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STARTING DEVICE FOR EXPLOSIVE ENGINES.

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1,043,399. Patented Nov. 5, 1912.

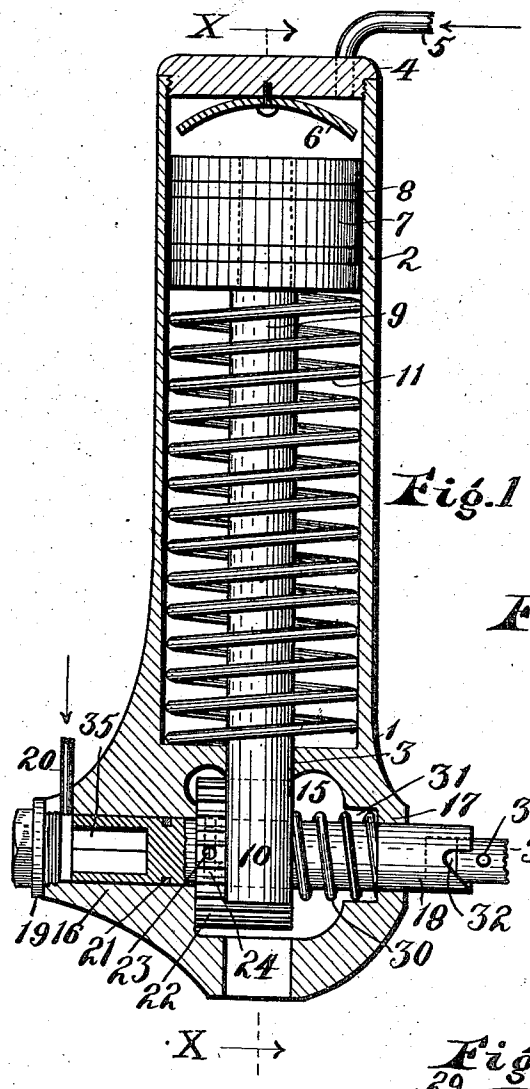

Fig. 1

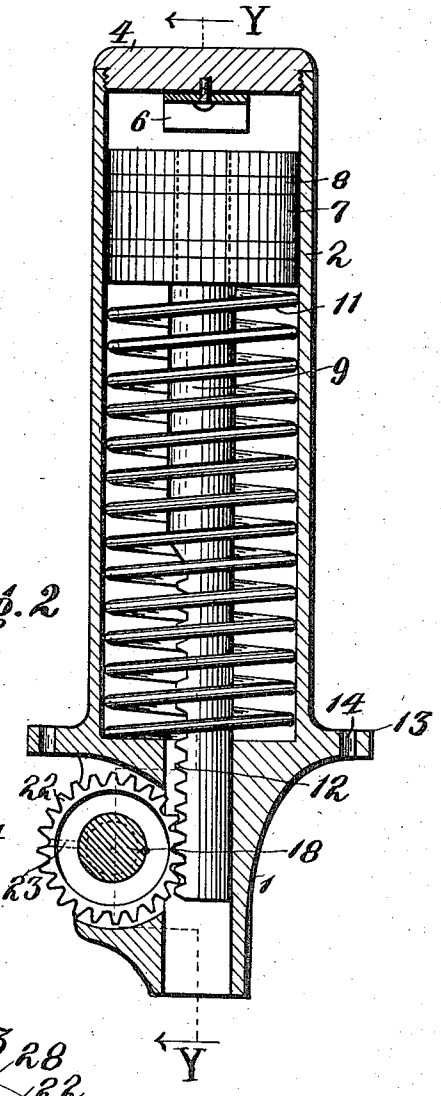

Fig. 2

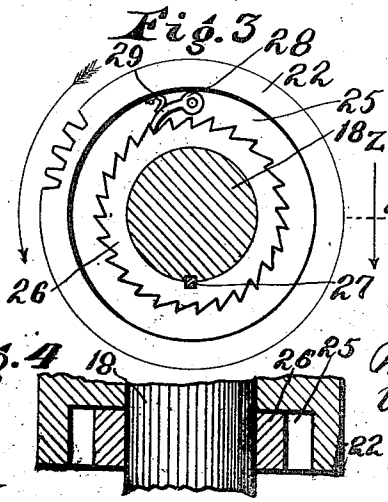

Fig. 3

Fig. 5

Fig. 6

Fig. 4

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UNITED STATES PATENT OFFICE.

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STARTING DEVICE FOR EXPLOSIVE-ENGINES.

1,043,399. Specification of Letters Patent. Patented Nov. 5, 1912.

Application filed March 2, 1912. Serial No. 681,301.

To all whom it may concern:

Be it known that I, MILTON ELLSWORTH COLE, a citizen of the United States, residing at Akron, in the county of Summit and State of Ohio, have invented new and useful Improvements in Starting Devices for Explosive-Engines, of which the following is a specification.

This invention relates to starting devices for explosive engines and is especially adapted for use in connection with engines used on automobiles.

The object of the invention is to provide mechanism for imparting an initial rotary movement to the engine-shaft preliminary to the automatic operation of the engine by the successive explosions in the cylinder thereof. This object I accomplish through the medium of mechanism operated by a fluid under pressure which automatically connects an operating-shaft with the engine-shaft, which is followed by the rapid rotation of the two shafts to start the engine, after which the operating mechanism is disengaged from the engine-shaft.

My invention contemplates the successive performance of these operations by the employment of an easily controlled fluid under pressure.

With the foregoing and other objects in view, the invention consists in the novel construction, combination and arrangement of parts constituting the invention to be hereinafter specifically described and illustrated in the accompanying drawings which form a part hereof wherein is shown the preferred embodiment of the invention, but it is to be understood that changes, variations and modifications can be resorted to which come within the scope of the claims hereunto appended.

In the drawings in which similar reference numerals indicate like parts in the different figures, Figure 1, is a vertical, central, sectional view of a device embodying this invention, the section being on line Y—Y of Fig. 2; Fig. 2, is a sectional view of the device on line X—X of Fig. 1; Fig. 3, is a view in side elevation of the mechanism for transmitting the reciprocal motion of a portion of the mechanism to a rotary motion; Fig. 4, is a section of the mechanism shown in Fig. 3 on line Z; and, Figs. 5 and 6, are respectively, end and sectional views of portions of the mechanism employed.

Referring to the drawings in detail the reference numeral 1 denotes a containing-casing, the upper portion 2 of which constitutes a cylinder having an opening 3 in its lower end and provided at its upper end with a closure device 4 through which extends an inlet 5. Secured to the inner face of the closure member 4 is a spring 6 constituting a resilient abutment. Slidably mounted in the cylinder 2 is a piston 7 provided with packing-rings 8 and connected with a depending piston-rod 9 the lower end 10 of which extends through the opening 3 which constitutes a bearing and guide therefor. Surrounding the piston-rod 9 within the cylinder 2 is a coiled resilient element 11 the normal tendency of which is to raise the piston 7 upwardly into contact with the spring 6 which latter acts as a cushioning abutment therefor. The lower end 10 of the piston-rod 9 is provided on one face with a plurality of ratchet-teeth 12 for a purpose to be described.

The lower portion of the casing 1 is provided with a pair of laterally-extending lugs 13 through the openings 14 of which may be passed hold-fast devices for securing the device to a suitable supporting medium. The lower end of the casing 1 is enlarged and provided with a central opening 15 and with two laterally-extending portions 16 and 17 in which are formed bearings for a horizontal, rotatable and longitudinally-shiftable shaft 18. The bearing in the lateral extension 16 constitutes a chamber which is closed through the medium of a cap 19 and is provided with an inlet-opening 20. The shaft 18 is provided with packing-rings 21 to form a tight-joint within the bearing 16 in which it is placed.

Mounted on the shaft 18 is a wide-faced spur-gear 22 which is freely revoluble on the shaft 18 and is held against longitudinal movement with respect to the shaft through the medium of a set screw 23 which engages in a circumferential groove or channel 24 which is indicated in dotted lines in Figs. 1 and 2. The face of the gear 22 which op-

poses the lateral-extension 17 is provided with a cylindrical recess 25 within which is positioned a ratchet-wheel 26 securely fixed to the shaft 18 by a key 27 or otherwise. Secured to the gear 22 within the recess 25 is a pawl 28 the free end of which is held in engagement with the teeth of the ratchet-wheel 26 through the medium of a resilient element 29. Surrounding the shaft 18 is a resilient element 30 one end of which bears against the lateral face of the ratchet-wheel 26 and its opposite end is seated in a suitable recess 31 in the lateral extension 17 of the casing 1. The projecting end of the shaft 18 is provided with a notch 32 adapted to engage a pin 33 on the end of the engine-shaft 34 which is to be rotated by this device. The opposite end of the shaft 18 is provided with a squared socket 38 to receive a hand-crank to permit manual manipulation of the shaft 18 when desired.

When it is desired to start an explosive engine by utilizing this device a supply of fluid such as gas or air is admitted to the chamber in the extension 16 through the inlet 20 which causes the shaft 18 to move to the right in Fig. 1 sufficiently to cause the notch 32 to engage the pin 33 on the engine-shaft 34 and while maintaining this interlocking engagement of the two elements a supply of fluid under pressure is admitted through the opening 5 to the cylinder 2 which forces the piston 7 downwardly overcoming the resilient element 11 and causing the teeth 12 on the piston-rod 9 to rotate the free running gear 22 rapidly in the direction of the arrow in Fig. 3. This rotation of the gear 22 will cause a simultaneous revolution of the ratchet-wheel 26 and as this ratchet-wheel is fixedly secured to the shaft 18 the latter will be rotated sufficiently to impart an initial rotation to the engine-shaft to permit the starting of the engine. As soon as the engine is started the pressure in the chamber within the extension 16 is removed permitting the resilient element 30 to shift the shaft 18 longitudinally to restore the parts to the position shown in Fig. 1, thereby disconnecting the shaft 18 from the engine-shaft 34. After disconnecting these two elements, the pressure of fluid within the cylinder 2 is removed allowing the spring 11 to restore the piston to its normal upper position, in doing which a reverse rotation of the gear 22 is permitted by reason of the fact that the pawl 28 will run inoperatively over the teeth of the ratchet-wheel 28 and the termination of the upward movement of the piston 27 will be cushioned by the spring 6.

If it is desired at any time to start the engine by hand the cap 19 is removed and a suitable tool, such as a wrench or hand-crank, is inserted in the socket 35 and the shaft 18 is manipulated in the ordinary way until a sufficient number of rotations of the shaft have been given to cause the initial starting of the engine.

I claim:

1. A starting device for explosive engines comprising a cylinder, a piston therein adapted to be operated by a fluid under pressure, a piston-rod carried by said piston, said piston-rod provided with rack-teeth, a rotatable shaft adapted to be temporarily coupled with a suitable portion of an engine to be started and adapted to be longitudinally shifted into engagement therewith by a fluid under pressure, a gear loosely rotatable on said shaft, a ratchet-wheel fixedly mounted on said shaft, a pawl carried by said gear adapted to engage said ratchet-wheel when said gear is operated in one direction for rotating said shaft, and resilient means for withdrawing said shaft from engagement with said engine portion.

2. A starting device for explosive engines comprising a cylinder, a piston therein adapted to be operated by a fluid under pressure, a piston-rod carried by said piston, said piston provided with rack-teeth, a rotatable shaft adapted to be temporarily coupled with a suitable portion of an engine to be started and adapted to be longitudinally shifted into engagement therewith by a fluid under pressure, a gear freely rotatable on said shaft and movable longitudinally in unison therewith, means for transmitting movement from said gear to said shaft when said gear is rotated in one direction, said means being inoperative when said gear is operated in the opposite direction, and means for withdrawing said shaft from engagement with said engine portion.

3. A starting device for explosive engines comprising a cylinder, a fluid-operated piston therein, a piston-rod provided with rack-teeth carried by said piston, a shaft suitably mounted for coupling it with a suitable portion of an engine to be started, a gear mounted on said shaft and receiving motion from said piston-rod, means for transmitting motion from said gear to said shaft when said gear is rotated in one direction, said means being inoperative when said gear is operated in the opposite direction, said shaft adapted to be shifted into engagement with said engine portion by a fluid under pressure, means for withdrawing said shaft from connection with said engine portion, said shaft provided with means to receive a hand-tool for independently rotating it.

4. A starting device for explosive engines comprising a casing, a portion of which constitutes a cylinder, a fluid-operated piston therein, a piston-rod carried by said piston, said piston-rod provided with rack-teeth, a rotatable shaft mounted in said casing provided with means for coupling it to a suitable portion of an engine to be started, said

shaft adapted to be moved into engagement with said engine portion by a fluid under pressure, a freely rotatable gear mounted on said shaft, means for communicating motion from said gear to said shaft when the former is revolved in one direction, said means being inoperative when said motion is reversed, and a resilient element adapted to normally hold said shaft out of engagement with said engine portion.

5. A starting device for explosive engines comprising a casing, a portion of which constitutes a cylinder, a reciprocatory fluid-operated piston in said cylinder, a piston-rod provided with rack-teeth carried by said piston, a rotary shaft mounted in suitable bearings in said casing, one of said bearings projecting beyond the end of said shaft to constitute a chamber, a closure device for said chamber, a fluid inlet to said chamber, said shaft provided with means for coupling it with a suitable portion of an engine to be started, said shaft further provided with means to permit the manual manipulation of said shaft when said closure device is removed, a gear freely rotatable on said shaft and engaging the teeth on said piston-rod, means for communicating motion from said gear to said shaft when said shaft is rotated in one direction, said means being inoperative when said motion is reversed, and means adapted to longitudinally shift said shaft out of engagement with said engine portion.

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

MILTON E. COLE.

Witnesses:
C. E. HUMPHREY,
A. L. MCCLINTOCK.