No. 725,556. PATENTED APR. 14, 1903.

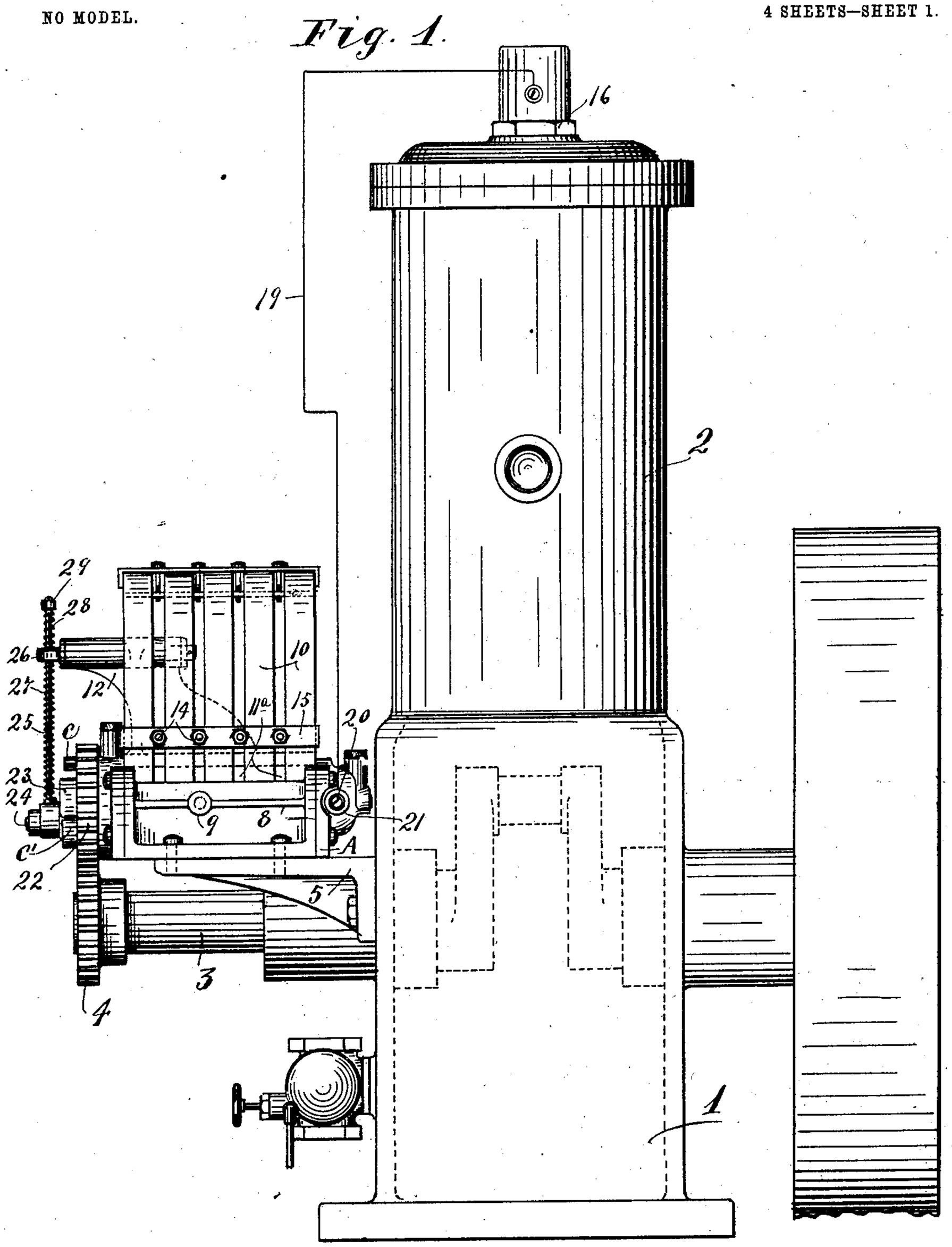
G. A. GOODSON.

ELECTRIC IGNITER FOR EXPLOSIVE ENGINES.

APPLICATION FILED MAR. 17, 1902.

NO MODEL. 4 SHEETS—SHEET 1.

Fig. 1.



Witnesses.
A. H. Opsahl.
H. D. Kilgore.

Inventor.
George. A. Goodson.
By his Attorneys.
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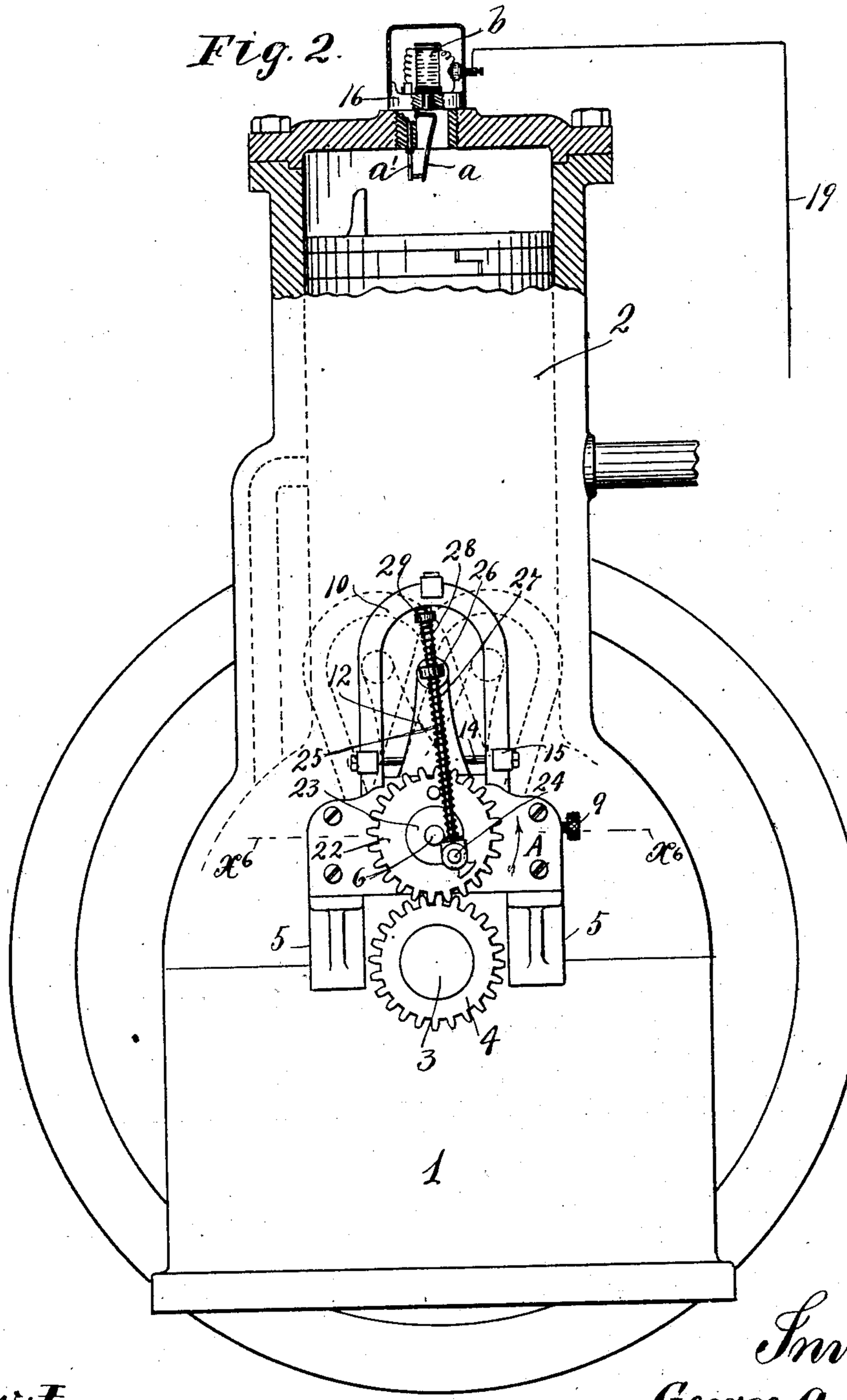
NO MODEL. 4 SHEETS—SHEET 2.

Fig. 2.



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NO MODEL. 4 SHEETS—SHEET 3.

Fig. 3

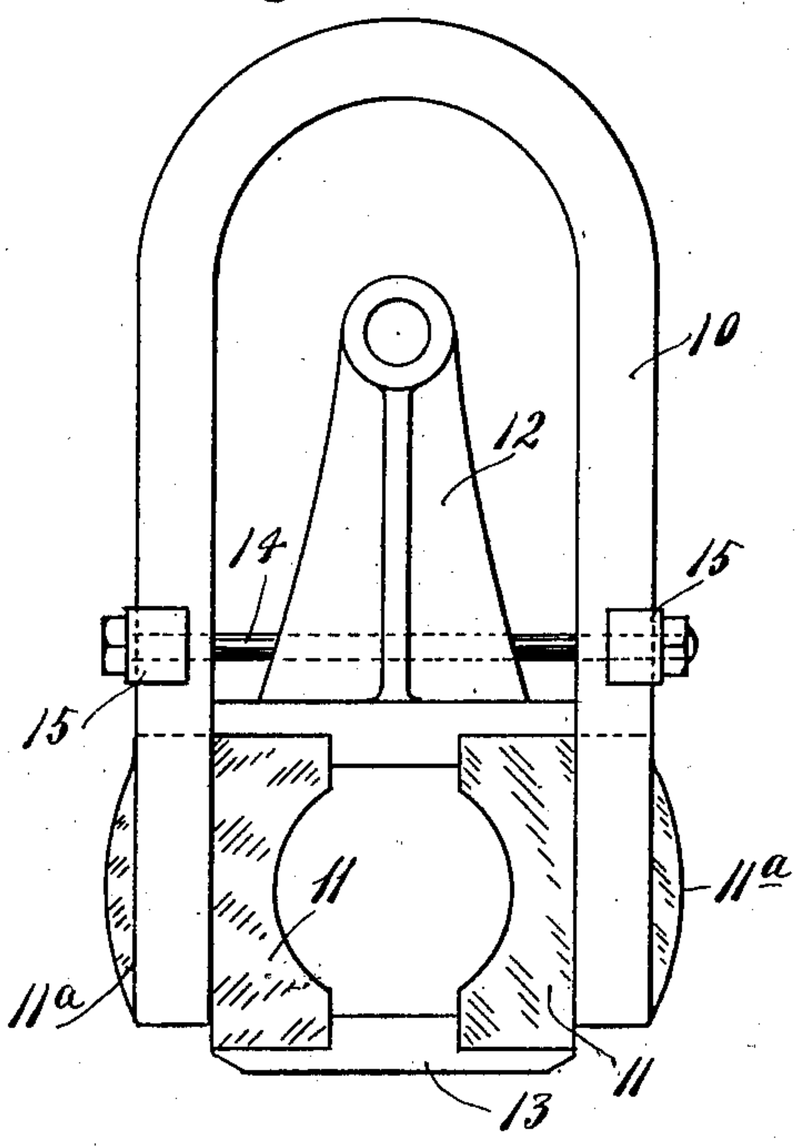
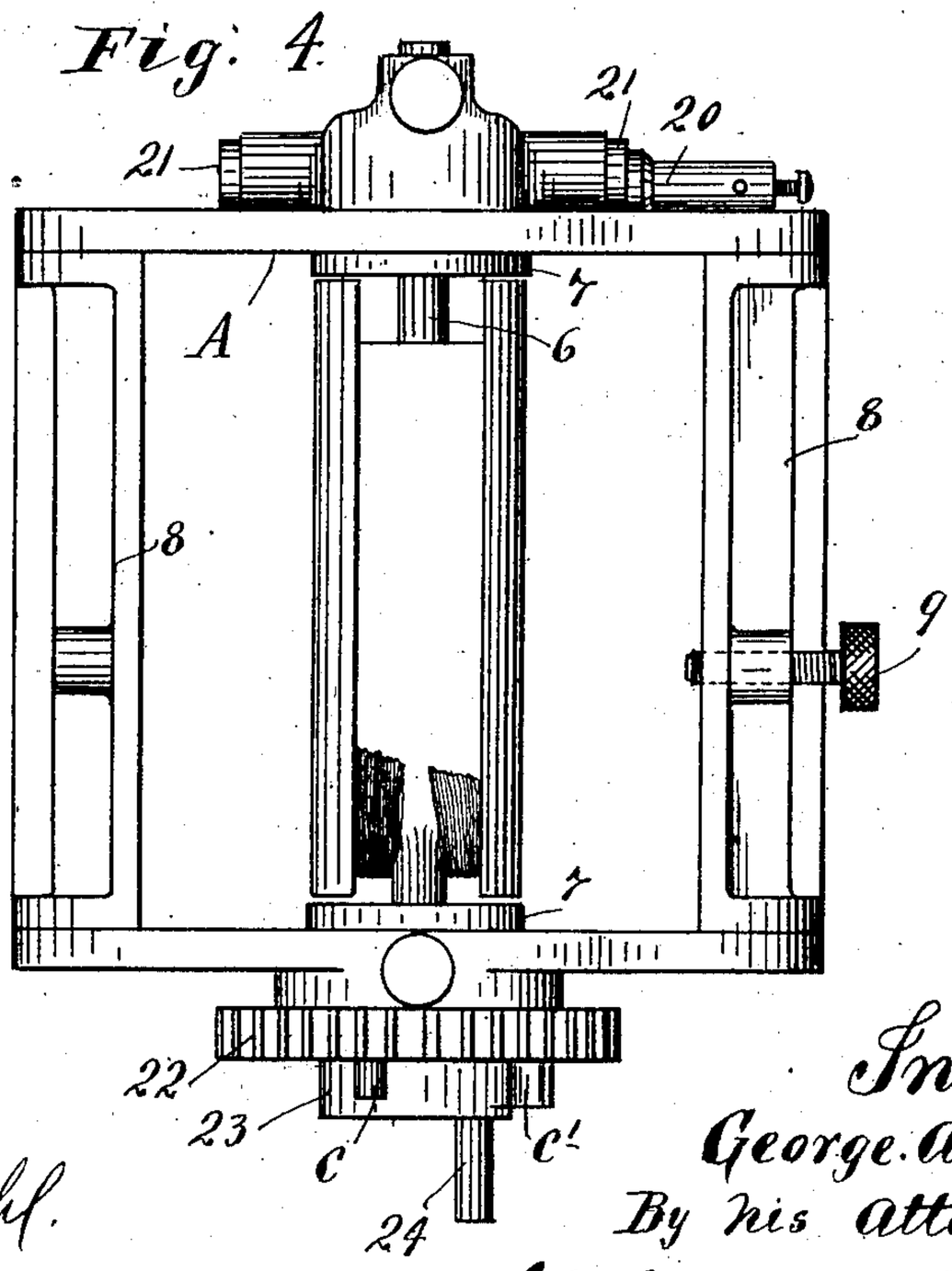


Fig. 4.



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NO MODEL. 4 SHEETS—SHEET 4.

Fig. 5

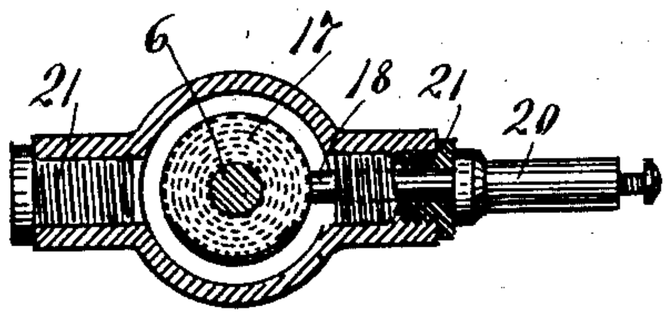
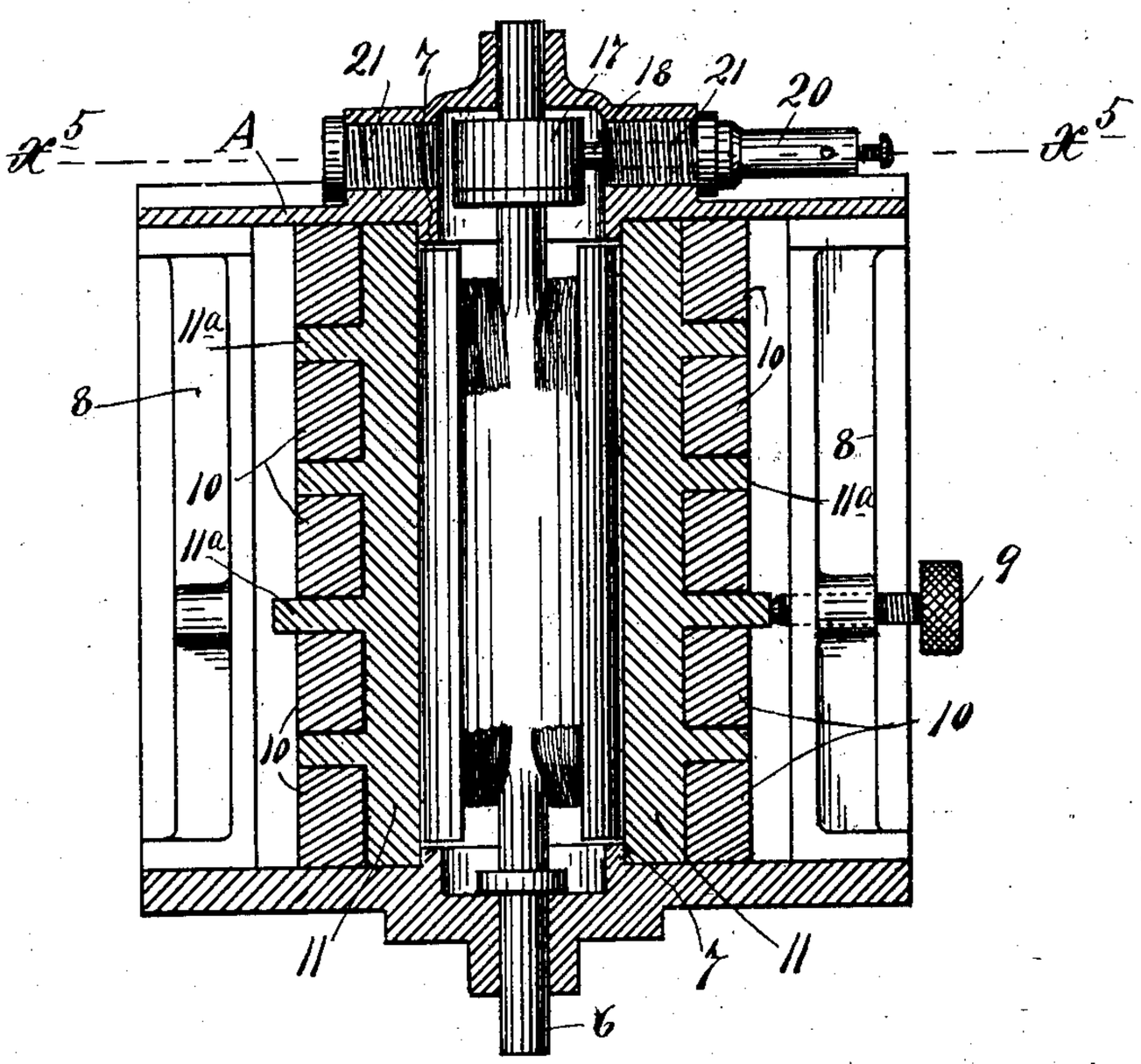


Fig. 6.



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UNITED STATES PATENT OFFICE.

GEORGE ARTHUR GOODSON, OF MINNEAPOLIS, MINNESOTA.

ELECTRIC IGNITER FOR EXPLOSIVE-ENGINES.

SPECIFICATION forming part of Letters Patent No. 725,556, dated April 14, 1903.

Application filed March 17, 1902. Serial No. 98,465. (No model.)

To all whom it may concern:

Be it known that I, GEORGE ARTHUR GOODSON, a citizen of the Dominion of Canada, residing at Minneapolis, in the county of Hennepin and State of Minnesota, have invented certain new and useful Improvements in Electric Igniters for Explosive-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.

My invention relates to electric igniters for explosive-engines, and has for its object to provide certain improvements therein with a view of securing greater efficiency.

The generator is of the type disclosed in my pending application, Serial No. 86,009, filed December 16, 1901, and the sparking-plug is identical with that disclosed in my pending application, Serial No. 93,136, filed February 8, 1902.

My present improvement relates especially to the generator and will appear from the following description and claims.

The invention is illustrated in the accompanying drawings, wherein like notations refer to like parts throughout the several views.

In said drawings, Figure 1 is a view in elevation showing my invention as applied to an ordinary two-cycle engine. Fig. 2 is a view of the parts shown in Fig. 1, chiefly in left end elevation, but partly in vertical section, with some of the parts broken away. Figs. 3 and 4 are details showing parts of the magneto separated from each other, Fig. 3 being an elevation of the magnets, pole-pieces, &c., detached, and Fig. 4 a plan view of the base as it appears when the parts shown in Fig. 3 are removed therefrom. Fig. 5 is a detail in vertical section on the line $x^5\,x^5$ of Fig. 6, and Fig. 6 is a horizontal section through the magneto on the line $x^6\,x^6$ of Fig. 2 with some parts removed.

The engine proper being of the ordinary well-known two-cycle type any extended description thereof is deemed unnecessary. It is sufficient to note the base-casting 1, the cylinder-casting 2, and the crank-shaft 3. The crank-shaft 3 has fixed thereto a gear 4 for operating the magneto, as will later appear.

The cylinder-casting 2 is shown as provided with the bracket 5, which serves as the support for the magneto.

In the present instance I provide a magneto wherein what for convenience may be called the "body portion" is angularly adjustable in respect to the base. The base includes a suitable supporting-frame A of box-like form, in which is mounted the armature-shaft 6. The side pieces of the base are provided with bearing-bosses 7, surrounding the armature-shaft, as best shown in Figs. 4 and 6, and with cross-pieces 8, at least one of which is fitted with a set-screw 9. The permanent magnets 10 and the pole-pieces 11, together with a brass bearing-bracket 12 and a brass bottom piece 13, are all tied together by cross-bolts 14, extending through the bracket 12 and reacting against brass clamping-strips 15. The pole-pieces 11 are provided with spacing-ribs 11^a, between which the lower ends of the magnets 10 are fitted, and one of these ribs 11^a of each pole-piece projects outward beyond the faces of the magnets. The pole-pieces 11 are properly shaped at their ends to embrace and rock on the bearing-bosses 7 of the base when the parts are in working position. Otherwise stated, the parts shown in Fig. 3 when in working position on the parts shown in Fig. 4, as illustrated in the other views, may receive an angular adjustment in respect to the base, as illustrated in Fig. 2. The set-screw 9 may be made to engage with one of the projecting spacing-ribs 11^a of the pole-pieces, as shown in Fig. 6, to lock the magnets or body portion of the device in whatever angular position it may be set in respect to the base. One wire of the armature is brazed fast to the armature-shaft 6 in the usual way, whence current reaches the frame of the magneto and through the same the cylinder-casting of the engine and passes thence to the armature member a of the sparking-plug 16. The other wire of the armature is made fast to an insulated disk 17, on which works a brush-contact 18, suitably supported on and insulated from the base of the magneto. Thence a wire 19 leads to the magnet b of the sparking-plug and through the same to the fixed member a' of the electrodes within the explosion-chamber of the engine. The brush-contact 18 is carried by an insulating-plug 20, which can

be applied to either of two screw-threaded seats 21 on the base, located on opposite sides of the armature, at will. In the same way the set-screw 9 can be applied to seats provided for the same in each of the cross-bars 8 of the base, so as to lock the body portion of the magneto by a set-screw applied on either side of the armature-shaft, as may be desired.

The armature-shaft 6 is provided with a loose gear 22 in mesh with the gear 4 on the crank-shaft 3 and having the same number of teeth, as shown. The armature-shaft is also provided with a crank-disk 23, fixed thereto alongside the loose gear 22. The gear 22 has a lateral driving-stud *c*, which comes in contact with a radial lug *c'* on the crank-disk 23. The crank-disk 23 has a pin 24, on which is pivoted a pitman-rod 25. The rod 25 extends through a swiveled bearing, which, as shown, is in the form of an eyebolt 26, mounted in the bearing-bracket 12 with freedom for rocking motion therewith but held against sliding motion thereon. On the rod 25 is mounted an impelling-spring 27, which reacts between the eyebolt 26 and the lower end or head of the pitman 25, as shown in Figs. 1 and 2; and on the rod 25 is also mounted a buffer-spring 28, which reacts between the eyebolt 26 and the retaining-nut 29, applied to the upper end of the rod 25.

The impelling-spring 27 is loose on the rod 25 and is not made fast either to the rod or to the bolt 26. It is applied under tension and normally tends to hold the parts in the position shown in full lines in Fig. 2. The impelling-spring 27 and the rod 25 are so applied that the axes thereof would, if produced, cross the axis of the armature-shaft at some point under the action of the device. Hence it follows that whenever under the action of the loose gear 22, driven from the engine through the gear 4, the crank-disk 23 and the armature is turned until the axis of the spring passes the center of the armature-shaft. Then the spring 27 becomes instantly operative to throw the armature forward at a speed independent of the speed of the engine.

The parts being constructed and mounted as above described, the operation is as follows: Under the motion of the engine the loose gear 22 will be rotated with the gear 4 on the engine-shaft. Under the motion of the loose gear 22 its driving-stud *c* will come in contact with the stud *c'* on the crank-disk 23, and the crank-disk will thereby be made to turn with the loose gear for a part of a revolution—to wit, until the crank-pin 24 has been carried past the center or axis of the armature-shaft in the direction of rotation—and whenever that occurs the impelling-spring 27, which was put under increased tension while the crank-disk was being driven by the loose gear, will become operative to throw the crank-disk and the armature forward in advance of the gear with an instantaneous action at the proper speed for generating the required current. The buffer-spring 28 is so related to the impelling-spring 27 that when the latter was being compressed under the driving action of the loose gear 22 on the crank-disk 23 the buffer-spring is released from tension, so that it does not interfere with the driving action of the impelling-spring 27 when the latter makes its stroke; but when the crank-disk and armature has received the necessary throw from the impelling-spring 27 the buffer-spring 28 becomes operative to cushion the stroke and stop the crank-disk without vibration, overthrow, or noise. The device is therefore reliable, exact, and noiseless. This cushioning feature is an improvement as compared with the magnetos shown in my prior applications. It of course must be obvious that the eyebolt 26 serves as a guide to the rod 25 and a base of resistance to the impelling-spring 27, as well as to the buffer-spring 28. Under the angular motion of the rod 25 the eyebolt 26 swivels or rocks in its bearing-bracket 12, so as to always maintain the eye of the bolt 26 in the proper plane for the free driving action required.

By angularly adjusting the magnets and pole-pieces or what has been called the "body portion" of the magneto in respect to the base, whereon is mounted the armature-shaft, it must be obvious that the anchorage-point or base of resistance 26 for the impelling-spring 27 is also angularly adjusted in respect to the armature-shaft. This has the effect of shifting the axis of the spring in an angular direction in respect to the axis of the armature, and as the loose pinion 22 occupies a constant relation in respect to the engine-driven wheel 4 it follows that the spring will pass the center of the armature-axis earlier or later, according to the direction of the angular adjustment. Hence the impelling device will be tripped into action earlier or later, as may be desired. It follows that with this angular adjustment the time of ignition may be varied at will, so as to give any desired lead, either positive or negative, in respect to the position of the crank-shaft and the piston. The magnet of the sparking-plug 16 is of course energized from the same impulse which affords the spark, and this is at or near the limit of the throw imparted to the armature by the impelling-spring. That throw will come earlier or later, according to the timing of the trip. Hence as the time of the tripping may be varied at will by angularly adjusting the magnets or body portion of the magneto the time of ignition may be correspondingly varied, so as to effect the explosion at any lead or point desired. This simple feature of construction adapts my magneto to have this additional function for varying the time of ignition. Hence this angular adjustment of the body portion or magnets in respect to the base constitutes an important feature of improvement over the magnetos shown in my prior application. The principle

involved, of course, is a shift in the angular disposition of the axis of the impelling-spring. Such a shift might be secured by other means than that shown and nevertheless be within the principle of my invention.

In the broad point of view it must be further understood that the variation in the timing of the explosion might be otherwise secured. I therefore do not limit myself to the particular means shown for securing that result.

It is of course obvious that in this generator the rotary member turns in a constant direction. It does not rock or reciprocate, but rotates. It should be further noted that said rotary member of the generator receives its rotary motion under the coöperation of two impelling devices, which may be distinguished, respectively, as the "primary" and the "secondary" impelling devices. The primary impelling device is the engine-driven wheel 17, taken together with the loose gear 22 on the armature-shaft. The secondary impelling device is the spring 27 and the crank-disk 23, fixed to the armature-shaft, with the crank-disk and the loose gear so related that the latter will rotate the former for a part of a revolution, so as to set spring 27 under increased tension and to trip the same into action for impelling the armature in advance of the loose gear or engine-driven part. Otherwise stated, the primary impelling device acts through a part of the secondary impelling device for a portion of the revolution of the rotary member of the generator, and thereby brings the secondary impelling device into an operative position for impelling the armature-shaft forward for the remainder of the revolution in advance of the primary impelling device if that should be necessary to give the required speed to generate the current desired. For example, this would always be true until the engine worked up to its full normal speed for its normal load; but when the engine reaches a speed high enough to cause the primary impelling device or engine-driven loose wheel 22 to keep up with the speed or action of the spring 27 then the primary and the secondary devices will both rotate together through the entire revolution of the armature. This disposition is highly important and probably absolutely necessary to the success of any generator designed to afford the required current from a single impulse. With this construction the spring-driven part can never interfere with the engine-driven part, and, conversely, the engine-driven part can never interfere with the spring-driven part. Hence the desired result is always secured. Any single-impulse machine which provides for the reciprocation or rocking of the rotary member of the generator is impracticable, for the reason that the engine may catch up with the speed of the impelling device which imparts the motion to secure the single impulse, and hence the engine-action and the impulse-action devices may interfere with and neutralize each other. To use a figure of speech, such rocking or reciprocating devices may be said "to tramp on their own feet."

What I claim, and desire to secure by Letters Patent of the United States, is as follows:

1. The combination with an electric generator having a rotary member, of an engine-driven impelling device moving said member in a constant direction, means for giving said device a speed independent of the engine's speed, a trip for setting and releasing said means, and means for varying the time of action of the trip.

2. An electric igniter for explosive-engines, comprising an electric generator having a rotary member, an engine-driven device and an impelling-spring coöperative to turn said rotary member of the generator always in a common direction and being so related that the engine-driven device will, during a part of the revolution, set said spring under tension and trip the same into action for insuring motion to said rotary member during the remainder of the revolution, at a speed independent of the speed of the engine, and means for varying the time of the trip to said spring, substantially as described.

3. In an electric igniter for explosive-engines, the combination with an electric generator, of a crank on the armature thereof, an impelling-spring applied to said crank and reacting against a base of resistance on a line which crosses the axis of the armature, at some point in the revolution of the crank, an engine-driven wheel operative on said crank to turn the same therewith, for a part of a revolution, and to set said spring under tension and to trip the same into action, thereby causing the spring to rotate the armature in advance of the crank, for the remainder of the revolution, and means for shifting the line of action of said impelling-spring, whereby the time of tripping and, consequently, the time of ignition may be varied, at will, substantially as described.

4. In an electric igniter for explosive-engines, a magneto wherein the magnets and pole-pieces are angularly adjustable, in respect to the armature, a crank on the armature-shaft, a bracket carried by the angularly-adjustable part of the magneto, an impelling-spring reacting between said bracket and said crank, and an engine-driven wheel operative on said crank to turn the same therewith, for a part of a revolution, thereby setting the spring under tension and tripping the same into action to impel the armature in advance of the engine-driven wheel, substantially as described.

5. In an electric igniter for explosive-engines, a magneto wherein the magnets and pole-pieces are angularly adjustable, in respect to the armature, a crank on the armature-shaft which becomes subject to an engine-driven wheel for a part of its revolution, a rod pivoted to said crank and extending

through a swiveled guide mounted in a bracket angularly adjustable with said magnets and pole-pieces, an impelling-spring reacting between said guide and said crank, and a buffer-spring reacting between said guide and the head of said rod, all for coöperation substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

GEORGE ARTHUR GOODSON.

Witnesses:
HAROLD J. GROSS,
JOHN M. WALTON.