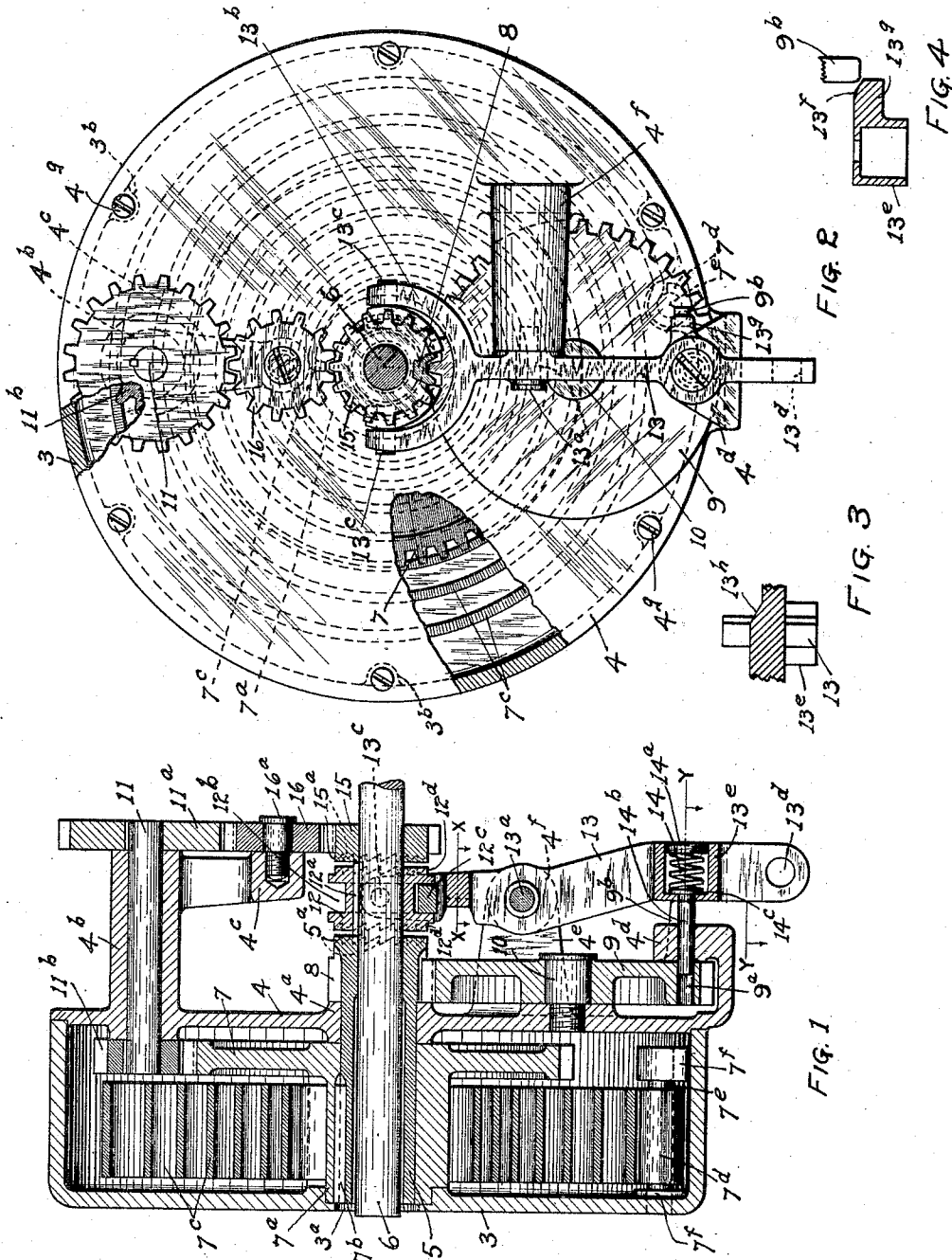


J. B. KENDALL & H. M. EWING.
ENGINE STARTER.

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WITNESSES:

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JAMES B. KENDALL, OF CHICAGO, ILLINOIS, AND HOWARD M. EWING, OF ST. LOUIS, MISSOURI.

ENGINE-STARTER.

994,932.

Specification of Letters Patent. Patented June 13, 1911.

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To all whom it may concern:

Be it known that we, JAMES B. KENDALL and HOWARD M. EWING, citizens of the United States, residing, respectively, at Chicago, in the county of Cook and State of Illinois, and St. Louis, State of Missouri, have invented certain new and useful Improvements in Engine-Starters, of which the following is a specification.

Our invention relates to improvements in means for starting internal-combustion gas-engines the pistons of which must ordinarily be moved to compress the charge of gas to effect the initial explosions and thus start the operation of the engine.

The object of the improvements which constitute the subject matter of this application for patent is to provide gas-engine starting means having the following advantages and characteristics: a compact, cheaply constructed and readily applied device having but few parts and those of simple and effective form and arrangement; a device which will be automatic in operation in storing power, applying same to the object to be driven, and in becoming operatively disconnected from such object; a device so designed that it may have its previously stored power released through the manual operation of a rod or wire directly connected with a working part of the device, such release being the only manual manipulation of the machine required or possible.

In the accompanying drawing we have illustrated a preferred adaptation of our invention in the following views:—

Figure 1 is a cross-sectional view taken through an engine starting device embodying our invention; Fig. 2 is an elevational view of the device with portions of the casing broken away to more clearly disclose the parts; Fig. 3 is a sectional view of the clutch lever shown at $x-x$ of Fig. 1, and Fig. 4 is a sectional view of the lower portion of the clutch lever shown at $y-y$ of Fig. 1.

Referring to the details of the drawing, 3 represents a metal cup-shaped shell which forms a casing for parts of the device to be presently described. It is provided with a central opening 3^a, and at spaced intervals on its periphery it is formed with internal lugs 3^b.

Fitted to the casing 3 is a cast metal plate 4, which is formed with a central hub 4^a

through which extends an opening in line with the opening 3^a. Said plate is also formed with a stud 4^b which projects outwardly at right angles, and has depending therefrom an arm 4^c, and at its lower edge is provided with a hook-shaped lug 4^d. Extending outward from the plate 4 is an integral bracket 4^e, having cast therewith an arm 4^f which lies parallel with the said plate and forms a support for a clutch, lever hereinafter described. The said plate 4 is secured to the shell by screws 4^g, which engage threaded holes in the lugs 3^b. The shell 3, with its cover plate 4, is carried by a sleeve 5 rotatably mounted upon the engine shaft 6. The sleeve projects beyond the said cover plate 4 and is provided at the extremity with ratchet teeth 5^a, formed in its end face. Mounted upon the sleeve 5 immediately within the cover plate 4 is a gear wheel 7, having an extended hub 7^a, secured to the said sleeve by a key 7^b. Arranged within the shell 3, is a coiled ribbon spring 7^c having its inner end secured to the hub 7^a of the gear 7, while its outer end is formed into an eye 7^d, engaged by a pin 7^e, secured in bearings 7^f formed on the shell. Mounted upon the said sleeve 5 outside the cover plate 4 is a pinion 8 which is adapted to mesh with a segmental gear wheel 9 journaled on a shouldered stud 10 having a threaded engagement with the plate 4. The said stud 4^b is bored longitudinally to receive a shaft 11, carrying upon its outer end a gear 11^a and upon its inner end, which projects through the cover plate 4, is keyed a pinion 11^b meshing with the said gear 7.

Mounted upon the engine shaft 6 adjacent the sleeve 5 is a clutch sleeve 12, a spline 12^a permitting the sleeve to slide longitudinally on the shaft, at the same time insuring its rotary movement therewith. The said sleeve has a peripheral groove 12^b in which is loosely mounted a saddle block 12^c. A lever 13 pivoted at 13^a to the arm 4^f has one end bifurcated to form a yoke or fork 13^b, the arms of the yoke being pivotally attached to the saddle block 12^c by pins 13^c, in a manner common in clutch construction. The lower end of the lever 13 is provided with a hole 13^d for the attachment of an operating rod (not shown) and adjacent this end is an enlargement or boss 13^e, counter-bored to receive a spring 14 secured in place by a threaded plug 14^a. Opposite the said

plug is a suitable hole through which the body of a pin 14^b passes, the head 14^c of the pin being retained in the bore of the boss and engaged by said spring 14. This pin 14^b is extended through a suitable hole in the hook shaped lug 4^d and is adapted to engage a suitable hole 9^a in the web of the gear 9. Projecting outwardly from the face of the said gear 9 is a lug 9^b, which is adapted to engage the under curved surface 13^f of a lug 13^e extending laterally from the lever 13, when in its initial or normal position, shown in Figs. 1 and 2. The under side of the said lever 13, adjacent the base of the fork 13^b is beveled to form a cam face 13^b, with which the said lug 9^b will engage when the said gear 9 is turned on its center. Mounted upon the engine shaft alongside the clutch sleeve 12 is a pinion 15 having teeth 15^a similar to the teeth in the sleeve 5, formed in the side adjacent the said sleeve 12. The latter is provided upon its opposite end faces with teeth 12^d adapted to alternately engage with the teeth 5^a and 15^a when operated by means of the lever 13. An intermediate gear wheel 16 journaled on a stud 16^a secured in the arm 4^e, connects the pinion 15 with the gear 11^a.

The operation of the mechanism is as follows:—The spring being wound it is held in a state of tension by the pin 14^b. To start the engine, the lever 13 is moved so as to carry the clutch sleeve 12 toward the sleeve 5 and bring the teeth 12^d into mesh with the teeth 5^a on said sleeve 5. This movement of the lever 13 will withdraw the pin 14^b from the hole 9^a, releasing the gear 9, and permitting the full force of the spring to be exerted on the shaft 6 through the sleeves 5 and 12, and as the said shaft rotates the gear 9 will be rotated in the direction of the arrow *a*, Fig. 2. The pinion 8 which drives the gear 9 is so related to the latter in pitch that when the said gear has been turned a little less than one-half a revolution the shaft 6 will have been rotated a sufficient number of times to start the engine. Just at this point in the movement the lug 9^b on the gear 9 will strike the cam surface 13^f and throw the clutch sleeve 12 in the opposite direction, so as to engage the pinion 15, and as the clutch 12 is now in motion with the rotating shaft 6 the train of gears 16, 11^a, 11^b and 7 will turn the sleeve 5 in a direction to wind up the main spring 7^c. When the clutch sleeve is thus thrown over toward the pinion 15 the opposite end of the lever 13 will move toward the plate 4, bringing the end of the pin 14 into contact with the side of the gear 9, but this will not interfere with the lever movement since the spring 14 will yield to give the proper movement to the said pin, and when the gear 9 returns to its initial position, the pin will reënter the hole 9^a, locking the gear 9 and sleeve 5 as at first.

As the said gear reaches its initial position the lug 9^b will engage the cam surface 13^f on the lug 13^e, and throw the clutch sleeve 12 to its initial position, shown in Fig. 1, where it is out of engagement with either ratchet, and the entire device will remain in a state of rest in this normal position, until the lever 13 is again operated to start the engine.

Having thus described our invention, what we claim as new, is:—

1. In an engine starter, the combination with the engine shaft, of a sleeve rotatably mounted on said shaft, a spring operatively connected with said sleeve, a pinion loosely mounted on the shaft, a train of gearing connecting said pinion with said sleeve, a clutch member splined on said shaft and adapted to alternately engage said sleeve and pinion, a lever adapted to operate said clutch member, a pinion mounted on said sleeve, a gear engaging said pinion, means on said gear for operating said lever, and means for locking said gear in its initial position.

2. In an engine starter, the combination with the engine shaft, of a sleeve rotatably mounted on said shaft, a spring operatively connected with said sleeve, a pinion loosely mounted on the shaft, a train of gearing connecting said pinion with said sleeve, a clutch member splined on said shaft between said sleeve and pinion, and adapted to operatively engage the sleeve and pinion, a clutch lever, a pinion mounted on said sleeve, a gear meshing with said pinion, means on said gear for moving said lever in opposite directions, and means carried by said lever for locking said gear in its initial position.

3. In an engine starter, the combination with the engine shaft, of a sleeve loosely mounted on said shaft, a spring connected with said sleeve, means for locking said spring against movement, a clutch member splined on the shaft, means on said clutch for engaging said sleeve when moved in one direction, means for unlocking said spring while the said clutch and sleeve are engaged, and means for automatically winding said spring.

4. In an engine starter, the combination with the engine shaft, and a casing mounted on said shaft, of a sleeve loosely mounted on said shaft within the casing and having one end projecting therefrom, a gear mounted on said sleeve within the casing, a spring connected with said gear, a clutch splined on the shaft and adapted to engage said sleeve, a lever for operating said clutch, means controlled by the said lever for locking the said sleeve against rotary movement, and means for automatically winding the said spring by the rotation of the engine shaft.

5. In an engine starter, the combination with the engine shaft, and a casing mounted

on the shaft, of a sleeve loosely mounted on said shaft within the casing and having one end projecting therefrom, a gear mounted on said sleeve within the casing, a spring connected with said gear, a clutch splined on the engine shaft and adapted to engage said sleeve, an operating lever for said clutch, means for locking said sleeve against rotary movement, said means comprising a pinion mounted on the projecting end of the sleeve, a gear meshing with said pinion, a spring held pin on said lever adapted to engage a hole in said gear, and means for automatically winding said spring by the rotation of the engine shaft, said winding means including a pinion loosely mounted on said shaft, and adapted to be engaged by said clutch, and a train of gears operatively connecting said loosely mounted pinion with the said gear within the casing.

6. In an engine starter, the combination with the engine shaft, and a casing mounted on the shaft, of a sleeve loosely mounted on said shaft within the casing and having one end projecting therefrom, a gear mounted on said sleeve within the casing, a spring connected with said gear, a clutch splined on the engine shaft and adapted to engage

said sleeve, an oscillating lever adapted to move said sleeve in opposite directions from its initial position, a pinion mounted on the projecting end of the sleeve, a segmental gear meshing with said pinion, means connected with said lever for locking said segmental gear in initial position, means for automatically winding said spring, said winding means including a pinion loosely mounted on said shaft adjacent the clutch and adapted to be engaged thereby, a train of gears connecting said loosely mounted pinion with the gear on said sleeve, and means for operating said lever, comprising a lug on said segmental gear adapted to alternately engage said lever upon opposite sides of its pivotal center.

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

JAMES B. KENDALL.
HOWARD M. EWING.

Witnesses for James B. Kendall:

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