C. A. DEAL.

STARTING MECHANISM FOR INTERNAL COMBUSTION ENGINES.

APPLICATION FILED AUG. 8, 1910.

1,001,512.

Patented Aug. 22, 1911.

2 SHEETS—SHEET 1.

Fig. 6.

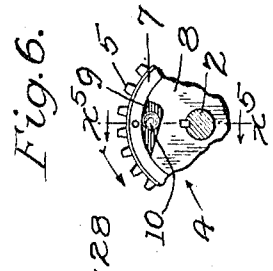


Fig. 5.

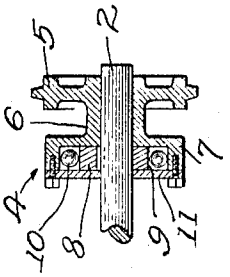


Fig. 1.

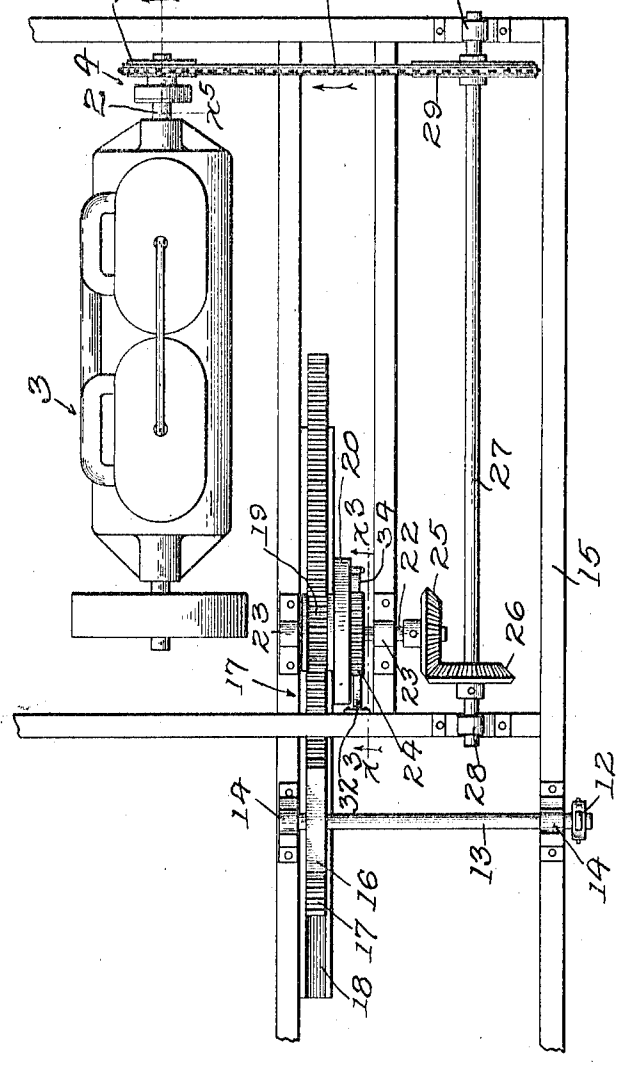
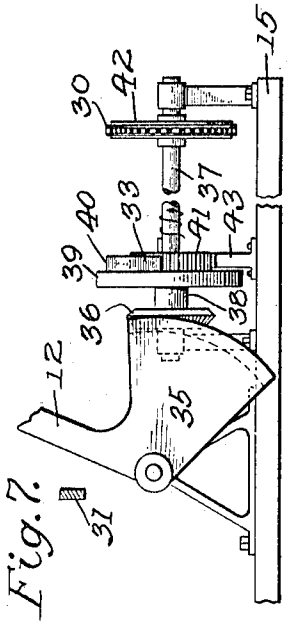


Fig. 7.



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2 SHEETS—SHEET 2.

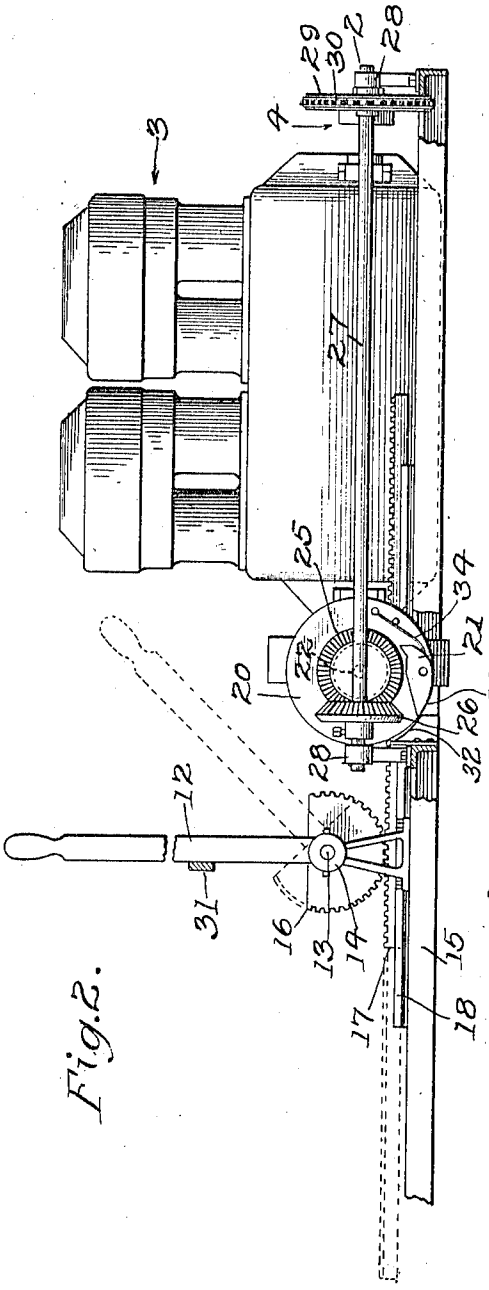

Fig. 2.

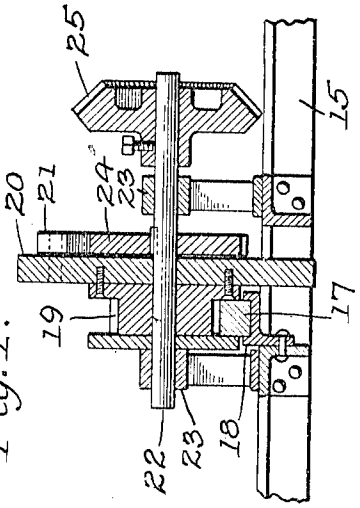

Fig. 4.

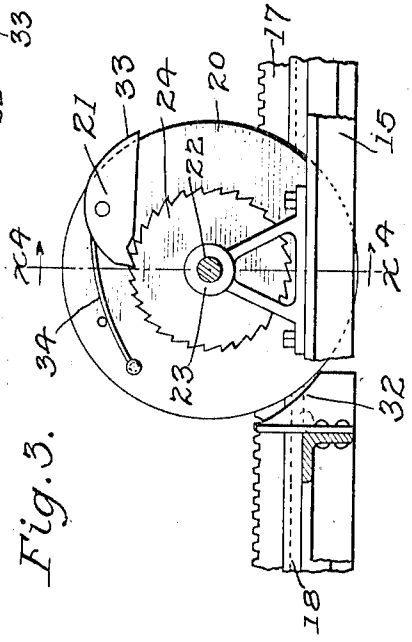

Fig. 3.

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UNITED STATES PATENT OFFICE.

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STARTING MECHANISM FOR INTERNAL-COMBUSTION ENGINES.

1,001,512. Specification of Letters Patent. Patented Aug. 22, 1911.

Application filed August 8, 1910. Serial No. 576,212.

To all whom it may concern:

Be it known that I, CHARLES A. DEAL, a citizen of the United States of America, residing at Los Angeles, in the county of Los Angeles, State of California, have invented a certain new and useful Starting Mechanism for Internal-Combustion Engines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to starting mechanism for internal-combustion engines, and it has for its objects to provide a novel construction therefor which shall be easy and convenient to manipulate, strong and durable in use, positive and effective in action, and by which is avoided danger of injury to the operator in case the engine operates to rotate the crank shaft in a reverse direction.

With the above and other objects and advantages in view which will be apparent to those skilled in the art, the invention may be said to consist of the novel construction, arrangement and combination of parts as set forth in the claims and as will appear from a consideration of the description hereinafter of two preferred forms of construction in which the invention may be embodied, the construction being illustrated in the accompanying drawings forming part hereof, of which drawings—

Figure 1 is a plan view of one form of construction for the invention in connection with the gas engine. Fig. 2 is a partly broken away elevation of the construction shown in Fig. 1. Fig. 3 is a section taken on the line X^3—X^3 of Fig. 1, the pawl being in changed position. Fig. 4 is a section taken on the line X^4—X^4 of Fig. 3. Fig. 5 is a section taken on the line X^5—X^5 of Figs. 1 and 6. Fig. 6 is a partial detail of the ball clutch, and Fig. 7 is a modified construction for a portion of the actuating mechanism.

On the crank shaft 2 of an internal combustion engine, indicated by the numeral 3 in Figs. 1 and 2, may be mounted a device 4 connected with actuating mechanism for turning the crank shaft to start the engine; the device being adapted to be disengaged from the actuating mechanism after the engine starts. As shown in Figs. 1, 6 and 7, the device 4 may comprise the sprocket wheel 5 provided with the sleeve 6, carrying the ball clutch comprising the disk 7 which is rigidly mounted on the crank shaft and recessed to receive the disk 8 having the inwardly inclined recesses 9 on the periphery thereof in each of which recesses is disposed a ball 10. A plate 11 is secured to the disk 7 to retain the balls 10 in place in the recesses 9; and the plate together with the disk 7, sleeve 6 and sprocket wheel 5 are loosely mounted on the crank shaft 2.

In one form of the construction for the actuating mechanism as shown in Figs. 1 to 4 inclusive, the hand lever 12 is secured to a shaft 13 mounted on the bearings 14 on a suitable frame 15, and the shaft carries fast thereto the segmental gear-wheel 16 which meshes with a rack bar 17 adapted to slide in the guideway 18 thereunder. In mesh with the rack bar 17 is the pinion 19 secured to the disk 20 carrying the spring pressed pawl 21; the pinion 19 and the disk 20 being loosely mounted on the shaft 22 which is mounted in the bearings 23 and has fast thereon the ratchet wheel 24 and the bevel gear wheel 25. The gear wheel 25 is in mesh with the gear wheel 26 fast on the shaft 27 which is mounted on the bearings 28 at each end thereof and carries the sprocket wheel 29 which is connected with the sprocket wheel 5 by the sprocket chain 30. A stop 31 connected to any suitable stationary part (not shown) prevents movement of the lever 12 to the left beyond the vertical position. The abutment 32 secured to the frame is adapted to throw the pawl 21 out of engagement with the ratchet wheel in consequence of the heel 33 of the pawl striking thereagainst at the limit of movement of the lever to the left in the drawing.

With the construction as above described and assuming that the lever 12 occupies a position to the right of the vertical position, the operation may be as follows: The lever on being moved quickly to the vertical position rotates the shaft 13 and in consequence the segmental gear wheel 16 moves the rack bar 17 to the right to rotate the pinion 19 and the disk 20 carrying the pawl 21 which, by means of the spring 34, is pressed in engagement with the ratchet wheel 24 so that the latter is caused to rotate with the disk 20 and thereby rotate the shaft 22 and also the bevel gear wheel 25 which through bevel gear wheel 26 drives the shaft 27 and the sprocket wheel 29 which by means of

sprocket chain 30 drives the sprocket wheel 5 which thereupon actuates the ball clutch to engage to turn the crank shaft to start the engine. By the time the lever reaches the stop 31, the pawl 21 will strike the abutment 32 and thus be thrown out of engagement with the ratchet wheel 24 to disconnect the latter, the disk 20, pinion 19, rack bar 17, segmental gear wheel 16, shaft 13 and lever 12 from the remainder of the actuating mechanism. Should the engine start the ball clutch becomes disengaged by the balls moving to a lower position in the recesses 9, as will be understood. In case the engine does not start after movement of the lever as just described the lever may be moved to the right and then quickly to the left again and this operation repeated as many times as may be necessary to cause the engine to start. In moving the lever to the right, the segmental gear wheel 16 moves the rack bar 17 to the left and the latter rotates the pinion 19 and disk 20, but the pawl 21 rides over the teeth of the ratchet wheel 24 so that the remainder of the actuating mechanism is not affected by such movement of the lever.

In the form of construction shown in Fig. 7, the lever 12 carries the integral bevel geared sector 35 which meshes with the bevel pinion 36 on shaft 37. The pinion 36 is connected by sleeve 38 with the disk 39 carrying pawl 40; the pinion 36, sleeve 38 and disk 39 being loosely mounted on the shaft 37 and the pawl being associated with a ratchet wheel 41 fast on the shaft 37. The shaft 37 also has mounted fast thereon the sprocket wheel 42 which may drive by means of a sprocket chain (not shown) the parts shown in Fig. 1 on the crank shaft 2. An abutment 43 is arranged adjacent to the ratchet wheel 42, the abutment and also the disk 39, pawl 40 and ratchet wheel 41 are similar to those already described in connection with the first form of construction for the actuating mechanism.

In the operation of the last form of construction, lever 12 being moved to the left causes the bevel geared sector 35 to rotate the bevel pinion and disk 40 and consequently the shaft 37 to drive the sprocket wheel 42 because the pawl 40 is engaged with the ratchet wheel 41. When the lever is near the vertical position the pawl 40 strikes the abutment 43 and is disengaged from the ratchet wheel 41 and thereby the disk 39, pinion 36 and bevel geared sector 35 are disengaged from the remainder of the actuating mechanism as will be understood. In moving the lever to the right the bevel geared sector 35 will rotate the pinion 36 and disk 39 but the pawl will ride over the teeth of the ratchet wheel 41 so that there is no movement of the remainder of the actuating mechanism.

While two forms of construction embodying the invention have been illustrated and described, there are many changes and modifications that will occur to those skilled in the art, and the right is therefore reserved to all such changes and modifications as do not depart from the spirit and scope of the invention.

I claim:

1. The combination with the crankshaft of an internal-combustion engine, of a device mounted on said crankshaft, said device adapted to be in disengaged condition when the engine starts to drive the crankshaft, a shaft adjacent to said device and operatively connected therewith, a ratchet wheel fast on the last shaft, rotatory means loosely mounted on the last shaft including a pawl associated with said ratchet wheel, a hand lever, operative connections between the hand lever and said means, and means to throw said pawl out of engagement with the ratchet wheel when the lever is moved to a predetermined position.

2. The combination with the crankshaft of an internal-combustion engine, of a device mounted on said crankshaft, said device adapted to be in disengaged condition when the engine starts to drive the crankshaft, a shaft adjacent to said device and operatively connected therewith, a ratchet wheel fast on the last shaft, rotatory means loosely mounted on the last shaft including a pawl associated with said ratchet wheel, a rack bar connected with said means, and a hand lever operatively connected with the rack bar.

3. The combination with the crankshaft of an internal-combustion engine, of a device mounted on said crankshaft, said device adapted to be in disengaged condition when the engine starts to drive the crankshaft, a shaft adjacent to said device and operatively connected therewith, a ratchet wheel fast on the last shaft, rotatory means loosely mounted on the last shaft including a pawl associated with said ratchet wheel, a rack bar connected with said means, a hand lever operatively connected with the rack bar, and means to throw said pawl out of engagement with the ratchet wheel when the lever is moved to a predetermined position.

In testimony whereof, I have signed my name to this specification in the presence of two subscribing witnesses at Los Angeles, county of Los Angeles, State of California, this 1st day of August A. D. 1910.

CHARLES A. DEAL.

Witnesses:
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Harry A. Brooks.

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