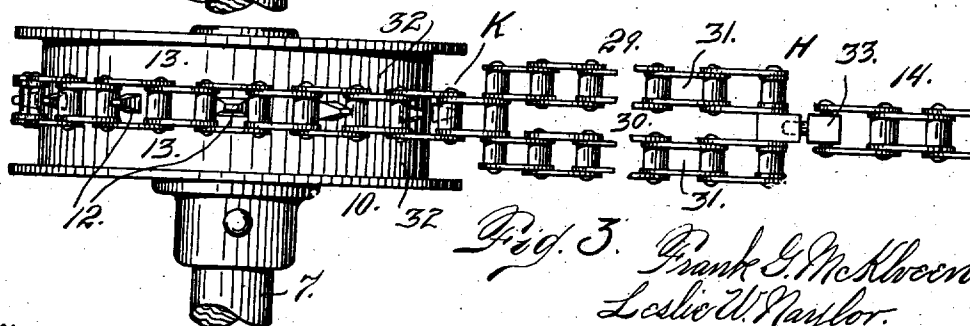
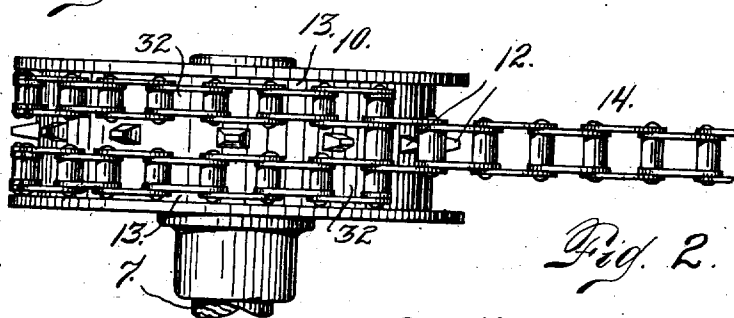
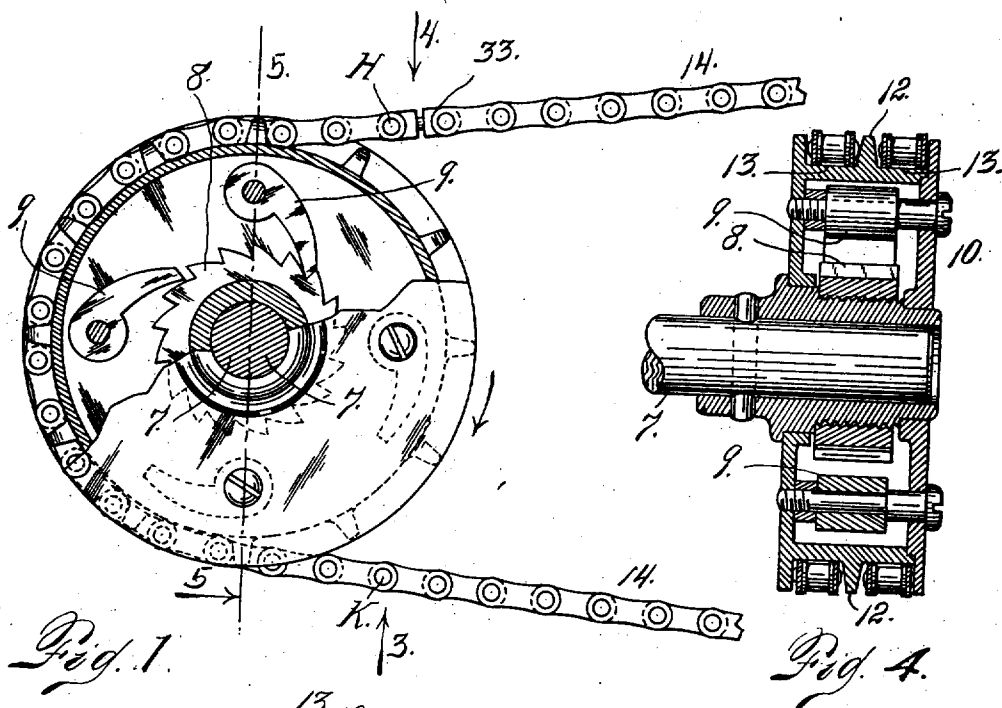


F. G. McKLVEEN & L. W. NAYLOR.
 STARTER FOR INTERNAL COMBUSTION ENGINES.
 APPLICATION FILED JAN. 30, 1911.

1,017,681.

Patented Feb. 20, 1912.

2 SHEETS—SHEET 1.



Witnesses

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 C. H. Rossmore.

Frank E. McKlveen.
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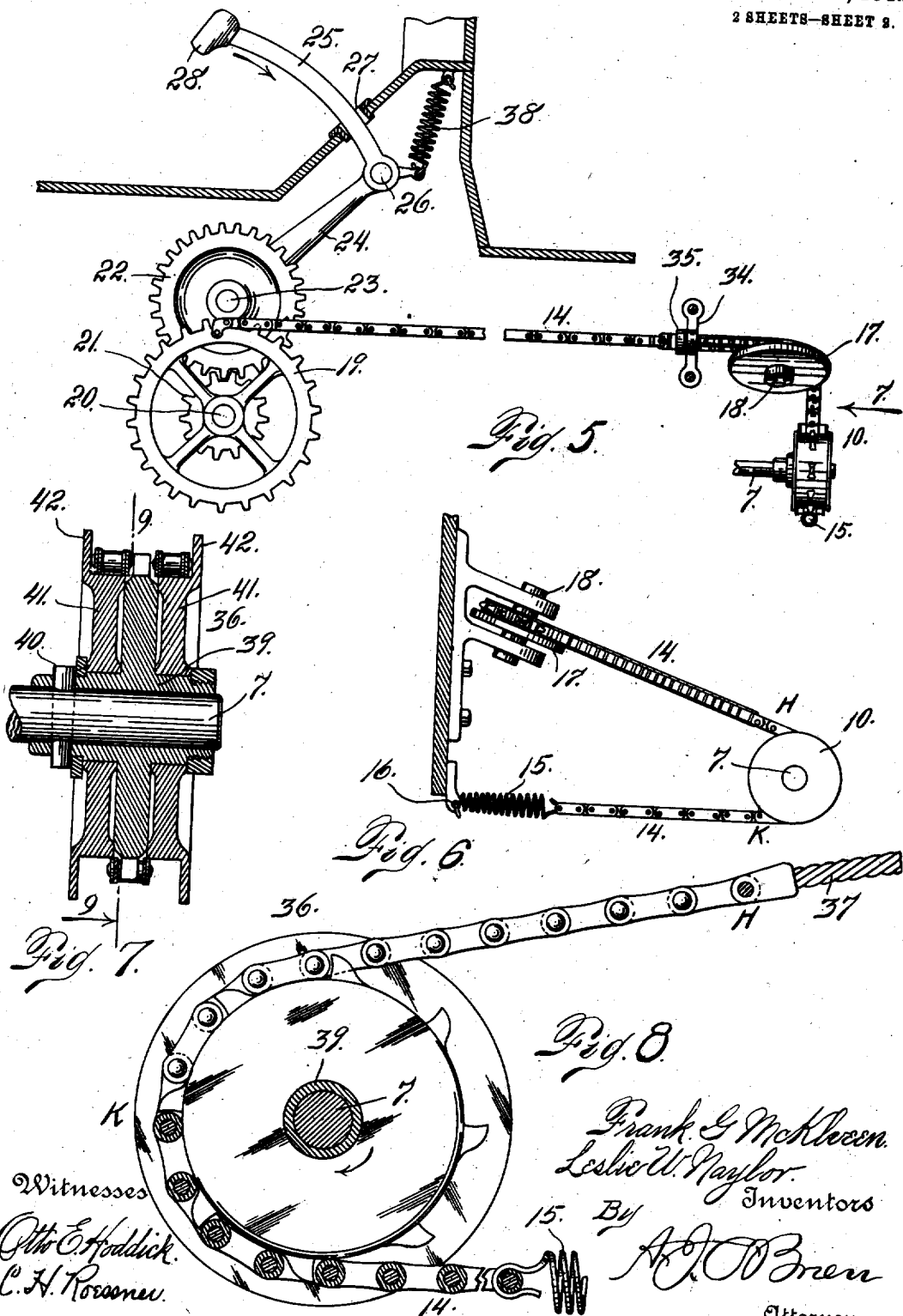
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UNITED STATES PATENT OFFICE.

FRANK G. McKLVEEN AND LESLIE W. NAYLOR, OF DENVER, COLORADO; SAID NAYLOR
ASSIGNOR TO SAID McKLVEEN.

STARTER FOR INTERNAL-COMBUSTION ENGINES.

1,017,681.

Specification of Letters Patent.

Patented Feb. 20, 1912.

Application filed January 30, 1911. Serial No. 605,642.

To all whom it may concern:

Be it known that we, FRANK G. McKLVEEN and LESLIE W. NAYLOR, citizens of the United States, residing in the city and county of Denver and State of Colorado, have invented certain new and useful Improvements in Starters for Internal-Combustion Engines; and we do 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, reference being had to the accompanying drawings, and to the characters of reference marked thereon, which form a part of this specification.

Our invention relates to improvements in starters for internal combustion engines, being more especially adapted for use in connection with the engines employed in running automobiles or horseless vehicles.

In our improved construction we employ a flexible device, as a chain, connected at one extremity with a sprocket wheel mounted on a shaft having a gearing connection with a rock shaft, the latter being equipped with a crank arm and a lever, the latter being easily accessible. The chain employed engages a drum mounted on the engine shaft and either directly connected therewith or connected therewith through the medium of a clutch device, as pawls carried by the drum and engaging a ratchet fast on the engine shaft.

An important feature of our improved construction consists in the fact that the central portion of the wheel or drum is equipped with ratchet teeth, while the periphery of the drum on opposite sides of these teeth is perfectly smooth. The chain is equipped with a section large enough to pass around the drum, whose central portion is devoid of links, or blank, the links of the chain occupying the portion of the drum devoid of teeth on opposite sides of the ratchet zone. The normal position of the chain is such that the blank central portion of the chain is in engagement with the drum when the engine is running. When it stops, however, and it is desired to start the engine, a relatively short movement of the crank arm, will actuate the chain sufficiently to cause the portion of the chain having the blank central portion to leave the drum, while the portion of the chain

adapted to engage the sprocket teeth of the drum will be brought into operative relation therewith, whereby the drum is rotated and the engine shaft actuated for starting purposes. After the engine is started, a spring with which one extremity of the chain is connected, returns the chain to its normal position, bringing the portion of the chain having the blank central portion into position to surround the drum and allowing the latter, if necessary, to rotate freely with the engine shaft, since the sprocket teeth of the drum protrude through the central blank portion of the chain.

Having briefly outlined our improved construction, we will proceed to describe the same in detail, reference being made to the accompanying drawing in which is illustrated an embodiment thereof.

In this drawing: Figure 1 is an enlarged side elevation of one form of sprocket drum, the casing being broken away on one side to disclose the ratchet pawl construction, the parts being shown on a larger scale. Fig. 2 is an underneath view of the construction shown in Fig. 1, or a view looking in the direction of arrow 3, Fig. 1. Fig. 3 is a top plan view of the structure shown in Fig. 1. Fig. 4 is a section, taken through the sprocket drum, on the line 5-5 of Fig. 1. Fig. 5 is a side view of the starter mechanism, the parts being shown on a larger scale, and the casing of the vehicle being sectionized to better disclose the mechanism. Fig. 6 is a view looking in the direction of arrow 7, Fig. 5. Fig. 7 is a section, taken through a modified form of sprocket drum. Fig. 8 is a section taken on the line 9-9 of Fig. 7.

The same reference characters indicate the same parts in all the views.

Referring first more particularly to Fig. 6, let the numeral 5 designate the body of an automobile, 6 the explosive engine carried thereby, and 7 the engine shaft upon which is mounted and made fast a ratchet disk 8 engaged by pawls 9 carried by a sprocket drum 10 whose periphery is provided with a centrally located set of sprocket teeth 12, the periphery of the drum on opposite sides of the teeth being plain as shown at 13. This drum is engaged by a chain 14, one extremity of which is secured to a spring 15 made fast to the framework of the vehicle as shown at 16.

From the spring 15 the chain passes around the sprocket drum 10, and passes thence to a guide sprocket 17 journaled in the framework of the vehicle as shown at 18, its axis being inclined to the horizontal to harmonize with the inclination of the chain as it passes upwardly from the sprocket drum on the engine shaft. This chain passes thence rearwardly to a sprocket wheel 19 fast on a shaft 20 carrying a fast gear 21 meshing with a gear 22 fast on a shaft 23 equipped with a crank arm 24 to whose outer extremity is secured a lever arm 25 as shown at 26, the said lever arm passing through an opening 27 in the bottom of the vehicle, the upper extremity 28 of the foot lever being within convenient reach of the foot of the driver or person in charge of the machine.

The chain 14 is provided intermediate its extremities with a section 29 having a centrally located blank space 30, this space being located between chain members 31, the said members 31 being adapted to engage the spaces 32 of the periphery of the drum 10. This double section of the chain with a centrally located space extends from a point H to a point K of the chain (see Fig. 1), being sufficient in length to pass around the sprocket drum, whereby the latter may turn independently of the chain, since the teeth of the drum are free to rotate in the space 30 between the members 31 of the double chain section 29. In order to permit the chain to engage the guide sprocket 17 for the purpose of passing around the corner of the framework, the chain is provided with a swivel joint 33. In order that the chain may always stop in the right position when returned to its normal position under the influence of the spring 15, a guide bracket 34 is employed, the chain being equipped with a stop 35 adapted to arrest the reverse movement of the chain under the influence of the spring 15 just in time to cause the section 29 of the chain to engage the plain portion of the sprocket drum on opposite sides of the sprocket teeth, thus allowing the drum to turn freely during the reverse movement of the engine shaft or during either the forward or backward movement thereof, when the sprocket wheel 36 is fast upon the engine shaft (see Figs. 7 and 8). In these views the sprocket wheel has a relatively long hub 39 which is secured to the engine shaft by a key 40. Mounted on this hub and located on opposite sides of the body of the wheel 36 are two disks 41 which are loose on the hub 39, their peripheries being adapted to be engaged by the members 31 of the chain section 29. This is the normal position of the chain when the engine is running, and in this event the disks 41 will remain stationary with the chain while the sprocket wheel and its hub ro-

tate. The disks 41 are provided with flanges 42 to prevent the chain from slipping laterally therefrom when in use.

In the foregoing construction the intermediate double chain section 29 is substantially the same as heretofore described, but a cable section 37 is employed and adapted to pass around a guide pulley which would take the place of the sprocket 17 where the chain is employed. By employing a cable section, the necessity for making a swivel joint in the chain is overcome.

From the foregoing description the use and operation of our improved engine starter will be readily understood. The driver of the vehicle when sitting in the seat (not shown), is so situated that he can press his foot upon the extremity 28 of the lever arm 25, whereby a short movement of the crank arm 24 on the shaft 23 will through the instrumentality of the gearing connection between the shafts 23 and 20, impart sufficient movement to the chain 14 to give the engine shaft several turns, or sufficient movement to set it in motion. During this operation the blank section 29 of the chain moves away from the drum, while the body portion of the chain having parts adapted to engage the sprocket teeth of the drum is moved into engagement therewith, actuating the drum in the direction indicated by the arrow in Fig. 1, and rotating the shaft in the same direction by virtue of the ratchet and pawl connection between the drum and the engine shaft. As soon as the engine is started, the shaft with its ratchet disk moves freely within the sprocket drum without turning the latter. In the meantime, or as soon as the pressure acting upon the crank arm 24 ceases to act, the spring 15, which has been placed under tension by the movement of the chain incident to the starting of the engine, will return the chain to its normal position, whereby the section 29 having the blank space to receive the sprocket wheel of the drum will be caused to engage the latter. In this event the sprocket drum fast on the engine shaft may be employed, since the drum may rotate freely due to the fact that the teeth of the drum engage the space 30 between the two chain members.

In the construction shown in Fig. 5 a spring 38 is connected with the outer extremity of the crank arm 24, whereby the latter together with the foot member 25 are supported in their normal position, thus overcoming any tendency to move by gravity.

Having thus described our invention, what we claim is:

1. The combination with an engine shaft, of a wheel mounted thereon and connected in operative relation therewith, a device for operating the same, a spring connected with

one extremity of the device, the said device having a section normally held in engagement with the wheel by the spring, said section having a centrally located space and the wheel being equipped with teeth adapted to move in said space, whereby the wheel may rotate without moving the device, the portion of the latter, beyond the said section, being adapted to engage the teeth to operate the wheel, and means for actuating the device to operate the wheel for engine-starting purposes, substantially as described.

2. The combination with an engine shaft, of a wheel connected in operative relation therewith and having a relatively wide periphery, a row of teeth formed on said periphery, a toothless space on the periphery of the wheel adjacent the teeth, an operating shaft, a device forming a connection between the operating shaft and said wheel,

a spring attached to one extremity of said device, the latter having a section normally held in engagement with the wheel by the spring, said section having a space corresponding in location with the teeth on the wheel, to allow the wheel to turn without moving the device, the said device beyond its inactive section and in line with the space being constructed to engage the teeth to operate the wheel, and means for actuating the operating shaft to bring the said device into operative relation with the wheel on the said shaft, for the purpose set forth.

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

FRANK G. McKLVEEN.
LESLIE W. NAYLOR.

Witnesses:

A. J. O'BRIEN,
A. EBERT O'BRIEN.

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