S. F. BRIGGS.

GAS ENGINE IGNITER.

APPLICATION FILED FEB. 4, 1909.

950,126. Patented Feb. 22, 1910.

4 SHEETS—SHEET 1.

Fig. 1.

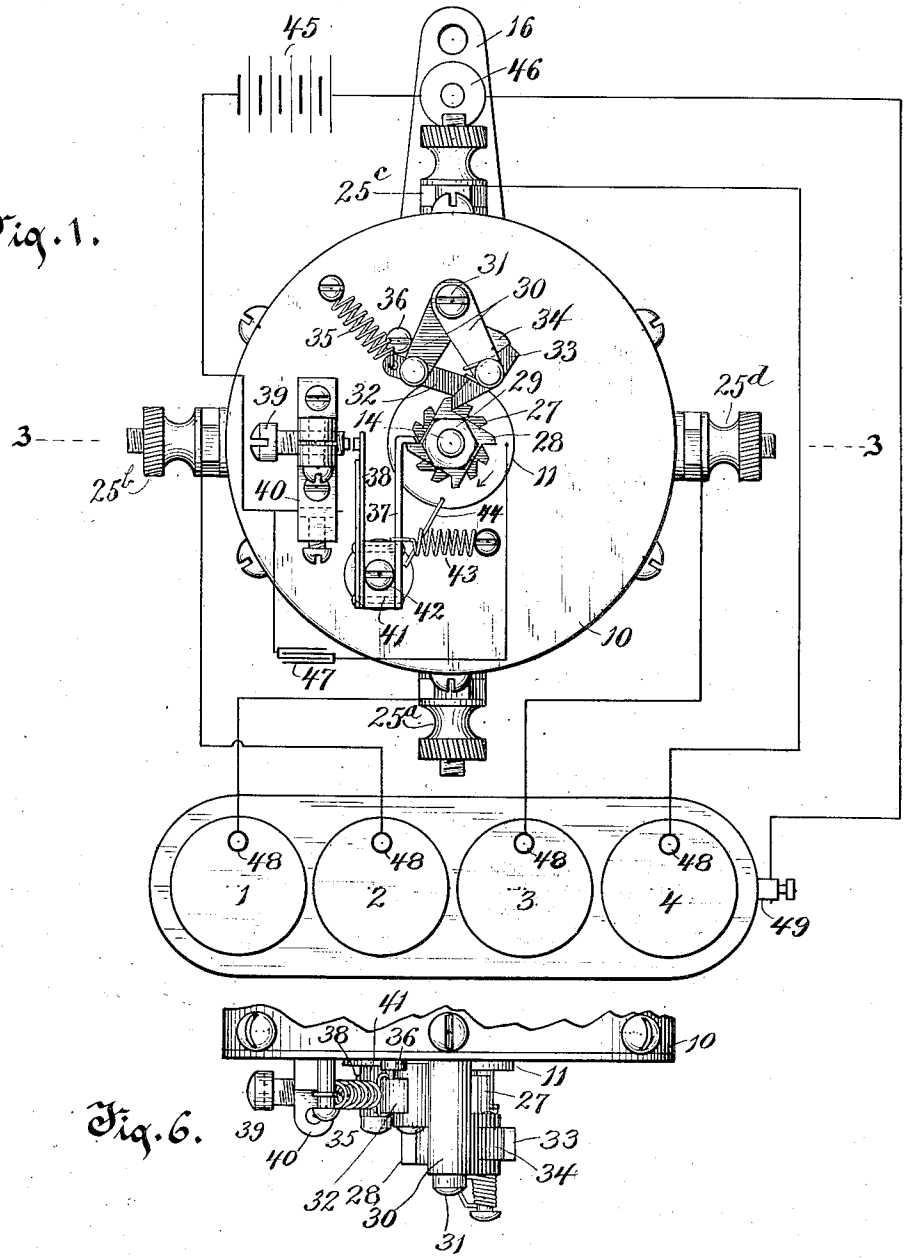

Fig. 6.

Witnesses.

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4 SHEETS—SHEET 2.

Fig. 2.

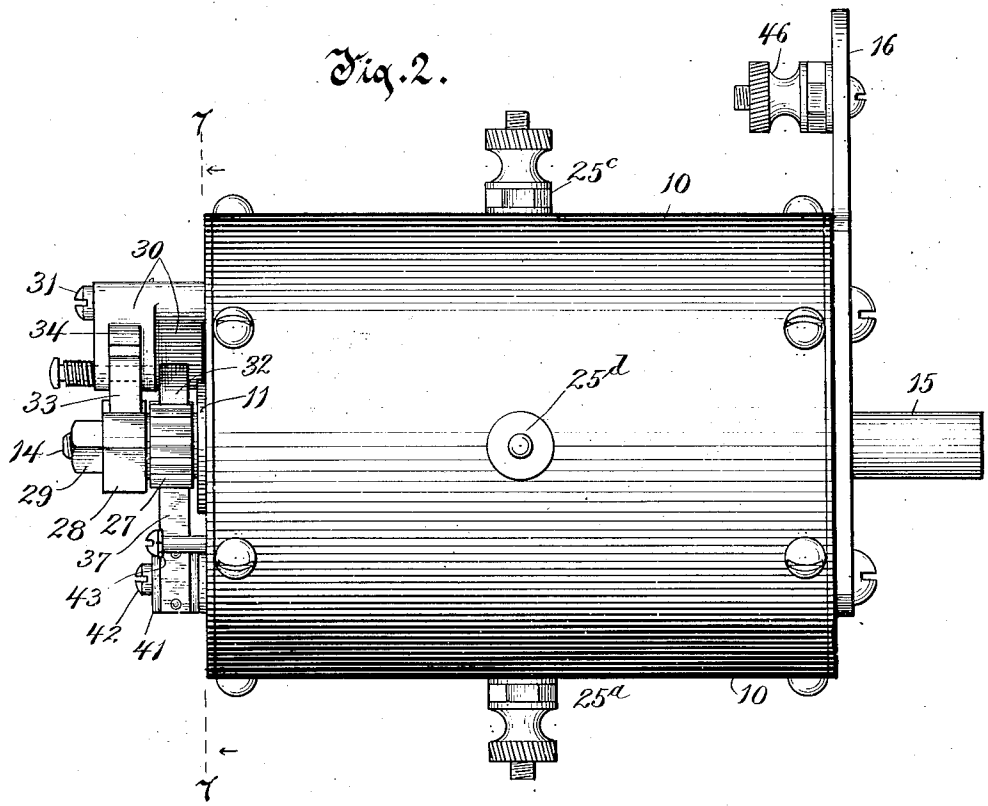
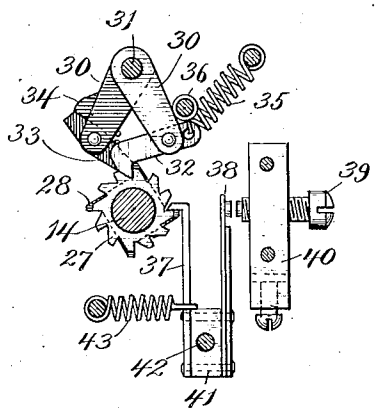


Fig. 7.



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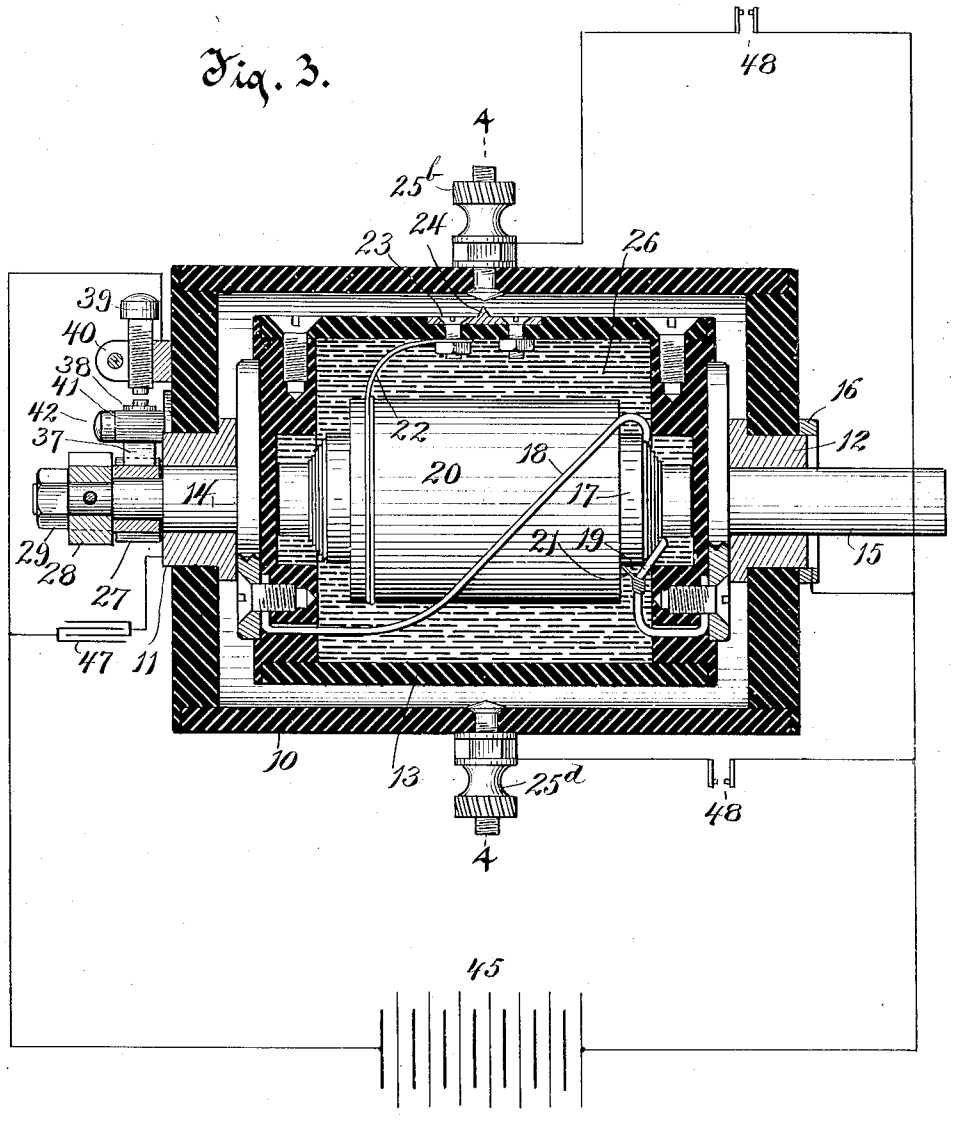
4 SHEETS—SHEET 3.

Fig. 3.



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4 SHEETS—SHEET 4.

Fig. 4.

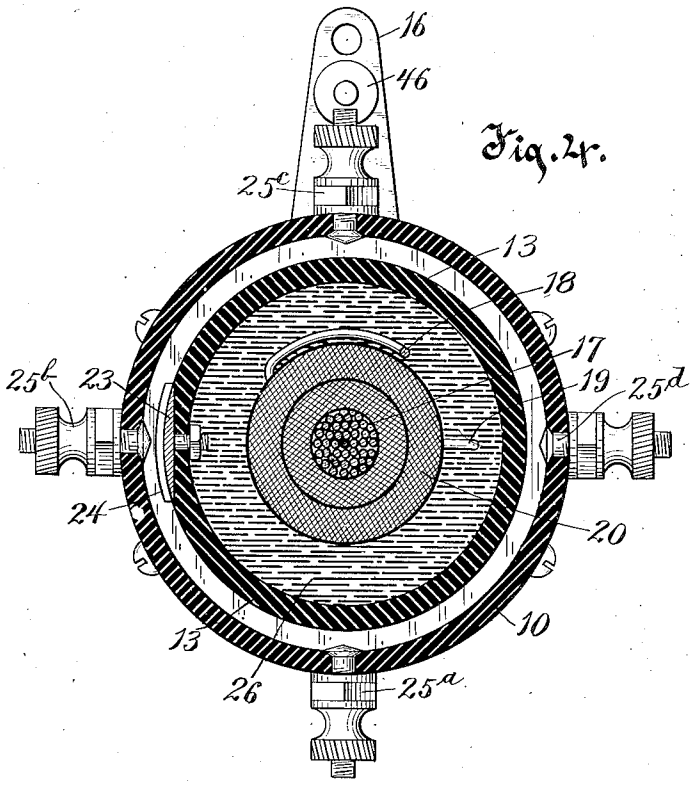
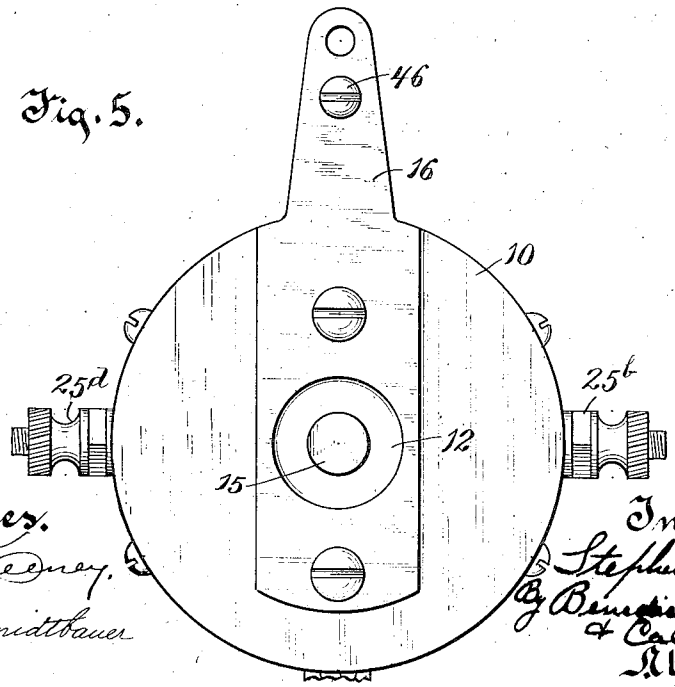


Fig. 5.



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UNITED STATES PATENT OFFICE.

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GAS-ENGINE IGNITER.

950,126. Specification of Letters Patent. Patented Feb. 22, 1910.

Application filed February 4, 1909. Serial No. 475,957.

To all whom it may concern:

Be it known that I, STEPHEN F. BRIGGS, residing in Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented new and useful Improvements in Gas-Engine Igniters, of which the following is a description, reference being had to the accompanying drawings, which are a part of this specification.

This invention has for its object to provide an igniter for gas engines and the like of a construction which will be neat and compact, combining the induction coil and the timer and the distributer in a single mechanism which is simple and efficient in its operation, inexpensive to construct and easily maintained in operative condition.

Another object of the invention is to provide for a uniform period of contact of the timer or interrupter in the primary circuit whatever the speed of the engine may be, which period will be just sufficient for the purpose and thereby assure economy in the use of the battery current with a resulting increase in life of the battery.

Another object is to provide such an igniter with simple means for advancing or retarding the ignition.

With the above and other objects in view the invention consists in the igniter for gas engines herein claimed, its parts and combinations of parts and all equivalents.

I desire it to be understood that this invention is not limited to any specific form or arrangement of parts except in so far as such limitations are specified in the claims.

Referring to the accompanying drawings in which like characters of reference indicate the same parts in the different views; Figure 1 is an end elevation of an igniter embodying the principles of this invention the circuit connections being shown in diagram; Fig. 2 is a side elevation thereof; Fig. 3 is a sectional view thereof on the plane of line 3—3 of Fig. 1, circuit connections being shown in diagram; Fig. 4 is a transverse sectional view on the plane of line 4—4 of Fig. 3; Fig. 5 is a rear end elevation; Fig. 6 is a detail plan view of the parts at the front end of the igniter; and, Fig. 7 is a view of said parts looking outwardly from the casing with their casing connections in section on the plane of line 7—7 of Fig. 2.

In these drawings 10 indicates a cylindrical casing, which as here shown is of insulating material, but which may be of metal when circuit carrying parts thereon are properly insulated. At the ends or heads of the cylindrical casing 10 are bearing bushings 11 and 12 respectively in which are journaled the trunnions on the ends of an inner cylindrical casing 13, also shown to be of insulating material though it may likewise be of metal with proper insulation for conducting parts. The trunnion 14 which is journaled in the bushing 11, and the trunnion 15 which is journaled in the bushing 12, each consists of a disk like plate firmly secured to the inner cylindrical casing 13 and an outwardly extending projection which is turned down to have a working fit in the bearing. The trunnion 15 is preferably connected with the cam shaft of the gas engine so as to be driven thereby to cause the inner cylindrical casing to turn within the casing 10 while the latter is held against turning by an arm 16 secured to its rear end and preferably connected with the spark advance mechanism on the steering wheel, in the case of a motor vehicle.

Within the inner cylindrical casing 13 there is an induction coil, the primary winding 17 of which has its terminals 18 and 19 connected respectively to the trunnions 14 and 15 while the secondary winding 20 has one of its terminals 21 connected with the terminal 19 of the primary coil and its other terminal 22 connected with a distributer plate 23 on the surface of the cylindrical casing 13. The plate 23 is provided with an outwardly extending rib 24 which during the turning movements of the casing 13 passes close to the inner pointed ends of a series of binding posts 25^a, 25^b, 25^c and 25^d to connect therewith by means of a jump spark at proper times, there being one of the binding posts for each of the cylinders of the engine and in connection with the spark plug thereof as will be later described. The space within the inner cylindrical casing 13 and surrounding the induction coil is preferably filled with sealing wax 26 or other suitable insulating material which will harden and assist in holding the parts in place.

At the front end of the outer casing 10 is provided a circuit interrupter or timer actuated by the turning movements of the inner casing. A ratchet wheel 27 is loosely

mounted on the trunnion 14, just outside of the bushing 11 and between stepped reducing shoulders of said trunnion, so as to be capable of freely turning thereon, while a four toothed cam 28 is keyed on the trunnion 14 next to the ratchet wheel 27 with a set nut 29 bearing thereagainst to hold it in place. A bell crank lever 30 with its two arms in different vertical planes is pivotally mounted on a screw stud or post 31 on the end of casing 10 and carries a hook shaped dog 32 on one arm engaging the ratchet 27 and a spring actuated pawl 33 on its other arm to engage the teeth of cam 28. The spring of pawl 33 normally holds it against a stop lug 34 on the arm of the bell crank lever to which it is pivotally mounted and a spring 35 connects the dog 32 with the casing 10 to serve the double purpose of swinging said dog toward the ratchet wheel and for swinging the bell crank lever 30 against a stop 36 on casing 10. The turning of the trunnion 14 in the direction of the arrow in Fig. 1 causes the teeth of cam 28 to successively engage the pawl 33 and cause it to swing the bell crank lever 30 and advance the dog 32 on the ratchet until the tooth of cam 28 passes out of engagement with the pawl, when the spring 35 quickly returns the bell crank lever to its normal position against the stop 36 and in the meantime feeds the ratchet 27 the distance of one tooth by the engagement of the dog 32 therewith, the direction of feed of the ratchet being opposite to the direction of movement of the trunnion and the cam 28. The front edges of the teeth of ratchet wheel 27 form cams which engage and swing a pivoted hook member 37 to close the primary circuit of the induction coil by means of a spring tongue switch member 38 carried thereby moving into engagement with an adjustable contact screw 39 on a block 40 secured to the casing 10. The hook 37 and its spring contact tongue 38 are pivotally mounted on the casing 10 by having the pivot block 41 by which they are connected mounted on a pivot post 42 on said casing, there being a spring 43 connecting these pivoted parts to the casing to hold the hook member against the teeth of the ratchet. A wire 44 connects the pivot post 42 with the bushing 11 to include the normally disengaged contact points of the spring 38 and the screw 39 in the primary circuit of the induction coil.

In wiring the igniter of this invention the battery 45 has one terminal connected with a binding post 46 on the arm 16 which is in connection with the bushing 12 and its other terminal is connected with the stationary contact block 40 of the circuit interrupter. A condenser 47 is bridged across the contacts of the interrupter, preferably by having one terminal connected with the bushing 11 and the other terminal connected with the stationary contact block 40. The spark plugs 48 of the engine cylinders are connected with the binding posts 25^a, 25^b, 25^c and 25^d, having due regard to the desired order of explosion for the cylinders, and the ground or casing connection 49 of the engine is connected to the binding post 46.

In operation, the turning motion of the inner cylindrical casing, produced by its driving connection with the engine, causes the four toothed cam 28 to swing the bell crank lever 30 against the action of its spring 35 and release the pawl 33 thereof at the exact time that one of the cylinders of the engine is in condition to receive ignition. The release of the bell crank lever causes the dog 32 to quickly turn the ratchet wheel 27 the distance of one tooth and thereby swing the hook member 37 by the cam action of a tooth of the said ratchet wheel and momentarily bring the contacts of spring tongue 38 and screw 39 into engagement to complete the primary circuit of the induction coil. The primary circuit may be traced from the battery 45 to the binding post 46 on arm 16, and through the bushing 12 and the trunnion 15 to the terminal 19 of the primary winding of the induction coil, and through said primary winding and by way of its other terminal 18 to the trunnion 14, and from the bushing 11 in engagement therewith through wire 44 and the pivot post 42 for the movable member of the interrupter, and through the engaged contacts of the interrupter back to the primary battery 45.

As the circuit is only closed during the brief interval that a tooth of ratchet 27 passes by the hook 37 the switch action is very rapid and is always uniform, being independent of the turning movement of the trunnion after the bell crank is released. This quick make and break of the primary circuit induces a current of high potential in the secondary winding of the induction coil. The secondary circuit may be traced through the secondary winding 20 and its terminal 22, across the air gap intervening between the distributer plate 23 and that binding post which is close thereto at that time, through the spark plug 48 of the cylinder of the engine with which such binding post is connected and back to the other terminal 21 of the secondary winding through the bushing 12 and trunnion 15. The arc caused at the spark plug 48 ignites the charge in that cylinder of the engine, and as the connections with the binding posts 25 are made with the spark plugs of the different cylinders with respect to the order of their explosion, the binding post through which the circuit is made by the distributer plate 23 being close thereto is always the one in connection with the cylinder which is in condition to re-

ceive the explosion, and the position of the cam 28 on the trunnion 14 is so fixed that the induced current is sent at the exact time that the ignition is required.

In order that the spark may be advanced or retarded according to the wish of the operator, the outer casing 10 is shifted in its position on the trunnions by means of the arm 16. By shifting the position of the casing 10 in a clockwise direction, when viewed as in Fig. 1, the ignition in the various cylinders of the engine will be uniformly retarded, whereas by shifting the position of the casing in the opposite direction the ignition is advanced. To permit of this adjustment in the timing of the ignition without varying the distance of the arc gap between the distributer plate 23 and the binding posts 25 said distributer plate is provided with the raised rib 24, which as seen in Fig. 4, will remain close to one of the binding posts through an angle of movement of the inner casing which will be ample to include the turning movements of the outer casing.

The object in pivotally mounting the pawl 33 to the bell crank 30 is to enable it to avoid the teeth of the cam 28 in event of the parts turning in the wrong direction.

It is obvious that the number of binding posts 25 provided will depend upon the number of cylinders of the engine with which the igniter is used, there being one binding post for each cylinder of the engine, and likewise the number of teeth on the cam 28 will correspond with the number of cylinders to the engine. It is also obvious that it is immaterial where the binding posts 25 are located for they may be at any convenient place on the casing 10, the end of the casing being suitable for the purpose if preferred. It is further obvious that a sweeping contact may be made between the distributer plate 23 and the binding posts if desired, instead of dividing the arc gap between the spark plugs and the binding posts.

A feature of merit in the present invention is the fact that whatever the speed of the engine may be the period of contact made by the circuit interrupter remains the same, that period being of the shortest duration under which the desired results may be attained. This period depends upon the length of the outer ends of the teeth of the ratchet 27 and the speed with which said ratchet is moved by the dog 32 of the bell crank 30. If this period is desired to be shortened or lengthened it may be done by substituting a ratchet wheel of a greater or a less number of teeth for the one shown.

By forming the induction coil on the movable part within the outer casing the construction may be made very compact and the electrical connections may be conveniently made so as to simplify the construction and render it less expensive to construct and more efficient and durable in use.

What I claim as my invention is:

1. An igniter for gas engines, comprising an engine driven member, a cam carried thereby, a spring retracted switch actuating member engaged and moved by the cam away from its normal position and then released to be returned to its normal position by its spring, a ratchet wheel engaged and moved by the switch actuating member, a switch having a movable member engaged and moved by the ratchet wheel upon the return movement of the switch actuating member, and an induction coil with its primary circuit including the switch and its secondary circuit including the spark plug of the engine.

2. An igniter for gas engines, comprising an engine driven member, a cam carried thereby, a spring retracted bell crank having a pivoted pawl on one arm and a pivoted dog on the other arm, the pivoted pawl standing in the path of the cam to be engaged thereby for moving the bell crank out of its normal position, a ratchet wheel engaged and turned by the dog on the return movement of the bell crank, a switch having a spring retracted pivoted member engaging the teeth of the ratchet, and an induction coil with its primary circuit including the switch and its secondary circuit including the spark plug of the engine.

3. An igniter for gas engines, comprising an engine driven member, a cam carried thereby, a spring retracted bell crank having a pivoted pawl on one arm and a pivoted dog on the other arm, the pivoted pawl standing in the path of the cam to be engaged thereby for moving the bell crank out of its normal position, a ratchet wheel loosely mounted on the engine driven member and engaged and turned by the dog on the return movement of the bell crank, a switch having a spring retracted pivoted member with a hook engaging the teeth of the ratchet to be swung thereby and a contact tongue to engage a stationary member of the switch, and an induction coil with its primary circuit including the switch and its secondary circuit including the spark plug of the engine.

4. An igniter for multiple cylinder gas engines, comprising a casing, an induction coil rotatably mounted in the casing and having driving connection with the engine, a circuit interrupter for the primary circuit of the induction coil actuated by the movements of the induction coil, cylinder terminals on the casing for connection with the spark plugs of the several cylinders of the engine, and a distributing terminal carried by the induction coil for the secondary circuit thereof adapted to establish connection

for the secondary circuit with the successive cylinder terminals on the casing.

5. An igniter for multiple cylinder gas engines, comprising a casing, an induction coil rotatably mounted in the casing and having driving connection with the engine, a circuit interrupter for the primary circuit of the induction coil actuated by the movements of the induction coil, cylinder terminals on the casing for connection with the spark plugs of the several cylinders of the engine, and a distributing terminal carried by the induction coil in connection with the secondary winding thereof adapted to travel close to the cylinder terminals to establish connection therewith by means of a jump spark.

6. An igniter for multiple cylinder engines, comprising an induction coil, insulated trunnions on which the induction coil is mounted, a casing, insulated bushings on the casing in which the trunnions are journaled for rotatably mounting the induction coil in the casing and forming electrical connections for said trunnions, one end of the primary winding of the induction coil being connected to one trunnion and the other end of the primary winding and one end of the secondary winding being connected to the other trunnion, an insulated distributing terminal carried by the induction coil and connected with the other end of the secondary winding of the induction coil, one of the trunnions being adapted for driving connection with the engine, a circuit interrupter for the primary circuit actuated by the movements of one of the trunnions and having electrical connection with the bushing thereof, insulated cylinder terminals on the casing close to the path of the distributing terminal for connection with the spark plugs of the several cylinders of the engine which are also in connection with one of the bushings, and a battery connected to the circuit interrupter and to the last mentioned bushing.

7. An igniter for multiple cylinder gas engines, comprising a casing, an inner casing contained therein, an induction coil in the inner casing, insulated trunnions on which the inner casing is mounted, insulated bushings on the outer casing in which the trunnions are journaled for rotatably mounting the inner casing and forming electrical connections for said trunnions, one end of the primary winding of the induction coil being connected to one trunnion and the other end of the primary winding and one end of the secondary winding being connected to the other trunnion, an insulated distributing terminal comprising a plate with a projecting flange carried by the inner casing and connected with the other end of the secondary winding of the induction coil, one of the trunnions being adapted for driving connection with the engine, a circuit interrupter for the primary circuit actuated by the movements of the other trunnion and having electrical connection with the bushing thereof, insulated cylinder terminals on the casing close to the path of the flange of the distributing terminal for connection with the spark plugs of the several cylinders of the engine which are also in connection with the bushing of the driving trunnion, a battery connected to the circuit interrupter and the bushing of the driving trunnion respectively, and means for rocking the outer casing on the trunnions for advancing or retarding the ignition.

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

STEPHEN F. BRIGGS.

Witnesses:
R. S. C. CALDWELL,
ALMA A. KLUG.