

F. & G. P. HULL.
MECHANICAL CRANKING DEVICE FOR ENGINES.
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995,464.

Patented June 20, 1911.

2 SHEETS—SHEET 2.

Fig. 2.

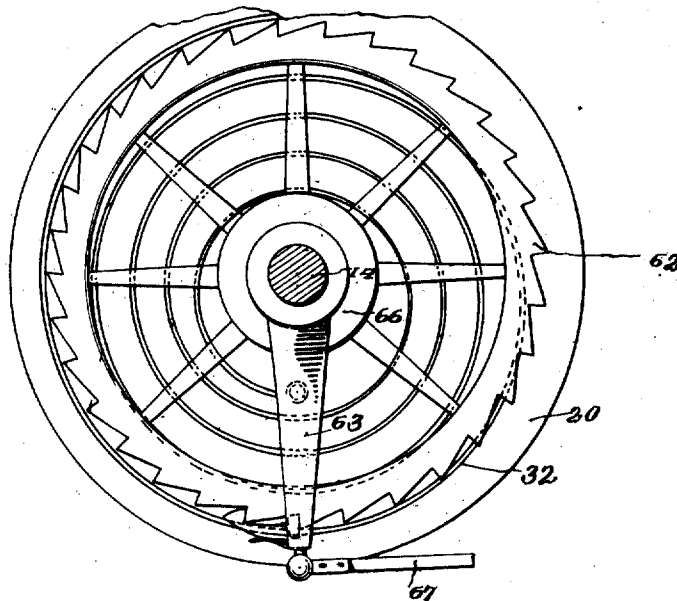


Fig. 4.

Fig. 5.

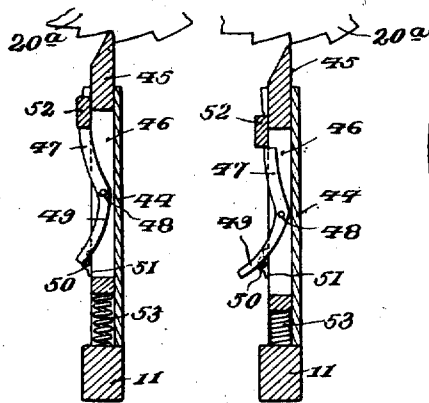
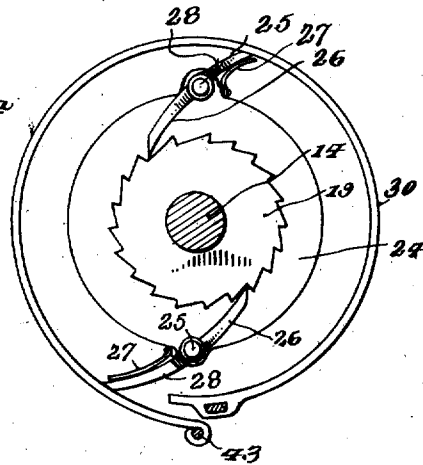


Fig. 3.



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MECHANICAL CRANKING DEVICE FOR ENGINES.

995,464.

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To all whom it may concern:

Be it known that we, FRANK HULL and GEORGE P. HULL, citizens of the United States, residing at Constantine, in the county of St. Joseph and State of Michigan, have invented certain new and useful Improvements in Mechanical Cranking Devices for Engines, of which the following is a specification.

This invention relates to internal combustion engine starters, and has for its object to provide an attachment for an engine of this character adaptable particularly to motor vehicles wherein the engine or motor can be started from the operator's seat.

Another object of this invention is to provide a starting mechanism with an operating spring which is so disposed that it is energized by the engine or motor when set in motion, or which, if the motor fails to run, may be wound by a hand-lever located in proximity to the seat of the operator.

The invention further contemplates a structure wherein the mechanism is not dependent upon a plurality of separate shafts necessitating various bearing or supporting members, but which is mounted upon the main crank-shaft of the engine which is elongated to extend outwardly from the casing of the motor to accommodate the improved mechanism. This novel arrangement of the starting mechanism eliminates many of the elements which are now employed in such devices thus producing a strong, durable, and more efficient starting device than has heretofore been devised.

A still further object of this invention is to construct a starting mechanism adaptable to motors varying in type, and which will not interfere with the working elements of the motor and admitting of the cranking of the motor by hand in the usual manner.

For a full understanding of the invention reference is to be had to the following description and accompanying drawings, in which:—

Figure 1 is a top plan view of the improved device, partially shown in section. Fig. 2 is a section taken on the line 2—2 of Fig. 1. Fig. 3 is a section taken on the line 3—3 of Fig. 1. Fig. 4 is a detail section view of the locking mechanism for holding the power-spring inoperative; and, Fig. 5 is a similar view showing the pawl partially retracted.

Corresponding and like parts are referred to in the following description and indicated in all the views of the drawings by the same reference characters.

Referring to the drawings the numerals 10 and 11 designate the side-bars of the frame of a motor vehicle, while the cross-bars of the frame are indicated by the numerals 12 and 13.

The main or crank-shaft of an internal combustion engine is designated by the numeral 14 and is journaled, in the usual manner, longitudinally and centrally within the frame. A bearing 15 is carried upon the forward cross-bar 12 at its central portion, and supports the forward end of the shaft 14. The shaft 14 is provided with a friction beveled wheel or pulley 16 attached rigidly thereto by a key 17 and having an outward beveled face 18. A ratchet wheel 19 is carried in fixed relation against the outer face of the pulley 18 so as to move in fixed relation with the main shaft 14. A second friction pulley 20 is mounted loosely upon the shaft 14 adjacent to its forward end and is provided with an inner beveled face 21 arranged oppositely to the inner face 18 of the pulley 16. The friction pulley 20 is provided against its inner face with a ratchet pulley 20^a and carries the oppositely extending sleeves 22 and 23. The sleeves 22 and 23 are preferably formed integrally with the pulley 20 and move in fixed relation therewith. The inner end of the sleeve 22 carries a flange or disk 24 disposed loosely against the outer side of the ratchet-wheel 19. The disk 24 is provided at diametrically opposite points with inwardly extending pins 25 which hingedly support the pawls 26 in the plane of the ratchet wheel 19. Springs 27 are supported upon the disk 24 and engage against outer extensions 28 formed upon the pawls 26. The side-bar 11 carries an inwardly extending arm 29 carrying one end of a split spring band 30. The free end of the band 30 slightly overlaps the fixed end thereof and is spaced inwardly therefrom so as to admit of a limited movement of the free end. The cross-bar 13 of the vehicle frame passes in proximity to the outer face of the friction pulley 20 and is suitably apertured at its central portion for the passage of the sleeve 23 loosely there-through. At one side of the sleeve 23 an arm 31 is disposed carrying the inner end of a flat coil spring 32 positioned against the

outer face of the pulley 20 at a point adjacent to its periphery and carries the outer end of the spring 32 on a pin 33.

The side bar 11 is provided with an inwardly extending guide 34 in which is slidably disposed one end of a slide-bar 35. The bar 35 is provided with an enlarged and apertured portion 36 loosely engaging about the sleeve 22 and admitting of a slight reciprocating movement of the bar 35. The opposite end of the bar 35 is rounded as at 37, to loosely support an idler 38 having a beveled face 39 for frictional contact against the beveled faces 18 and 21 of the pulleys 16 and 20 respectively. The rounded portion 37 of the slide-bar is provided with bushings or collars 40 engaging against the opposite sides of the idler 38 to hold the same from longitudinal movement upon the slide-rod. A squared shank 41 projects from the end of the rounded portion 37 and slidably engages in an angular socket 42 mounted upon the side-bar 11 of the vehicle frame in transverse registration with the guide 34. The guide 34 carries a hinged lever 43 having the short arm thereof projecting into a recess 35^a formed in the side of the slide-bar 35. The extremity of the short arm of the lever 43 is loosely hinged upon a pin 35^b carried by the slide-rod. The end of the long arm of the lever 43 is attached to the free end of the spring band 30 and is employed for expanding and contracting the band. The side-bar 11 of the frame is further provided with a guide 44 positioned in the plane of the ratchet wheel 20^a and is provided with a sliding pawl 45 engaging with the teeth of the ratchet wheel 20^a. The sliding pawl is provided with a longitudinal central slot 46 in which is hinged a dog 47 upon a transverse pin 48. The dog 47 carries an upwardly and outwardly extending cam-arm 49 which engages against a transverse roller 50 journaled in bearings 51 at the opposite sides of the guide 44. The bearings 51 are mounted upon the guide 44 midway between the ends thereof so as to strike the cam-arm 49. The outer end of the dog 47 is curved to present a flattened face for the reception of the outer end of a retracting bar 52. The retracting bar 52 is rigidly attached to the sliding bar 35 and projects over the upper faces of the guide 44 and the pawl 45. A spring 53 is interposed between the side-bar 11 and the inner end of the pawl 45 for normally extending the pawl for engagement with the teeth of the ratchet wheel 20^a.

The frame of the vehicle is provided at any suitable point, preferably adjacent to the operator's seat, with a hand-lever 54 which is provided with a segment 55 having a single tooth 56 arranged at its central portion for defining and limiting the

movement of the lever 54. A dog 57 is carried upon the lever 54 and operated by a thumb-latch 57^a for interlocking with the tooth 56. A connecting rod 58 projects outwardly within the motor vehicle frame to the outer end of the guide 34. A bell crank-lever 59 is hinged upon the beam 11 and connected at its long arm by a link 60 to the inner end of the slide rod 35. The link 60 is hinged upon the upper side of the rod 35 by a pin 61. The sleeve 23 extends a short distance outwardly of the brace 13 and carries in rigid relation upon its outer end a ratchet wheel 62. The swinging arm 63 is loosely disposed upon the shaft 14 between the forward end of the sleeve 23 and the bearing 15. The outer end of the swinging arm 63 is curved inwardly into the plane of the ratchet wheel 62 and is spaced a short distance from the periphery thereof. The pawl 64 is carried upon the outer end of the arm 63 and engages with the teeth of the ratchet wheel 62 under the tension of a leaf-spring 65. The spring 65 is carried upon the arm 63 and presses against the outer face of the pawl 64. The bushing 66 spaces the inner end of the arm 63 from the ratchet wheel 62. The outer end of the arm 63 is provided with a link 67 connected thereto by a ball and socket joint at its inner end and is connected by a similar joint, at its opposite end to the end of a bell-crank lever 68. The bell-crank lever 68 is hinged upon the side-bar 11 of the frame and carries the forward end of a connecting rod 69 extending backwardly within the frame. A hand-lever 70 is mounted upon the frame adjacent to the hand-lever 54 and is employed for swinging the arm 63 to intermittently rotate the ratchet wheel 62.

The operation of the device is as follows:—When it is desired to start the internal combustion engine, and the spring 32 is unwound, the operator grasps the hand-lever 70 and reciprocates the same to the full extent of the swinging movement. This action vibrates the arm 63 through the bell-crank lever 68 and the link 67. This motion of the arm 63 moves the pawl 64 over the ratchet-wheel 62 to intermittently rotate the same. When the hand-lever 70 is released the pawl 45 under the action of the spring 53 engages against the ratchet wheel 20^a and prevents the pulley 20 from rotating backwardly to unwind the spring. The operator now draws the hand-lever 54 backwardly to engage the dog 57 against the tooth 56. This movement draws the sliding bar 35 toward the side bar 11 of the frame and swings the lever 43 into such position as to expand the ring 30 and release the pawls 26. The pawls 26 drop into engagement with the teeth of the ratchet wheel 19 and interlock the pulleys 16 and 20. The

movement of the slide-bar 35 forces the retracting arm 52 against the dog 47 and retracts the pawl 45 from the teeth of the ratchet wheel 20^a. The spring 32 is now freed and imparts rotation to the main shaft 14 through the pawls 26 and the ratchet wheel 19. When the engine is thus started, and the shaft 14 is in motion, the spring 32 can be rewound by pressing the latch 57^a and raising the dog 57 from the tooth 56 and swinging the lever 54 backwardly beyond the tooth 56. This movement of the lever 54 draws the slide-bar 35 farther toward the side-bar 11 and brings the idler 38 into frictional contact against the pulleys 16 and 20. The motion of the shaft 14 is thus imparted to the idler 38 and the bevel-wheel 20 by the bevel 16, imparting opposite rotation to the wheel 20 from the crank-shaft 14.

Referring to Figs. 4 and 5 it will be noted that the arm 52 moves the pawl 45 inwardly to such an extent that the cam-arm 49 strikes the roller 50 and is deflected upwardly thereby to force the outer end of the dog 47 into the slot 46 and beneath the arm 52, when the pawl 45 is released and permitted to spring forwardly into engagement against the ratchet wheel 20^a. The pawl 45 thus holds the spring 32 from unwinding when released by the friction pulley 38.

Having thus described the invention, what is claimed is:—

1. A cranking device including a main shaft, a friction pulley rigid on the main shaft, a second friction pulley loose upon the main shaft, operating means connected to the second pulley for rotating the same in the direction of the shaft, interlocking means disposed between said pulleys for movement in the same direction, a lever connected to the interlocking means for releasing the same, and an idler arranged between the pulleys and connected to the lever for connecting the pulleys for opposite rotation to one another upon the releasing of the interlocking mechanism.

2. A cranking device including a main shaft, a friction pulley rigid on the shaft, a second friction pulley loose upon the shaft, rotating means connected to said second pulley, a ratchet wheel fixed upon said first pulley, pawls carried by said second pulley for cooperation with the ratchet wheel, and releasing means connected to the pawls for retracting the same from said ratchet wheel.

3. A cranking device including a main shaft, a friction pulley rigid on the main shaft, a second friction pulley loose upon the main shaft and having interlocking means engaging with said first pulley, a spring connected to said second pulley for imparting rotation thereto, and an idler arranged between the pulleys for intermeshing the same at times and imparting opposite movement thereto to wind said spring.

4. A cranking device including a shaft, a friction pulley rigid on the shaft, a second pulley loose upon the shaft, a ratchet wheel carried by said first pulley, pawls carried by said second pulley for engagement with said ratchet wheel, a retaining pawl engaging said second pulley to hold the same from rotation, releasing means connected to said retaining pawl and to said pawls of said second pulley for interlocking the pulleys and releasing said second pulley, a spring connected to said second pulley for rotating the same, and an idler arranged between the pulleys for intermeshing the same for opposite rotation to one another to wind the spring.

5. A cranking device including a shaft, a friction pulley rigid on the shaft and having a ratchet wheel to move therewith, a second friction pulley loose upon the shaft, pawls carried by the second pulley for engagement with the ratchet wheel, a ring encircling the pawls and adapted to expand and contract to regulate the movement of the pawls, a second ratchet wheel carried upon said second pulley, a locking pawl for engagement with said second ratchet wheel to hold said second pulley from rotation, a spring connected to said second pulley for rotating the same, and winding means connected to said second pulley for rewinding said spring.

6. A cranking device including a main shaft, a friction pulley rigid on the main shaft, a second pulley loose on the main shaft, interlocking means carried by the pulleys, a lever attached to the interlocking means for releasing the same at times, a stub shaft connected to the lever, and an idler mounted on the stub shaft to intermesh with the pulleys when the interlocking means is released.

7. A cranking device including a shaft, a pulley rigid on the shaft, a second pulley loose upon the shaft, a ratchet wheel carried by the first pulley, pawls carried by the second pulley for engagement with the ratchet wheel, an expanding and contracting ring encircling the pawls to release the same from engagement with the ratchet wheel, a stub shaft arranged between the pulleys, an idler mounted upon the stub shaft to intermesh with the pulleys, a lever connected to said ring and said stub shaft for simultaneously operating the same to raise the pawls from the ratchet wheel and intermeshing the idler with the pulleys, and a spring connected to said second pulley for rotating the same.

8. A cranking device including a shaft, a pulley rigid on the shaft, a loose pulley upon the shaft, interlocking means arranged between the pulleys, a locking pawl for engagement with said second pulley to hold the same from rotation, a spring connected to said second pulley for rotating the same

when released, releasing means connected to said pawl and to said interlocking means to free the pulleys one from the other, and an idler connected to said releasing means adapted to intermesh said pulleys for opposite rotation to one another to wind said spring.

9. A cranking device including a shaft, a pulley keyed to the shaft, a second pulley loose upon the shaft, interlocking means arranged between the pulleys, a spring connected to said second pulley for rotating the same, a ratchet wheel carried upon said second pulley, a swinging arm hinged upon the shaft adjacent to said ratchet wheel, a pawl mounted upon the arm for engagement with the ratchet wheel, and a lever connected to the swinging arm for reciprocating the same to impart intermittent rotation to the ratchet wheel for winding the spring.

10. A cranking device including a main shaft, a pulley keyed upon the shaft, a second pulley loose upon the shaft, a ratchet wheel carried by one of said pulleys, pawls carried upon the opposite one of said pulleys, an expanding and contracting ring encircling the pawls, a lever connected to the ring for operating the same, a slide rod arranged between the pulleys and having connection to said lever, a second ratchet wheel carried upon said second pulley, a locking pawl engaging with said second ratchet wheel and having connection with said slide

rod, a stub shaft carried upon said slide rod, an idler carried upon the stub shaft for intermeshing the pulleys and a spring connected to said second pulley for rotating the same.

11. A cranking device including an engine shaft, a fixed pulley on the engine shaft, a loose pulley on the engine shaft, a spring connected to said loose pulley for rotating the same, interlocking means arranged between the pulleys for imparting rotation to the engine shaft, and an idler arranged between the pulleys for intermeshing therewith at times to impart opposite rotary movement to the pulleys for rewinding the spring.

12. A cranking device including a main shaft, a rotary element rigid on the main shaft, a second rotary element loose upon the main shaft and spaced from the first element, interlocking means carried by the rotary elements, releasing means connected to the interlocking means, an idle element having connection to the releasing means to intermesh the rotary elements when the interlocking means is released.

In testimony whereof we affix our signatures in presence of two witnesses.

FRANK HULL. [L. S.]
GEORGE P. HULL. [L. S.]

Witnesses:

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