E. A. GARDNER.

GASOLENE ENGINE STARTER.

APPLICATION FILED JULY 12, 1909.

950,848.

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Fig. 1

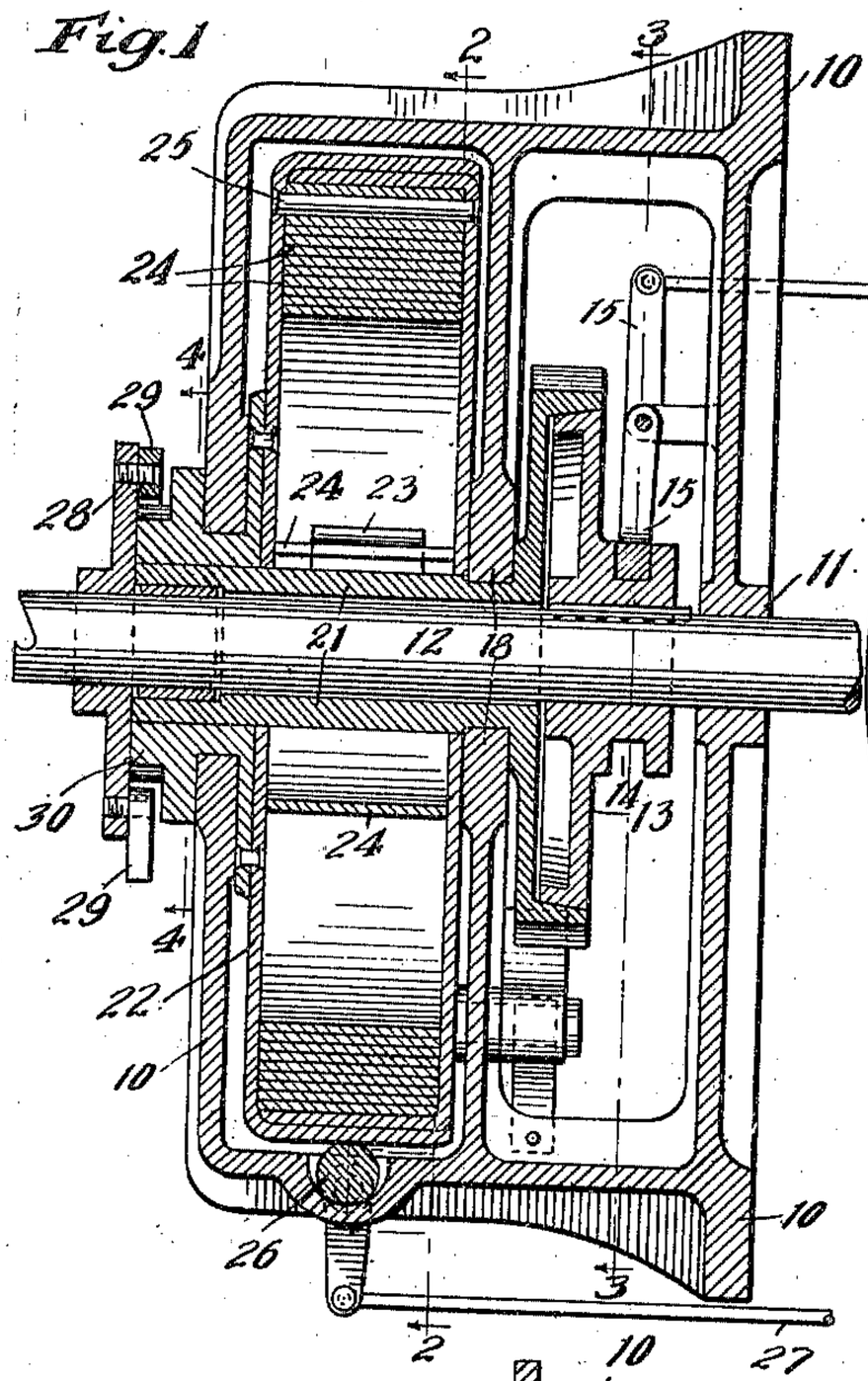


Fig. 3

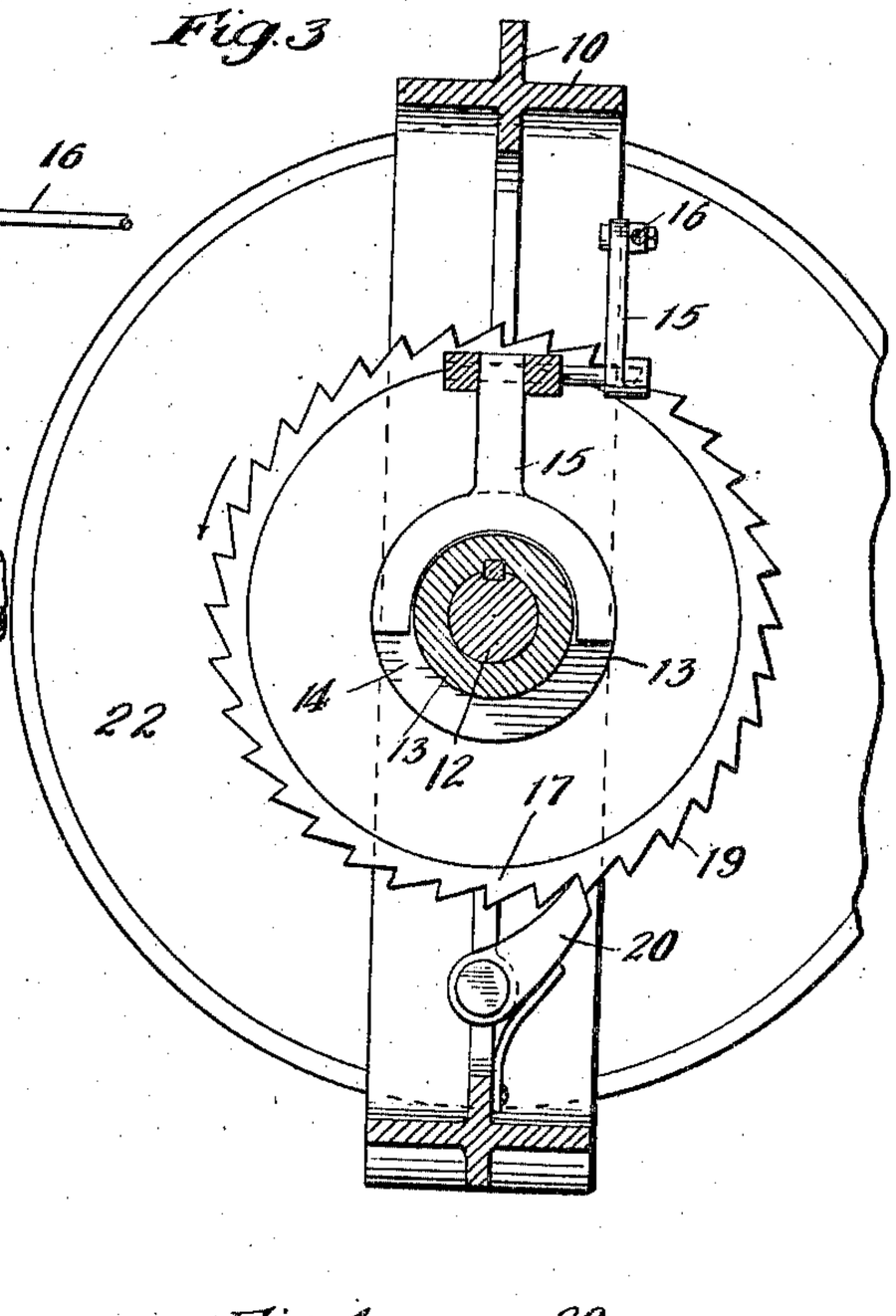


Fig. 2

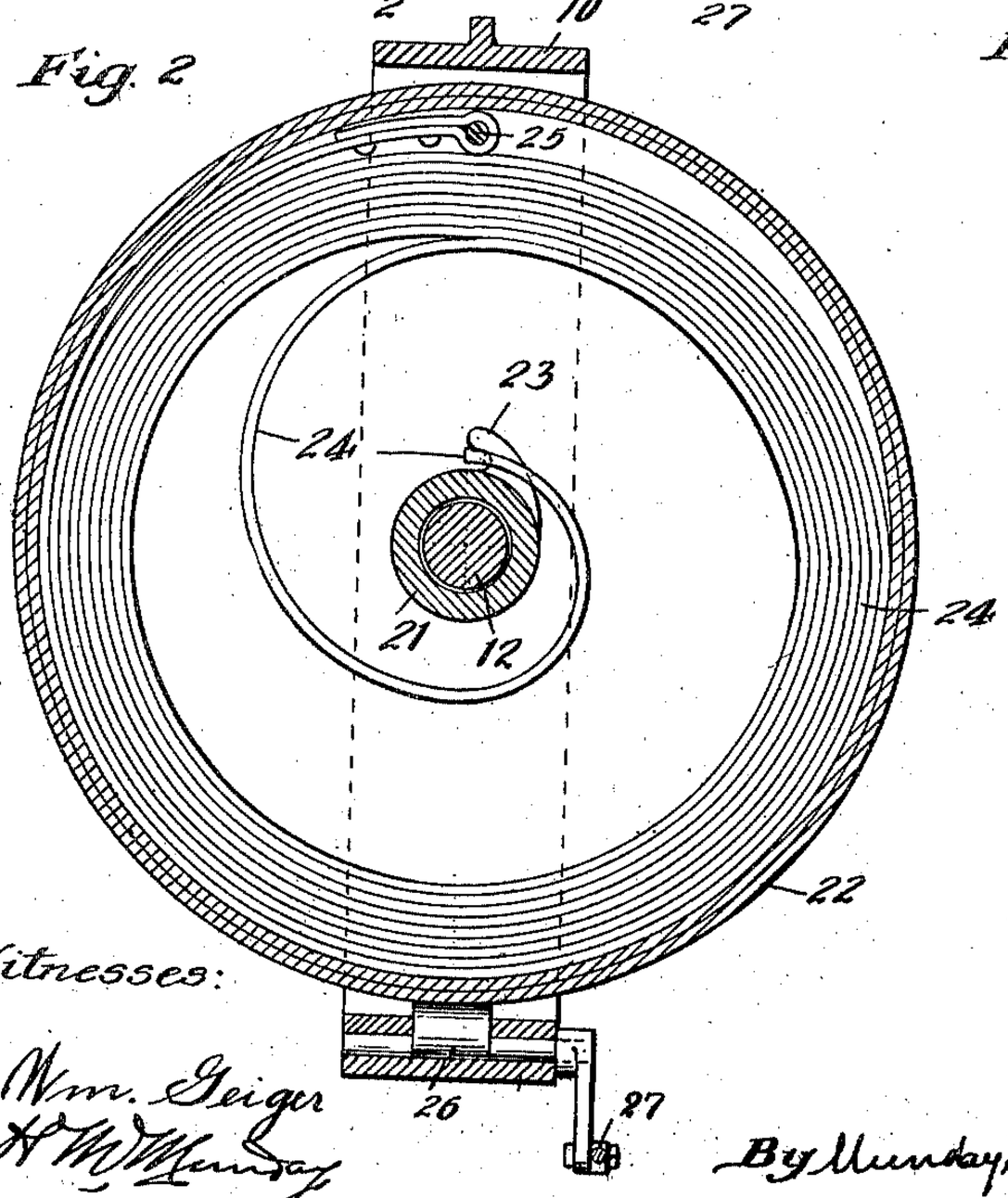
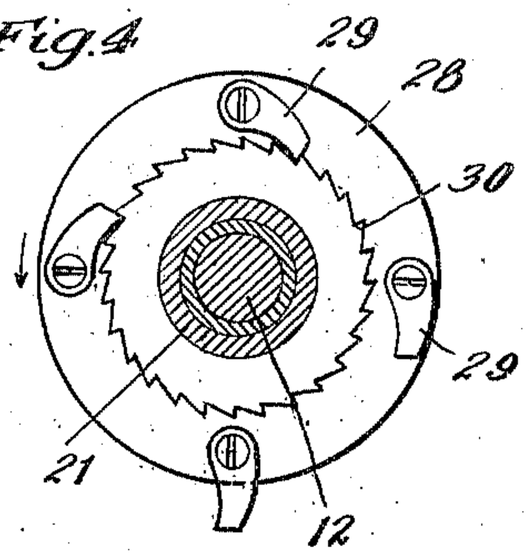


Fig. 4



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GASOLENE-ENGINE STARTER.

950,848. Specification of Letters Patent. **Patented Mar. 1, 1910.**

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To all whom it may concern:

Be it known that I, EDWIN A. GARDNER, a citizen of the United States, residing in Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Gasolene-Engine Starters, of which the following is a specification.

This invention relates to improvements in engine starters.

The purpose of the invention is a gasolene engine starter, of cheap, strong and durable construction, that may be applied directly to the main shaft of the engine, or an extension thereof, of any form of gasolene or explosive engine, and at either side of such engine, and at any part of such shaft, and this without cutting the shaft in two or employing any counter-shafting; and which is so constructed that the shaft is not required in its ordinary revolution to carry any great weight of parts; and so contrived as not to interfere with the cranking of the engine by the ordinary crank. These results I accomplish by means of a mechanism consisting essentially of a spring drum running loose from the shaft and borne on the stationary frame-work of the machine in conjunction with a two-part clutch, one member of the clutch being splined to and revolving with the shaft, and the other member being connected directly to one end of the spring, of which the other end spring is connected to the drum above mentioned, this member of the clutch being also provided with a locking device or ratchet that permits rotation in the direction of the revolving shaft and prevents rotation in the opposite direction; and further in a second two-part locking or ratchet mechanism, one member of which is carried by said shaft and the other member of which is carried by the spring drum, this latter locking mechanism being so contrived that the shaft member is free to revolve at all times with the shaft, while the drum member being secured to the spring drum, can revolve only with the drum, the locking being so contrived that when the drum revolves in the direction of revolution of the shaft, it will carry said shaft with it, but when the drum is stationary, the shaft is still free to revolve in the same direction; and further, a mechanism for locking the said spring drum at will against revolution, and releasing it to permit revolution; all of which will more fully and at large appear in the subsequent explanation, and aided by the accompanying drawing which forms a part of this specification.

In said drawings, Figure 1 is a longitudinal, vertical section of my improved starter. Fig. 2 is a vertical cross section of the same on the line 2—2 of Fig. 1. Fig. 3 is a vertical cross section on the line 3—3 of Fig. 1 and Fig. 4 is a vertical cross section on the line 4—4 of said Fig. 1.

Like characters of reference made use of in the several figures indicate like parts.

In the drawing, 10 is a stationary frame-work. This frame-work is provided with a bearing 11 for the shaft 12, supporting said shaft directly, and with other bearings supporting said shaft indirectly, as will appear from the drawing. Encircling this shaft is a two-part clutch, preferably a friction clutch, one member of which,—13,—is splined to the shaft to revolve therewith and slide thereon, and provided with a grooved hub 14 engaged by a clutch shifter 15 connected by the rod 16 to a suitable operating handle or lever, such handle not being shown in the drawing, by means of which the clutch may be thrown into and out of engagement at the will of the operator. The other member of the clutch, 17, is carried on the frame-work directly in the bearing 18 and indirectly elsewhere. The latter clutch, 17, is provided with a locking device that permits its revolution freely in the direction of the revolving shaft, but prevents revolution in the opposite direction, and which locking mechanism may consist of a ratchet 19 and a pawl 20, the latter carried on the stationary frame of the machine. It will be noted that this clutch member 17 is provided with a sleeve 21 extending through the spring drum 22. And within the drum said sleeve is provided with a hook 23 to which one end of the

spring 24 is attached, the other end of said spring being connected by a pin 25 to the drum itself.

The result of the mechanism thus far described is that when the friction clutch, which I call the spring-winding-clutch, is operated, both parts of the clutch being thus locked to the shaft 12, the revolution of the latter now tends to wind up the spring in the drum. But the drum, being itself free to revolve with the shaft, in order to actually wind the spring it is necessary to provide some locking mechanism or means to temporarily prevent the rotation of the drum. This temporary drum-locking mechanism may consist of a brake or eccentric locking device 26, operated by the rod 27. Now the drum being locked, the spring will be wound up by the rotation of the shaft and the winding gained will be held by the ratchet and pawl 19, 20, of the spring-winding-clutch. Since the drum locking mechanism is frictional in its character, if the spring be overwound, the drum will slip before breaking takes place, though since the winding takes but a moment of time, the operator can determine when the spring is fully wound by the resistance, and at that moment release the clutch, leaving the drum locking mechanism in action to hold the winding that has been gained. On the other side of the drum from said clutch is the locking mechanism for locking the spring drum to the shaft when required to apply the spring power thereto, and which consists of two members, one member being connected to the spring drum and the other to the shaft. And this latter locking mechanism may consist of the pawl-carrying-disk 28, connected rigidly to the shaft and carrying the free swinging pawls 29; and the other member may consist of the ratchet wheel 30 rigidly connected with the spring drum. Of course, this locking mechanism may consist of any suitable mechanism that will permit the shaft to revolve freely in one direction while connecting the drum with the shaft when the drum is released and brought into action. But I greatly prefer the ratchet wheel and multiple pawl device shown in the drawing. The purpose of having several pawls operated by their own weight instead of a single spring-held pawl is that these pawls may swing freely, so that when the shaft 12 is revolving rapidly, in the normal operation of the engine, the centrifugal force of such revolution may operate to carry the loose pawls out and away from the ratchet teeth to avoid the rattling and noise which their engagement would otherwise cause at this time; while when the revolution of the shaft is stopped, there will be at least one of the four pawls in such position that it can drop into engagement with the ratchet wheel to connect the spring drum with the shaft to communicate the stored energy of the spring to the shaft to start the engine.

The operation of my improved engine starter is as follows: By some means, by the ordinary crank or otherwise, the engine is put into operation. Now while the shaft 12 is running in the direction of the arrow, and the spring drum lock 26 is set in the locked position to hold the said spring drum from revolution, the operator throws in the winding clutch and thus connects the sleeve 21 to revolve with the shaft 12, winding up the spring. When the spring is fully wound, which the operator may know by the feeling of the clutch, the clutch is released while the shaft 12 still continues to revolve, and leaving the spring in the wound condition, but not attached to the shaft. And when the engine is stopped, the spring drum immediately becomes connected to the shaft by the fall of the pawls 29 and remains in that condition for an indefinite time and for any length of time desired, the starter being now charged with the energy to seize and rotate the shaft in the proper direction as soon as the spring drum lock shall be released, and which release can be effected at any time by the operator by means of a pull or push on the rod 27. As soon as the spring drum is released, it being locked to the shaft, revolves the said shaft and thus starts the engine precisely as though the engine had been cranked by hand; and after the engine is started, the spring drum lock being again set to lock the drum, and the clutch being momentarily applied to wind the spring, the apparatus is again charged with energy to again crank the engine. Of course, it will be more economical sometimes to throw in the winding clutch just about as the engine is to be stopped, thus utilizing in some degree the momentum of the car, in case of an automobile, to aid in the winding.

Having thus described my invention, I claim:—

1. The combination with the motor spring surrounding the engine shaft, of said engine shaft, of a ratchet clutch device for connecting at will the inner end of the spring to the shaft for winding the same, a drum surrounding the spring and to which its outer end is connected, a ratchet surrounding the shaft and carried by the drum, and a pawl plate engaging said ratchet and attached rigidly to the shaft, substantially as described.

2. The combination with the motor spring surrounding the engine shaft, of said engine shaft, of a ratchet clutch device for connecting at will the inner end of the spring to the shaft for winding the same, a drum surrounding the spring and to which its outer

end is connected, a ratchet surrounding the shaft and carried by the drum, and a pawl plate engaging said ratchet and attached rigidly to the shaft, said pawl carrying device consisting of a pawl carrier to which a multiplicity of pawls are loosely pivoted so that the centrifugal force will carry the pawls free of the ratchet when the shaft is in rapid rotation and permit the pawls to engage the ratchet when moving slowly or at rest, substantially as described.

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