March 15, 1927. 1,620,998

V. R. CLARK

STARTING DEVICE FOR INTERNAL COMBUSTION ENGINES

Filed July 16, 1926

Fig. 1.

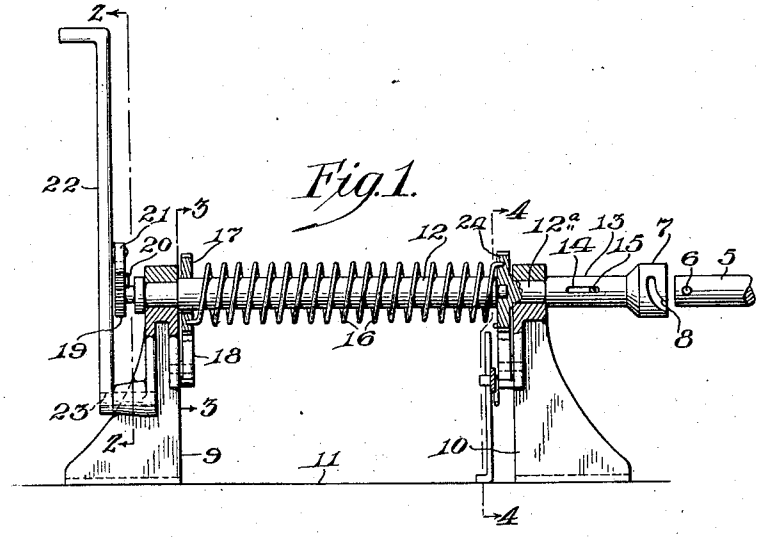


Fig. 2.

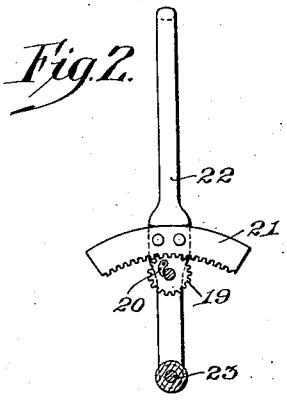
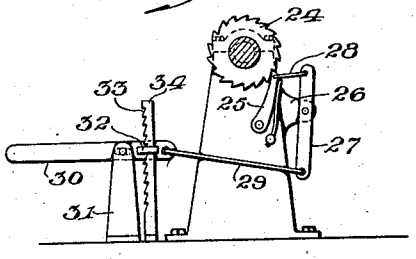


Fig. 3.



Fig. 4.



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Patented Mar. 15, 1927. 1,620,998

UNITED STATES PATENT OFFICE.

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STARTING DEVICE FOR INTERNAL-COMBUSTION ENGINES.

Application filed July 16, 1926. Serial No. 122,885.

The object of the invention is to provide improvements in apparatus for imparting a rotary motion to shafts, and particularly in devices adapted for starting internal combustion engines such as are used in marine launches, wherein there is generally no self-starter, and the high compression and inertia of movable parts while stationary makes it very difficult to rotate the shaft manually.

Another object is to provide a construction of a device of this character, which will not require an undue amount of space, is relatively simple and inexpensive to manufacture, and which will operate with a maximum of efficiency.

A further object is to provide an auxiliary shaft adapted to be operatively connected to and disconnected at will from the crank-shaft of an engine; to provide means to impart a rotary motion to this auxiliary shaft intermittently in one direction; to provide means to restrain said shaft against reverse motion as long as desired; to provide resilient means adapted to be tensioned by said first means; and to provide means to release said shaft so that said resilient means will rotate said shaft in the opposite direction and thereby rotate, or "turn over", the crank-shaft of such as an internal combustion engine.

With these and other objects in mind, the present invention comprises still further novel details of construction and operation as are hereinafter fully brought out in the following description, when read in conjunction with the accompanying drawings in which Fig. 1 is a side elevation of one embodiment of the invention partly in section; Fig. 2 is a fragmentary end elevation of a section of the same, taken on the line 2—2 of Fig. 1; Fig. 3 is another sectional detail of the same, taken on the line 3—3 of Fig. 1; and Fig. 4 is a detail section on the line 4—4 of Fig. 1.

Referring to the drawings, only a fragmentary portion 5 is shown of the crank-shaft of an internal combustion engine, or similar piece of mechanism, said shaft being provided with one or more pins 6, or other suitable means for engaging the same at will. The end portion of this shaft is adapted to be surrounded by and received within a socket 7, provided with a curved bayonet slot or groove 8, into which the pin or pins 6 extend in order to couple said shaft and said socket together for the purpose hereinafter described.

The present starting device it is to be understood is designed to be positioned within a ship, launch, or boat of any sort, or for that matter to be operatively positioned with respect to a device having an element to be given a rotating impetus, whether or not it is afloat or on land. Consequently, the standards 9 and 10 are to be considered as being fixed to and supported by any suitable base 11, from which they rise in spaced parallel relation. Thru these standards are journaled independent, aligned, relatively movable shafts 12 and 12ª, to one end of the latter of which is secured in longitudinally slidable, but rotatably fixed, relation a head 13, which in turn is an integral part or extension of the socket 7. The said head may be attached to said shaft 12ª in any suitable manner, but for purposes of illustration this connection is shown as comprising a longitudinal slot 14 in which a pin 15 is longitudinally slidable, while if desired an expansion spring (not shown) may be positioned within the head 13 in order to normally maintain said head in the position illustrated, that is, in spaced disengaged relation with respect to the shaft 5.

Surrounding the shaft 12 is a coil, or similar, spring 16, one end of which is secured to a ratchet 17, keyed to the said last-named shaft and engaged by a spring-pressed pawl 18, mounted upon the inner upright surface of the standard 9, to permit rotation in one direction, but to prevent its unintentional rotation in the opposite direction. Upon the adjacent end of this shaft is secured a pinion 19, carrying a dog or pawl 20, which normally engages a shoulder or the like upon the supporting shaft, while the teeth of said pinion mesh with the teeth of a rack 21, secured to a manually actuatable lever 22, oscillatably supported by means of a pivot 23, carried by the lower portion of the standard 9.

While the shafts 12 and 12ª may be rotatably associated in any suitable manner, the present embodiment of the invention shows the shaft 12ª as receiving the adjacent end of the shaft 12, while the surrounding portion of the former is enlarged and provided with teeth to comprise a ratchet 24, normally engaged by a spring-pressed pawl 25, mounted upon the inner upright surface of the standard 10. Said last-named standard

is also provided with a lug or shoulder 26, to which is pivotally secured a bell-crank lever 27, one end of said lever being connected to said pawl by means of a link 28, and the opposite end of said lever being connected by means of a link 29 to a pedal, or manually actuatable lever 30, pivotally supported by and in any suitable means 31, and provided with a strap or the like 32, which surrounds and engages teeth 33 carried by a standard 34, which is fixedly mounted in any suitable manner with respect to the shaft standard 9, hereinbefore described. It will also be noticed that the lever 30 and its support 31, while pivotally connected to afford relative oscillation, are so connected as to provide for a slight longitudinal movement of the former with respect to the latter, in order to permit the strap 32 to engage the teeth 33 of the standard by reason of the influence of its connection with the spring-pressed pawl 25, and yet to permit said strap to be instantly released from engagement with said teeth as this becomes necessary.

In the operation of the device, the head 7 is made to engage the pin 6 of the shaft 5, and the lever 22 is manually oscillated to and fro, thus oscillating the pinion 19, with the result that during each forward movement of said lever the spring 16 is wound tighter and tighter upon the shaft 12, by the indirect co-operation of the respective ratchet and pawls 17—18 and 24—25. Finally, after the spring 16 has become sufficiently tensioned, the pedal 30 is actuated either by one's foot or hand so as to disengage the rack, 33, and upon being pulled forward effects a disengagement of the pawl 25 from the ratchet wheel 24, thus releasing the shaft 12^a adjacent to the standard 10 and permitting the spring to indirectly rotate the head 7 and shaft 5. In the case of starting an integral combustion engine, before the ratchet 24 is released, the throttle and ignition spark are, of course, set, so that merely releasing the stored energy of the spring 16 operates to completely start the normal operation and running of the engine. In any case, upon resetting the lever 30 so that the pawl 25 engages the ratchet 24, the starting device as a unit is adapted to be again operated as above described, when and as soon as it becomes necessary to restart the engine, or other mechanism.

Having thus described my invention, what I claim and desire to protect by Letters Patent of the United States, is:—

1. The combination of a rotatable shaft, a head rotatably attached by a journalled connection to said shaft and adapted to engage the shaft of an internal combustion engine, a ratchet and pawl connected to said head, a ratchet and pawl connected to said shaft, a coil spring extending between and connected to said shaft and said head, a pinion also carried by said shaft, a pawl connected to prevent relative rotation between said pinion and said shaft in one direction and an oscillatable rack pivotally supported and co-operating with said pinion to rotate said shaft and tension said spring while the pawls engage the respective ratchets.

2. The combination of a rotatable shaft, a head rotatably attached by a journalled connection to said shaft and adapted to engage the shaft of an internal combustion engine, a ratchet and pawl connected to said head, a ratchet and pawl connected to said shaft, a coil spring extending between and connected to said shaft and said head, a pinion also carried by said shaft, a pawl connected to prevent relative rotation between said pinion and said shaft in one direction and an oscillatable rack pivotally supported and co-operating with said pinion to rotate said shaft and tension said spring while the pawls engage the respective ratchets, means to release said first pawl from its co-operating ratchet, to permit the spring to rotate said head and a shaft disengageably connected thereto.

3. The combination of a shaft, a coil spring surrounding said shaft, and adapted to be tensioned, a member rotatably associated with said shaft, a ratchet carried by said member, a spring-pressed pawl normally co-operating with said ratchet, a fixedly positioned rack, and means engaging said rack and connected to said pawl, whereby actuation of said means releases said pawl and permits said spring when tensioned to rotate said member with respect to said shaft.

4. The combination of a shaft, a coil spring surrounding said shaft and adapted to be tensioned, a head rotatably associated with said shaft, a ratchet carried by said head, a pawl operative to normally prevent rotation of said ratchet in one direction, a bell crank lever oscillatably mounted upon a pivot, a manually actuated lever, means connecting said first lever both to said pawl and to said last-named lever, and a relatively fixed rack engageable by, and operative to temporarily position said last-named lever so as to withhold said pawl from engagement with said ratchet, to permit said spring when under tension to rotate said head.

In testimony whereof I hereby affix my signature.

VIRGIL R. CLARK.