

C. VAN TUBBERGAN & P. WESTRATE.
STARTER FOR INTERNAL COMBUSTION ENGINES.

APPLICATION FILED FEB. 17, 1912.

Patented May 21, 1912.

2 SHEETS-SHEET 1.

1,027,087.

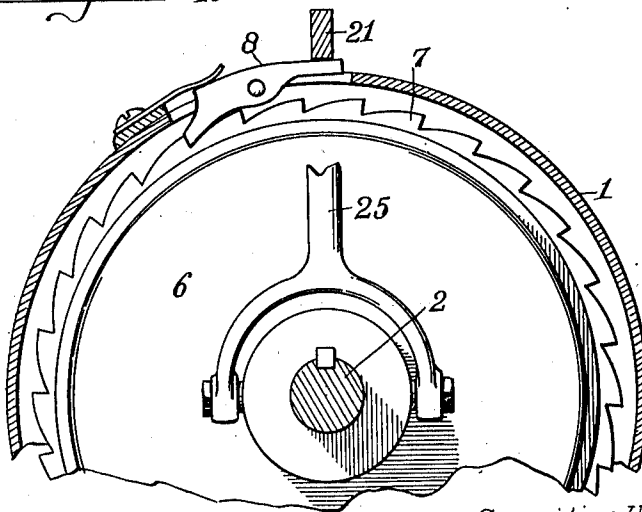
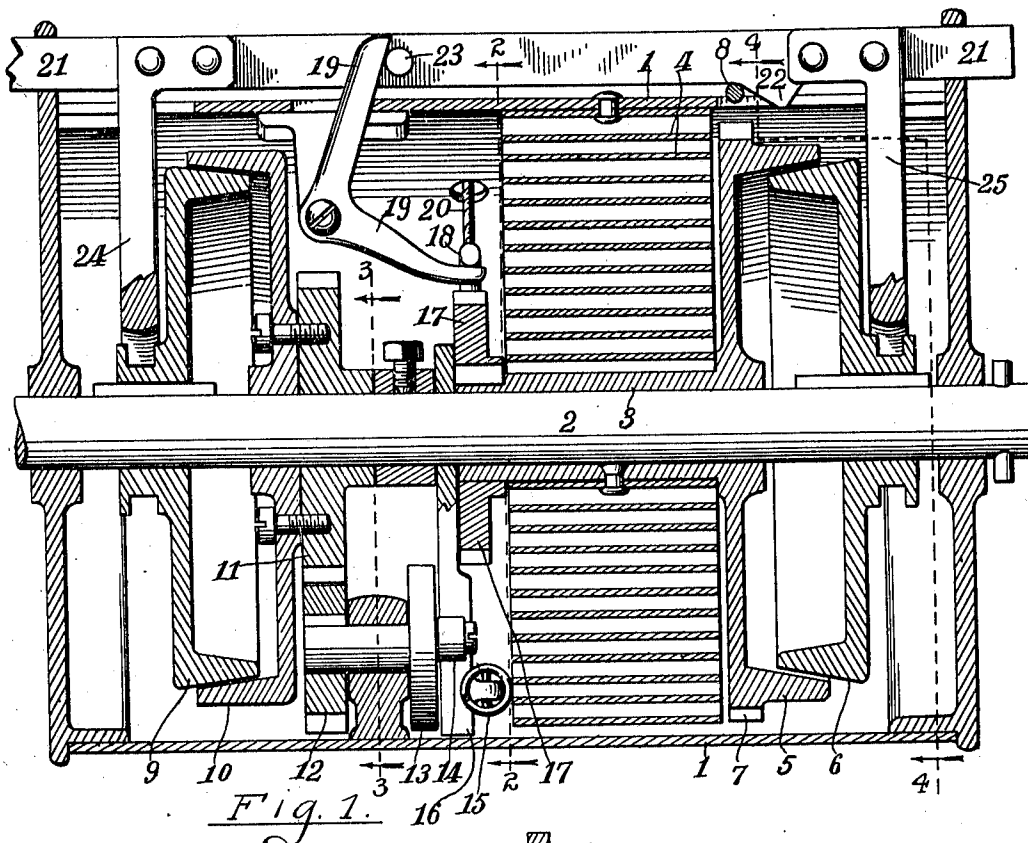


Fig. 4.

Witnesses

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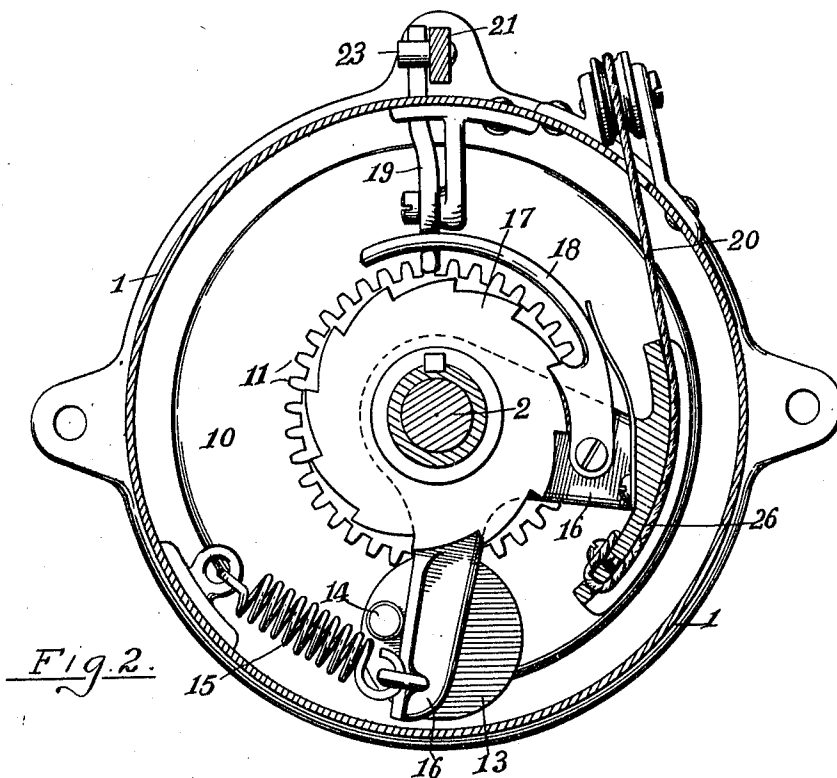


Fig. 2.

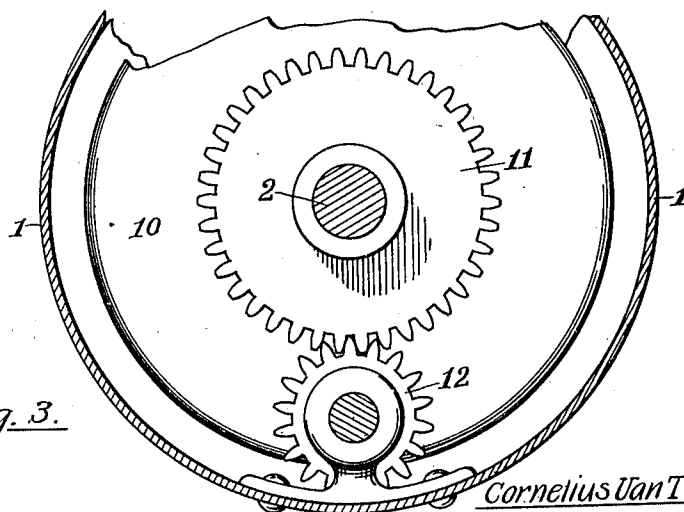


Fig. 3.

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UNITED STATES PATENT OFFICE.

CORNELIUS VAN TUBBERGAN AND PAUL WESTRATE, OF GRAND RAPIDS, MICHIGAN.

STARTER FOR INTERNAL-COMBUSTION ENGINES.

1,027,087.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that we, CORNELIUS VAN TUBBERGAN and PAUL WESTRATE, citizens of the United States of America, residing at Grand Rapids, in the county of Kent and State of Michigan, have invented certain new and useful Improvements in Starters for Internal-Combustion Engines; and we 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.

Our invention relates to improvements in starters for internal combustion engines and more particularly to such starters comprising a spring motor for imparting initial revolutions to the engine and its object is to provide the device with various new and useful features hereinafter more fully described and particularly pointed out in the claims reference being had to the accompanying drawings, in which;

Figure 1 is a longitudinal vertical section of a device embodying our invention; Fig. 2 a transverse section of the same on the line 2—2 of Fig. 1; Fig. 3 a detail in transverse section on the line 3—3 of Fig. 1; and Fig. 4 a transverse section on the line 4—4 of Fig. 1.

Like numbers refer to like parts in all of the figures.

1 represents any suitable cylindrical case in which the device is mounted; 2 a prolongation of the engine shaft rotative in the axis of the case; 3 a sleeve freely rotative on the shaft 2; 4 a motor spring having its outer end attached to the case and its inner end attached to the sleeve 3.

On one end of the sleeve is a clutch member 5 provided with ratchet teeth 7. Splined to the shaft 2 and longitudinally movable thereon is a clutch member 6 adapted to engage the member 5 and thereby connect the shaft to the sleeve. Engaging ratchet teeth 7 on the clutch member 5 is a pawl 8 (see Fig. 4) to hold the spring from unwinding when the device is out of action. A similar clutch member 9 is also splined to the shaft 2 and engages another clutch member 10 freely rotative on the shaft. Attached to the clutch member 10 is a gear 11 engaging a pinion 12 which pinion is mounted on a shaft carrying a crank wheel 13 provided with a crank 14 which engages a bell crank lever 16 pivoted on the shaft 2 one arm of

which lever is yieldably held in contact with the crank 14 by means of a contractile spring 15. The other arm of the lever 16 carries a pawl 18 which engages a ratchet wheel 17 fixed on the sleeve 3 whereby the sleeve is rotated step by step to wind up the spring 4. The pawl 18 has a curved arm concentric with the axis of the shaft 2 which arm slidably engages a bell crank lever 19 to lift the pawl 18 out of engagement with the wheel 17.

To manually wind the spring, a suitable cord 20 is attached to a grooved segment 26 on the end of one arm of the bell crank lever 16. This cord is led over suitable pulleys to any convenient point for manually operating the cord to oscillate the lever and thus through the pawl 18 and ratchet 17 to wind up the spring, the pawl 8 holding the sleeve from turning backward.

To operate the device, a sliding bar 21 is provided operated by any suitable lever (not shown) and forked arms 24 and 25 are fixed on the bar to engage the clutch members 6 and 9, these clutches being oppositely arranged so that when the bar is in mid-position both clutches will be disengaged and when the bar is oppositely moved the clutches are alternately engaged.

The bell crank lever 19 for releasing the pawl 18 is operated by a pin 23 in the sliding bar 21. The bar is also provided with a cam projection 22 which engages the pawl 8 and releases the same from engagement with the ratchet 7.

The operation of the device is as follows: When in the position shown in the drawings the device is in the inoperative position and presumably with the spring wound, or in condition to be wound manually by operating the cord 20. For starting the engine the bar 21 is moved to the left as shown in Fig. 1. This disengages the pawls 8 and 18 which hold the spring wound and engages the clutch members 5 and 6 whereby the inner end of the spring is connected to the shaft 2 and the sleeve and shaft released to rotate and start the engine. After the engine has started the spring is re-wound by moving the sliding bar 21 in the opposite direction until the pawls 8 and 18 are respectively reengaged with the clutch member 5 and ratchet wheel 17. This movement also engages the clutch members 9 and 10 whereby the engine now drives the gears 11 and 12 and through the crank wheel 13

and crank 14, and spring 15 oscillates the bell crank lever and winds the spring step by step. When the spring is fully wound the bar is moved to mid-position as shown in the drawings in which position both clutches are released and the pawls 8 and 18 hold the spring from unwinding ready for starting again as described.

What we claim is:—

1. An engine starter, comprising a shaft connected to the engine, a sleeve rotative on the shaft, a spring fixed at one end and connected to the sleeve at the other end, a clutch to connect the sleeve and shaft, a pawl and ratchet to hold the sleeve from rotating, means for rotating the sleeve to wind the spring, a clutch to connect said means with the shaft and means for alternately engaging said clutches.
2. An engine starter, comprising a shaft connected to the engine, a sleeve rotative on the shaft, a clutch to connect the sleeve and shaft, a spring fixed at one end and connected to the sleeve at the other end, a pawl and ratchet to hold the sleeve from rotating, means for rotating the sleeve to wind the spring, a clutch to connect said means with the shaft, a slidable bar connected to said clutches to alternately operate the same and means for disengaging the pawl from the ratchet operated by the bar when the bar is moved to connect the sleeve and shaft.
3. An engine starter, comprising a shaft connected to the engine and rotated thereby, a sleeve rotative on the shaft, a friction clutch member on the sleeve, a clutch member splined to the shaft to engage the member on the sleeve, a spring fixed at one end and attached at the other end to the sleeve to rotate the same, means for rotating the sleeve to wind the spring, a pawl and a ratchet wheel to hold the sleeve, a clutch to connect said means with the shaft, manually operated means for rotating the sleeve to wind the spring and means for alternately engaging the clutches adapted to detach the pawl from the ratchet wheel when the sleeve and shaft are connected by the first named clutch.
4. An engine starter, comprising a shaft attached to the engine, a sleeve rotative on the shaft, a spring fixed at one end and attached to the sleeve at the other end to rotate the sleeve, a clutch member fixed on one end of the sleeve, a clutch member splined to the shaft to engage said member, means for rotating the sleeve to wind the spring, a clutch member freely rotative on the shaft, a clutch member splined on the shaft to engage the last named clutch member, means for rotating the sleeve to wind the spring operated by the freely rotative clutch member, a pawl and ratchet wheel to hold the sleeve, means for alternately engaging the clutches adapted to detach the pawl from

the ratchet wheel when the clutch connecting the sleeve and shaft is engaged.

5. An engine starter, comprising a shaft connected to the engine and rotated thereby, a sleeve rotative on the shaft, a spring fixed at one end and connected to the sleeve at the other end, a clutch to connect the sleeve and shaft, two ratchet wheels fixed on the sleeve, a pawl to engage one wheel to hold the spring from unwinding, a pivoted lever carrying a second pawl to engage the other wheel, means for oscillating the lever, a clutch to connect said means with the shaft and means for alternately engaging said clutches adapted to release said first named pawl when the sleeve is connected with the shaft.

6. An engine starter, comprising a shaft connected to the engine and rotated thereby, a sleeve rotative on the shaft, a clutch adapted to connect the sleeve and shaft, a spring fixed at one end and attached to the sleeve at the other end to rotate the sleeve, a pawl and ratchet wheel to hold the sleeve from turning, a lever pivoted on the shaft, a pawl carried by the lever and engaging a wheel on the sleeve to rotate the sleeve and wind the spring, means for oscillating the lever operated by the engine, manually operated means for oscillating the lever, and means for simultaneously connecting the sleeve and shaft and for disengaging the holding pawl from the ratchet wheel.

7. An engine starter, comprising a shaft connected to the engine, a sleeve rotative on the shaft, a spring fixed at one end and attached to the sleeve at the other end to rotate the sleeve, a clutch to connect the sleeve and shaft having the member on the sleeve provided with a ratchet, a pawl to engage the ratchet and hold the spring from unwinding, a second ratchet wheel fixed on the sleeve, a pawl to engage said second ratchet wheel and wind the spring, a pivoted lever, carrying a pawl to engage said second ratchet wheel, means for oscillating said lever, a clutch to connect said means with the shaft, a slidable bar connected to the clutches to alternately engage the same, separate means operated by said bar to simultaneously disengage each of said pawls operated by the bar when moved to connect the sleeve and shaft.

8. An engine starter, comprising a shaft connected to the engine, a sleeve rotative on the shaft, a spring fixed at one end and attached to the sleeve at the other end, a stationary pawl to hold the sleeve from turning and allowing the spring to unwind, an oscillating pawl to turn the sleeve and wind the spring, means for oscillating the pawl, a clutch to connect said means with the engine to operate the same, a clutch to connect the sleeve and shaft, a slidable bar connected to the clutches to alternately en-

5 gage the same and to disengage both clutches when in mid-position, a cam projection on the bar to disengage the holding pawl and a lever engaging the oscillating pawl operated by the bar to simultaneously disengage the oscillating pawl, both pawls being disengaged when the sleeve is connected to the shaft.

10 9. An engine starter, comprising a shaft connected to the engine, a sleeve rotative on the shaft, a spring fixed at one end and attached to the sleeve at the other end, means for holding the sleeve from turning, means for releasing the holding means and
15 connecting the sleeve to the shaft, a ratchet wheel fixed on the sleeve, a lever pivoted on the shaft, a pawl carried by the lever and

engaging the wheel, a crank wheel having a crank engaging the lever to move the same in one direction, a spring to move the same in the other direction and permit it to move away from the crank, manually operated means for moving the lever away from the crank, means for rotating the crank wheel and a clutch to connect said means with the shaft. 20 25

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

CORNELIUS VAN TUBBERGAN.
PAUL WESTRATE.

Witnesses:

HAROLD O. VAN ANTWERP,
LUTHER V. MOULTON.

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