W. L. McKISSICK.

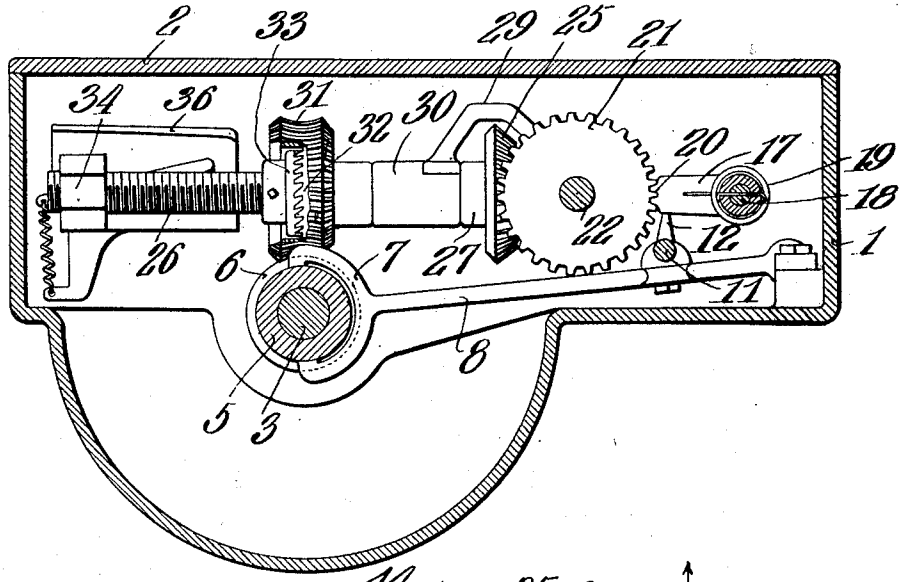
STARTING MECHANISM FOR HYDROCARBON ENGINES.

APPLICATION FILED NOV. 22, 1910.

1,007,885. Patented Nov. 7, 1911.

2 SHEETS—SHEET 1.

Fig. 2.



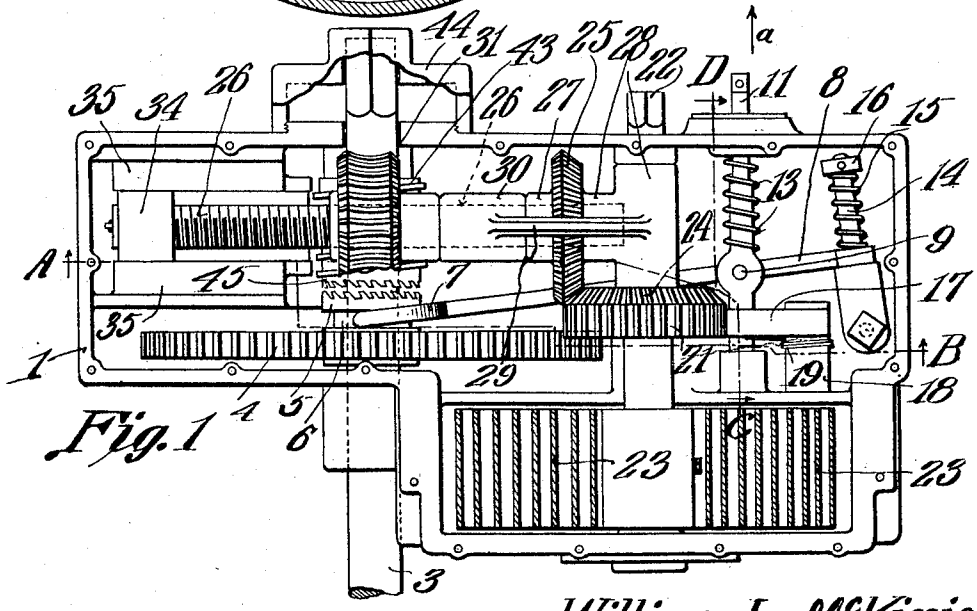


Fig. 1

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Witnesses
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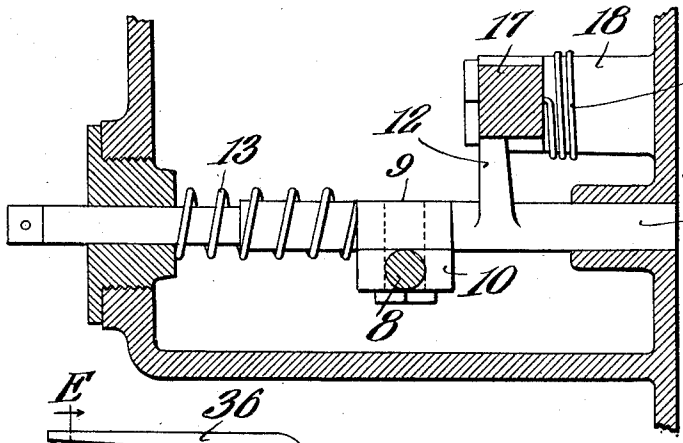

Fig. 3.

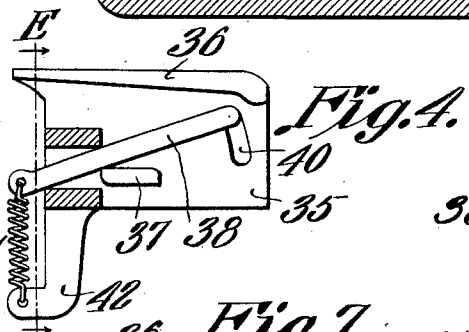

Fig. 4.

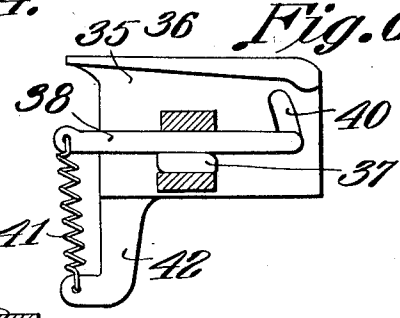

Fig. 6.

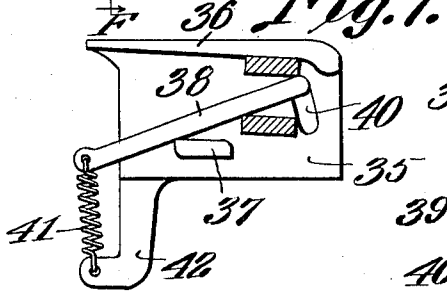

Fig. 7.

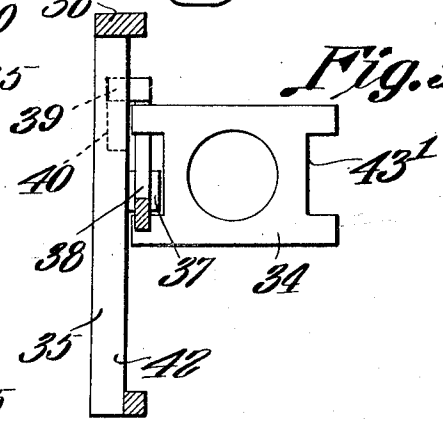

Fig. 5.

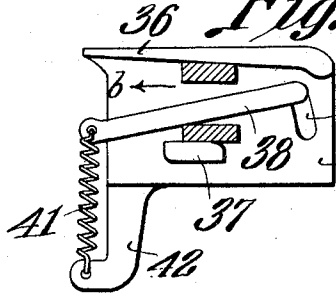

Fig. 8.

Witnesses

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UNITED STATES PATENT OFFICE.

WILLIAM L. McKISSICK, OF CARLISLE, IOWA.

STARTING MECHANISM FOR HYDROCARBON-ENGINES.

1,007,885. Specification of Letters Patent. Patented Nov. 7, 1911.

Application filed November 22, 1910. Serial No. 593,656.

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 Mechanism for Hydrocarbon-Engines, of which the following is a specification.

This invention relates to starting mechanism for use in connection with hydrocarbon engines, the object of the invention being to provide mechanism of this character utilizing a spring in which energy is stored by the engine immediately subsequent to the starting thereof, this energy being sufficient to subsequently start the engine.

A further object is to provide novel mechanism whereby the device can be automatically adjusted relative to the engine shaft so that the winding or recharging operation may be effected automatically at the proper time, there being improved means for controlling the release of the mechanism for the purpose of starting the engine.

A further object is to provide novel timing mechanism whereby the period consumed in energizing the spring, and in cranking the engine shaft, is controlled.

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 accompanying drawings the preferred form of the invention has been shown.

In said drawings:—Figure 1 is a plan view of the apparatus with the top plate removed. Fig. 2 is a section on line A—B Fig. 1, one of the gears being broken away. Fig. 3 is a vertical transverse section through the latch, said section being taken on the line C—D Fig. 1. Fig. 4 is a side elevation of one of the members of the timing mechanism, the adjoining end portion of the shiftable block being shown in section. Fig. 5 is a front elevation of said block and showing, in section, that portion of the timing mechanism located at one side thereof, said section being taken on the line E—F Fig. 4. Fig. 6 is a view similar to Fig. 4 but showing the positions of the parts when the mechanism is set to wind the spring. Fig. 7 is a view similar to Fig. 4 but showing the third position assumed by the parts during the actuation of the mechanism. Fig. 8 is a similar view showing the fourth or final position of said parts.

Referring to the figures by characters of reference 1 designates a casing adapted to be bolted or otherwise secured to a supporting structure, the top of this casing being closed by means of a cap 2 or the like. A motor shaft 3 is journaled within one wall of the casing and has a gear 4 slidably and revolubly mounted thereon close to one wall of the casing. This gear has a central tubular clutch member 5 integral with it and provided with an annular groove 6 for the reception of the forked end 7 of a lever 8. Said lever is fulcrumed, as at 9, between ears 10 depending from a locking bolt 11. Said bolt extends transversely of and is slidable within the casing, it having a locking finger 12 extending radially therefrom and there being a spring 13 inclosing a portion of the bolt and bearing against one wall of the casing for the purpose of holding this finger normally in a predetermined position. One end of the bolt 11 projects beyond the casing and may be connected to any suitable actuating mechanism not shown. That end of the lever 8 which is farthest removed from the fork 7, is loosely engaged by a pivoted stem 14 mounted within the casing and carrying a spring 15, one end of which bears against a head 16. The two springs 13 and 15 coöperate to hold the lever yieldingly in a predetermined position under normal conditions.

The finger 12 normally supports a latch 17 which is pivotally mounted on a stud 18 and has a spring 19 connected to it and to the stud, this spring serving to normally hold the latch in a predetermined position. The free end of the latch is provided with teeth, as shown at 20, these teeth being normally in mesh with the peripheral teeth of a gear 21 keyed or otherwise secured to the shaft 22 of the starting spring 23. Said gear 21 constantly meshes with the gear 4. The spring 23 is secured at one end to shaft 22 and at its other end to the casing, so that, when the shaft is rotated in one direction, the spring will be placed under stress. One face of the gear 21 forms a bevel gear,

as indicated at 24 which meshes with a gear 25, secured to a shaft 26. One end of this shaft is journaled within a tubular bearing 27 projecting from a sleeve 28 which is loosely mounted on the shaft 22, and is connected, as by means of a yoke 29, to another bearing sleeve 30.

A worm gear 31 is loosely mounted on the shaft 26 and is provided with a toothed clutch member 32 adapted to be engaged by a similar clutch member 33 which is keyed or otherwise secured to the shaft 26. That portion of the shaft 26 projecting beyond the clutch member 33 is screw threaded, as shown in Figs. 1 and 2, and projects through and engages a block 34 slidably mounted between guide members 35. Each of these members has a retaining flange 36 extending along its upper edge, the two flanges being projected toward each other and beyond the inner faces of the guide members, there being a short guide cleat 37 projecting from the inner face of each of the guide members. A lever 38 bears downwardly upon each of these cleats and has a lateral projection 39 at one end which is slidably mounted within an arcuate groove 40 formed within the member 35. The other end of the lever 38 is connected by a spring 41 to an arm 42 projecting downwardly from the guide member 35. The block 34 has recesses 43′ in its ends for the reception of the cleats 37 and the levers 38. When the block 34 is held in its lowermost position, as indicated in Fig. 4, the shaft 26 is also held down with gear 31 meshing with a worm 43 keyed or otherwise secured to the shaft 3. One end of this shaft 3 projects beyond the casing 1 and is shaped to be engaged and turned by a winding crank, not shown. After the original winding operation this projecting end of the shaft may be covered by means of a cap 44. Worm 43 has a clutch member 45 at that end thereof nearest the clutch member 5.

When it is desired to set the starting mechanism, the supply of fuel to the engine is cut off and the cap 44 is removed. With the block 34 in the position indicated in Fig. 4, gear 31 meshes with the worm 43. Moreover, lever 8 is held in its normal position by the springs 13 and 15, and the latch 17 is supported by the finger 12 which is also in its normal position, as shown in Fig. 3. Shaft 3 is rotated by means of a crank, and motion is transmitted therefrom through worm 43 and gear 31 to shaft 26. Gear 25 will therefore revolve and motion will be transmitted therefrom through gear 24 to the shaft 22, and spring 23 will be wound upon the shaft 22. Gear 4, which constantly meshes with gear 21 will rotate freely upon the shaft 3. During this winding of the spring, the block 34 is drawn toward the shaft 3 by the threaded portion of the shaft 26 and, as soon as the spring 23 has been wound to a desired extent, block 34, which has been passing under the cleats 37 and over the levers 38, as indicated in Fig. 6, passes from under the cleats 37. Those ends of the levers 38 mounted within the grooves 40 will thus be elevated by the springs 41 and block 34 will be lifted thereby until it assumes a position above the cleats 37. This lifting of the block will result in the lifting of the shaft 26 and the raising of gear 31 out of mesh with the worm 43. The power is thus transferred from the shaft 3 to the shaft 26 and as the spring, when unwinding tends to rotate the gear 24 in a direction opposite to that in which it is rotated by the shaft 3 and intermediate mechanism, it will be apparent that the latch 17, which has previously been raised against the stress of spring 19 out of engagement with the gear 21, will swing downwardly into engagement with said gear 21 and onto the finger 12 as soon as spring 23 starts to unwind. This latch and finger together with the gear thus coöperate to hold the spring against unwinding. With energy thus stored within the starting device, it merely becomes necessary, when it is desired to start the engine, to first direct fuel to the engine, and to then shift the bolt 11 in the direction indicated by the arrow *a* in Fig. 1. As the movement of one end of lever 8 will be retarded by spring 15, this actuation of the bolt 11 will cause the other or forked end 7 of the lever to shift the clutch member 5 into engagement with the clutch member 45. At the same time gear 4 will be shifted relative to gear 21 but will remain in mesh therewith. Finger 12 will also be shifted from under the latch 17 and as soon as the latch is thus relieved of its support, spring 23 will be released and will cause shaft 22 and the gear 21 to rotate and swing the latch 17 in the direction of the bolt 11 and out of mesh with gear 21. Shaft 22 and gear 21 will continue to rotate under the action of spring 23 and motion will be transmitted from gear 21 to gear 4, which, by reason of the engagement of the clutch members 5 and 45 will cause the shaft 3 to rotate and the engine to start. While the spring 23 is unwinding gear 25 is rotated by gear 24 and the threaded portion of shaft 26 moves the block 34 along the tops of the cleats 37 as indicated by the arrow *b* in Fig. 8. Levers 38 will therefore be lifted off of the cleats and the springs 41 will be under stress, as soon as the spring 23 imparts a desired number of revolutions to the shaft 3, block 34 arrives beyond the ends of the cleats 37 and is pulled downwardly by the springs 41 to the position shown in Fig. 4. This results in the return of worm gear 31 into mesh with the worm 43 and as the shaft 3 is now rotating under its own power,

the worm will rotate the gear 31 and wind the spring in the manner hereinbefore described, the block, 34, in the meantime, traveling to the position indicated in Fig. 6 and thence to the position indicated in Fig. 7, at which time the gear 21 is elevated out of engagement with the worm 43. Gear 4 is shifted laterally by the teeth on the clutch members 5 and 45 as soon as the shaft 3 begins to rotate under its own power. It will be apparent of course that the spring 19 is designed to hold the latch 17 normally in engagement with gear 21 and it will be apparent therefore, that as soon as the mechanism begins to wind the spring in the manner stated, gear 21 will engage the latch 17 and lift it out of the path of the finger 12, which will thus be projected under the latch by a spring 13 and coöperate with the latch to hold the spring under stress as soon as the winding mechanism has been automatically disengaged from the shaft 3 in the manner set forth.

What is claimed is:—

1. In an engine starter, the combination with a motor shaft, of a spring, winding mechanism for transmitting motion from said shaft to the spring, said mechanism including a gear, means for transmitting motion to the shaft from the spring when unwinding, and means for holding the spring against said winding, means including a yieldingly supported latch normally engaging the gear and shiftable thereby in one direction during the unwinding of the spring and in the opposite direction during the winding of the spring, and means for holding said latch against movement subsequent to the winding of the spring.

2. In an engine starter, the combination with a motor shaft, of a spring, winding mechanism for transmitting motion from said shaft to the spring, said mechanism including a gear, means for transmitting motion from the spring to the shaft, means for holding the spring against winding, said means including a yieldingly supported latch normally engaging the gear and shiftable thereby in one direction during the unwinding of the spring and in the opposite direction during the winding of the spring, and means for holding the latch against movement after the spring has been wound, said means including a spring controlled bolt, and a stop finger extending therefrom and into the path of the latch.

3. The combination with an engine shaft, of a spring for storing power, mechanism operated by the shaft for winding the spring, said mechanism including normally engaging power transmitting devices, a threaded shaft, a threaded bearing element supporting and engaged by said shaft, a guide for said element, a centrally supported spring controlled lever for successively raising and lowering said element automatically upon reaching the respective limits of its movement, means for holding the spring wound, and means operated by the release of the first mentioned spring for coupling the spring to the engine shaft.

4. The combination with an engine shaft, of a spring for storing power, mechanism operated by the shaft for winding the spring, said mechanism including a normally meshing worm and gear, a threaded shaft, a threaded bearing block supporting and engaged by said shaft, fixed guides for the block, centrally supported spring controlled levers tiltably mounted on the guides for successively elevating and lowering the block automatically when the block reaches the respective limits of its movement, means for holding the first mentioned spring wound, and means operated by the release of said spring for coupling the spring to the engine shaft.

5. The combination with an engine shaft, and a starting spring for storing power, of winding mechanism for transmitting motion from said shaft to the spring, said mechanism including a screw shaft, a threaded bearing block engaged and actuated by said shaft, fixed guides for the block, spring controlled levers tiltably mounted on the guides for automatically elevating and lowering the block, on reaching the respective limits of its movement, said block being movable upwardly and entirely above the guides to disengage the winding mechanism from the shaft and being movable downwardly and partly under the guides to couple said mechanism with the shaft, means for holding the starting spring against unwinding, and means operated by the release of the spring for coupling said spring with the engine shaft.

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:

J. A. McKissick,

Geo. Myers.