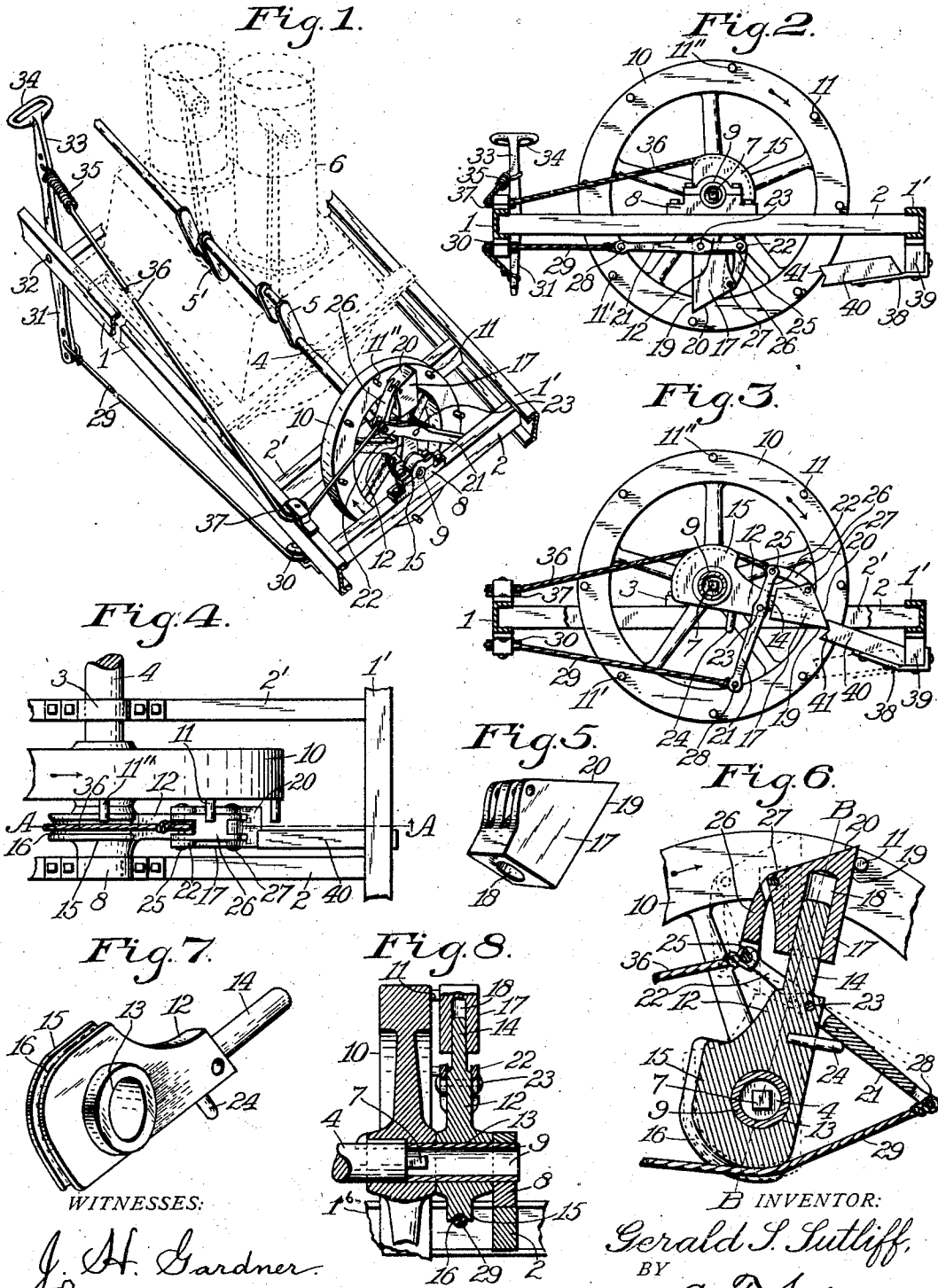


G. S. SUTLIFF.
ENGINE STARTER.
APPLICATION FILED JULY 8, 1911.

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Patented Mar. 26, 1912.



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ENGINE-STARTER.

1,021,493.

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To all whom it may concern:

Be it known that I, GERALD S. SUTLIFF, a citizen of the United States, residing in Perry Creek township, in the county of Vigo and State of Indiana, have invented a new and useful Engine-Starter, of which the following is a specification, reference being had to the accompanying drawings and to the letters and figures of reference marked thereon.

This invention relates to mechanism for starting explosion engines when at rest, more especially when compression occurs in the engine cylinders, the invention having reference particularly to a safety engine starter that is adapted to be operated by foot power.

The object of the invention is to provide a compact and reliable engine starter that will be adapted to be applied to automobile engines and so constructed as to be capable of being operated by a person in the operator's or driver's seat, a specific object being to provide engine starting mechanism of the above mentioned character that will not be injured in case the engine kicks back or back fires, and which will prevent the operator from being injured under similar circumstances.

The invention comprises ratchet mechanism of novel construction including an arm performing the functions of a pawl and having a retractable head which operates in connection with a wheel having projections, the head being retracted out of range with the projections in case the wheel moves backward, the mechanism including also an operating lever and connections between the lever and the ratchet mechanism.

Referring to the drawings, Figure 1 is a fragmentary perspective view of a frame such as might be used in automobile construction, a crank shaft mounted on the frame and provided with the improved starting apparatus, the outlines of an explosion engine being briefly shown by broken lines in connection with the frame and the crank shaft; Fig. 2, a front elevation of the engine starter shown in normal rest position; Fig. 3, a front elevation with the starting apparatus in the position occupied in case of back firing; Fig. 4, a fragmentary top plan of Fig. 3; Fig. 5, a perspective view of the retractable head of the aforementioned arm; Fig. 6, a fragmentary section on the plane of the line A A in Fig. 4 but with the apparatus in operative position; Fig. 7, a

perspective view of the aforementioned arm minus the retractable head; and Fig. 8, a fragmentary section on the plane of the line B B in Fig. 6.

Similar reference characters throughout the drawings indicate corresponding elements or features of construction herein referred to.

In the drawings 1 and 1' indicate the main or longitudinal bars of a suitable frame, 2 and 2' transverse bars of the frame, 3 a journal-box mounted on the bar 2', 4 the main shaft of the engine rotatably mounted at one end in the journal-box and having cranks 5 and 5', an engine 6 being mounted on the frame for actuating the crank shaft. The forward end of the crank shaft has a squared portion 7 to which a hand crank may be applied for rotating the shaft if desired to do so directly by hand, as when repairing or adjusting parts of the engine.

The crank shaft 4 extends forward beyond the journal-box 3 toward the transverse bar 2, and a box or support 8 is mounted on the bar 2 and fixedly supports a hollow axial shaft 9 which extends rearward to the end of the crank shaft 4 and over the squared portion 7, the shaft 9 being in alinement with the crank shaft. A fly-wheel 10 is secured to the forward portion of the crank shaft 4 and extends rotatably about the inner end portion of the hollow shaft 9, the forward side of the rim of the fly-wheel being provided with a suitable number of projections or pins 11, 11', 11''.

An arm 12 provided with an opening 13 is pivotally mounted on the hollow shaft 9 adjacent the fly-wheel 10 and it has a suitable guide bar 14 projecting from one end thereof, the arm having also a segmental guide 15 extending about one side and the opposite end thereof, the guide having a groove 16 therein so as to serve as a portion of a guide sheave, and during certain movements of the mechanism in a measure performs the function of a driving pulley. A head 17 is provided with a guideway arranged longitudinally therein which receives the guide bar 14 and the head is movable on the guide bar so as to effect a lengthening or shortening of the arm. The head has a flat front face 19 adapted to engage the projections on the fly-wheel and it has also an oblique-angled end 20 which enables the projections if they come in contact therewith to push the head inward when the fly-wheel

is moving forward, in case the head is not fully retracted. A lever 21 has a bifurcated end portion 22 which straddles the arm 12 and is connected to the arm by means of a pivot 23, the arm being provided with a suitable stop projection 24 to limit the movement of the lever in one direction. The bifurcated end of the lever is provided with a pivot pin 25 to which a stiff link 26 is connected, the link being connected by means of a pivot 27 to the movable head 17. The lever 21 is provided also with a pivot pin 28 to which is connected a suitable cable 29 which, during certain positions of the arm, extends into the groove 16, and the cable extends about a sheave 30 which is suitably mounted on the frame of the automobile. The cable is connected to the lower portion 31 of an operating foot lever which is suitably mounted on the vehicle frame by means of a pivot 32, and it will be clear that the arrangement may be such that the upper end portion 33 of the lever may extend through a slot in the floor of the vehicle body to be pressed forward by the foot of the operator, said upper portion being provided with a loop 34 into which the foot may be inserted for drawing the upper portion of the lever backward. A coil spring 35 is connected to the upper portion 33 of the lever, a cable 36 being connected to the spring and extending about a sheave 37 suitably mounted on the vehicle frame, said cable being connected to the pivot pin 25, so that the foot lever and the connecting cables control the movements and determine relative positions of the different parts of the starting mechanism.

In order to guard against accidents in case the engine kicks back in attempting to start it, a suitable plate spring 38 is supported in a suitable position, preferably on a bracket 39 secured to the vehicle frame, and the spring supports a retracting bar 40 which has a fish tail shaped end 41 to receive the extremity of the head 17, when the latter is projected and is being carried backward, the bar 40 normally being in the path of the head and is permitted to swing as on a pivot to the extent of the elasticity of the spring, the bar being swung upward in contact with the supporting bracket.

In practical use the upper portion 33 of the operating lever is drawn rearward as in Fig. 1 which moves the arm 12 approximately to the position shown in Fig. 1, the projection 11 on the fly-wheel being approximately in a position indicated when compression occurs, the head 17 being behind the projection. On movement of the end portion 33 forward, the cable 29 being in the groove 16 holds the lever 21 against the stop 24 and forces the head 17 outward, so that on further movement of the operating lever the head 17 engages the projection 11 and turns the fly-wheel forward, the op-

erating lever being pushed forcibly and briskly so that the fly-wheel is forcibly turned through nearly one-half of the revolution and given some momentum to further rotate it. If explosions take place as they should the engine continues to run under normal conditions, but in case of failure on the first attempt the operating lever is again manipulated so that the cable 36, lying in the groove 16, turns on the bifurcated end of the lever 21 and draws the arm 12 around to operative position as before, and then another effort may be made to start the engine. When the engine is running the arm 12 hangs down approximately as shown in Fig. 2, the lever 21 being in horizontal position and holding the head 17 up out of the way of the projections on the fly-wheel. When the head 17 passes downward in projected position it strikes the top of the bar 40 and readily pushes the bar out of the way, but when the head is carried upward, as illustrated in Fig. 3, with the head projected, the end of the head will pass into the recessed end 41 of the retracting bar and while pushing the bar upward would be retracted by the bar as the latter moves into a line drawn from the support of the bar through the axis of the crank shaft. Such action occurs when the head is in contact with one of the projections on the wheel and turning the wheel forward with the cable 29 under strain so as to hold the head 17 in projected position, the head then being carried backward in case of back fire but, as will be seen, the head 17 is forcibly retracted before being carried back to any appreciable extent. When the arm is moved backward from the position shown in Fig. 2 to the position shown in Fig. 1 the head 17 is held in retracted position by means of the cable 36 which is operating to move the arm upward but, since the spring 35 affords a yielding connection it is clear that when the cable 29 is under stress the lever 21, when the arm 12 is approximately upright, is moved so as to project the head 17 to operative position.

Having thus described the invention what is claimed as new, is—

1. An engine starter including a rotatable shaft, a wheel secured to the shaft provided with projections, an arm pivotally mounted adjacent the wheel on the axis thereof and provided with a movable head projectable into the path of the projections to rotate the wheel, a lever pivoted between its ends to the arm, a link pivoted to the lever and also to the movable head, and means connected to the lever for projecting the head.

2. An engine starter including a rotatable shaft, a wheel secured to the shaft having projections thereon, an arm pivotally mounted adjacent the wheel on the axis thereof and having a segment of a pulley on one end portion thereof, the opposite end portion of

the arm having a head mounted movably thereon, a lever pivoted on the arm adjacent the head, a link connected to the lever and also to the head, two cables connected to opposite end portions respectively of the lever and in operation of the arm and lever alternately pulling in contact with the segment of the pulley, and an operating lever pivotally supported and connected with the two cables.

3. In an engine starter, the combination with a frame, a crank shaft rotatably supported on the frame, and a wheel mounted on and adapted to rotate the crank shaft in one direction, the wheel having a plurality of projections thereon, of an arm pivotally mounted adjacent the wheel on the rotative axis of the crank shaft and having a head movably mounted thereon and projectable into the path of the projections for rotating the wheel forward, a retracting bar mounted on the frame to be engaged by the head for moving the same from the path of the projections, a lever pivoted to the arm, a link connected to the lever and the head, and means connected with the lever for moving the arm.

4. In an engine starter, the combination with a frame, a crank shaft rotatably supported on the frame, and a wheel secured to the crank shaft and provided with projections, of an axial shaft supported by the frame in alinement with the crank shaft, an arm pivotally supported on the axial shaft and provided with a stop device, a lever pivoted to the arm and movable to the stop device, a head movably mounted on the arm and projectable to the path of the projections, a link pivoted to the lever and also to the head, a cable connected to the lever adjacent the link, and a cable connected to the lever beyond the pivot thereof.

5. In an engine starter, the combination with a frame, of a crank shaft rotatably mounted on the frame and having a squared end, a hollow shaft secured to the frame in

alinement with the crank shaft, a fly-wheel secured to the crank shaft and extending rotatably onto the hollow shaft, the fly-wheel having projections thereon, an arm pivotally mounted on the hollow shaft and having a guide bar thereon, a head on the guide bar and movable to the path of the projections, a lever pivoted to the arm, a link pivoted to the lever and also to the head, and means connected to the lever for moving the head.

6. In an engine starter, the combination with a frame, a crank shaft rotatably supported on the frame, and an operating lever pivotally connected between its ends to the frame, of a coil spring connected to one end portion of the lever, a wheel secured to the crank shaft and having projections thereon, an axial shaft secured to the frame in alinement with the crank shaft, a retracting bar mounted to swing pivotally on the frame and normally supported yieldingly in proximity to the path of the projections, an arm pivotally supported on the axial shaft and provided with a guide, a head mounted on the guide and movable to or from the path of the projections, the head being forced from said path on being carried in one direction by the arm into contact with the said bar, a head controlling lever pivoted between its ends to the arm and operatively connected with the head, two sheaves mounted on the frame, a cable connected with one end portion of the head controlling lever and extending over one of the sheaves and connected to the coil spring, and a cable connected to the opposite end portion of said controlling lever and extending over the other one of the sheaves and connected to the opposite end portion of the operating lever.

In testimony whereof, I affix my signature in presence of two witnesses.

GERALD S. SUTLIFF.

Witnesses:

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JOHN M. TRINKLE.