 28, then if the collar cannot revolve (anti-clockwise) the outer end of the spring must and will turn the drum 10 which is clutched to the shaft.

Having thus described my invention, what I claim and desire to secure by Letters Patent is—

1. The combination of a driven shaft, a clutch hub keyed upon said shaft, a clutch sleeve slidable upon the shaft and adapted to mesh in one direction with the shaft hub, a housing turnable upon the shaft, a spring reacting between said housing and the slidable clutch sleeve, a spring hub mounted in the housing and splined to the clutch sleeve, a starting spring connected at one end to the spring hub and adapted to be wound by the clutch sleeve when in mesh with the shaft hub, a rocker shaft journaled in the housing and having a crank to which the outer end of the spring is connected, a stationary cam member, and a movable brake-block mounted upon said shaft and adapted to engage said cam for restraining the rotation of the housing when the spring is unwound, and a clutch sleeve shifting and controlling device.

2. The combination of a driven shaft, a clutch hub keyed upon said shaft, a clutch sleeve slidable upon the shaft and adapted to mesh in one direction with the shaft hub, a housing turnable upon the shaft, a spring reacting between said housing and the slidable clutch sleeve, a spring hub mounted in the housing and splined to the clutch sleeve, a starting spring connected at one end to the spring hub and adapted to be wound by

the clutch sleeve when in mesh with the shaft hub, a rocker shaft journaled in the housing and having a crank to which the outer end of the spring is connected, a stationary cam member, a movable brake-block mounted upon said shaft and adapted to engage said cam for restraining the rotation of the housing when the spring is unwound, a clutch mechanism whereby motion may be transmitted by the unwinding of the spring to start the shaft from an idle position, and a clutch sleeve shifting and controlling device.

3. The combination of a driven shaft, a clutch hub keyed upon said shaft, a clutch sleeve slidable upon the shaft and adapted to mesh in one direction with the shaft hub, a housing turnable upon the shaft, a spring reacting between said housing and the slidable clutch sleeve, a spring hub mounted in the housing and splined to the clutch sleeve, a starting spring connected at one end to the spring hub and adapted to be wound by the clutch sleeve when in mesh with the shaft hub, a rocker shaft journaled in the housing and having a crank to which the outer end of the spring is connected, a stationary cam member, a movable brake-block mounted upon said shaft and adapted to engage said cam for restraining the rotation of the housing when the spring is unwound, a clutch mechanism whereby motion may be transmitted by the unwinding of the spring, to start the shaft from an idle position, said mechanism including a flange in the housing, a clutch hub keyed to the shaft, and friction rollers adapted to bind the flange to the clutch hub when the flange rotates in one direction relative to the shaft, and a clutch sleeve shifting and controlling device.

4. The combination of a driven shaft, a clutch hub keyed upon said shaft, a clutch sleeve slidable upon the shaft and adapted to mesh in one direction with the shaft hub, a device for disengaging the clutch sleeve from the shaft hub, and restraining it against rotation when disengaged, a housing turnable upon the shaft, a spring reacting between said housing and the slidable clutch sleeve, a spring hub mounted in the housing and splined to the clutch sleeve, a starting spring connected at one end to the spring hub and adapted to be wound by the clutch sleeve when in mesh with the shaft hub, a rocker shaft journaled in the housing and having a crank to which the outer end of the spring is connected, a stationary cam member, and a movable brake-block mounted upon said shaft and adapted to engage said cam for restraining the rotation of the housing when the spring is unwound.

5. The combination in an engine starting apparatus, of a shaft, a housing turnable freely thereon in one direction, a spring hub

mounted in said housing, a starting spring, one end of which is connected to the spring hub, a winding clutch slidable and freely turnable on the shaft for tensioning the
5 spring by turning the spring hub, a clutch member secured on the shaft and engageable with the winding clutch to revolve it in one direction, means for carrying the slidable winding clutch member out of engagement
10 with the shaft clutch member and restraining it against rotation when disengaged, a stationary cam, relative to which the housing is turnable, a brake-shoe engageable with the stationary cam, means for operating said brake-shoe to carry it into engagement
15 with the cam when the spring is unwound, said means including a shaft having

an eccentric upon which the shoe is mounted, said shaft being connected to the outer end of the starting spring and adapted to
20 throw the shoe into frictional and stopping engagement with the stationary cam, and a transmitting mechanism whereby, when the winding clutch is disengaged from the shaft
25 clutch, the tension of the starting spring is transmitted to and revolves the shaft.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

JOHN J. O'LEARY.

Witnesses:

CHARLES EDELMAN,
C. C. COOK.

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