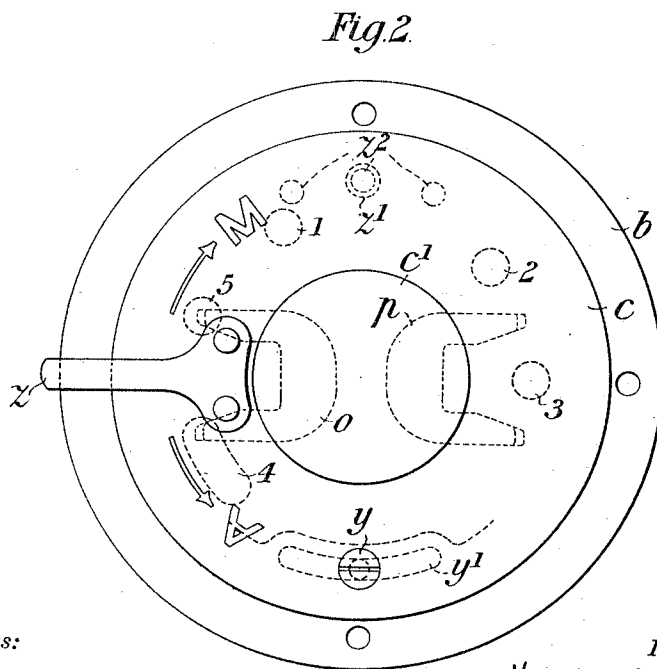
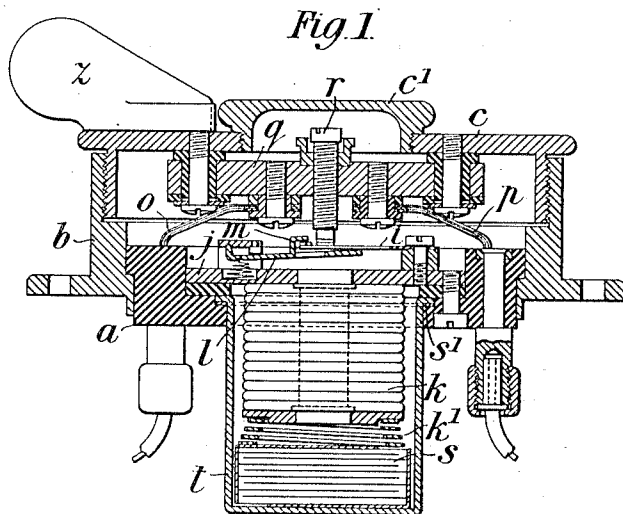


F. R. SIMMS.  
 STARTING INTERNAL COMBUSTION ENGINES.  
 APPLICATION FILED DEC. 10, 1910.

1,048,362.

Patented Dec. 24, 1912.

3 SHEETS—SHEET 1.



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3 SHEETS-SHEET 2.

Fig. 3.

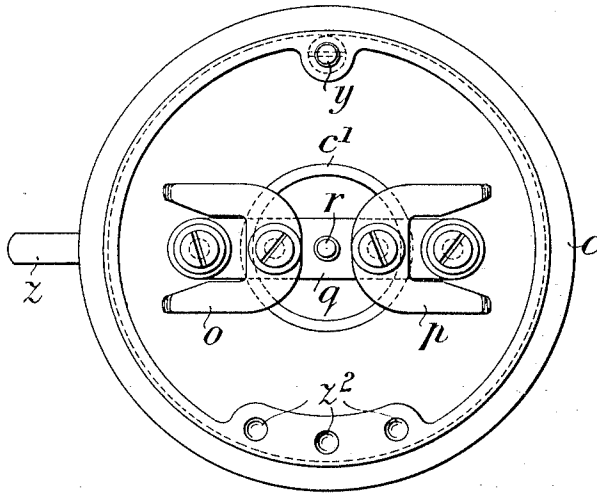
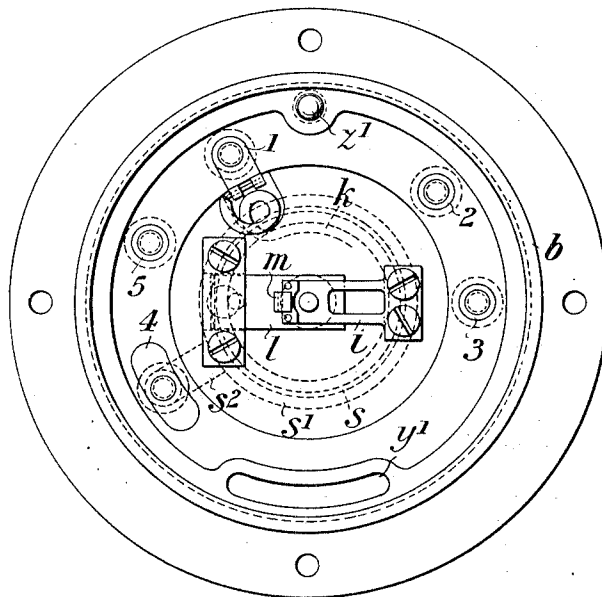


Fig. 4.



Witnesses:

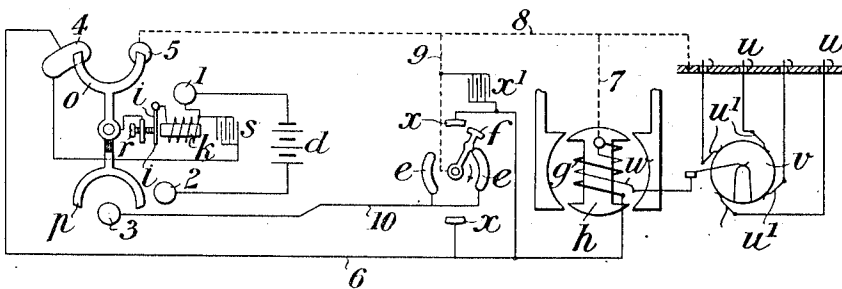
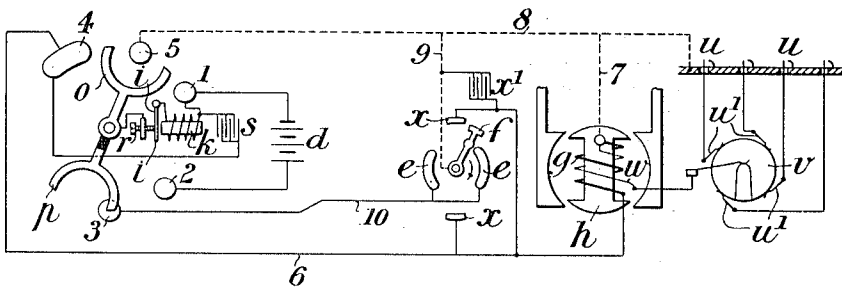
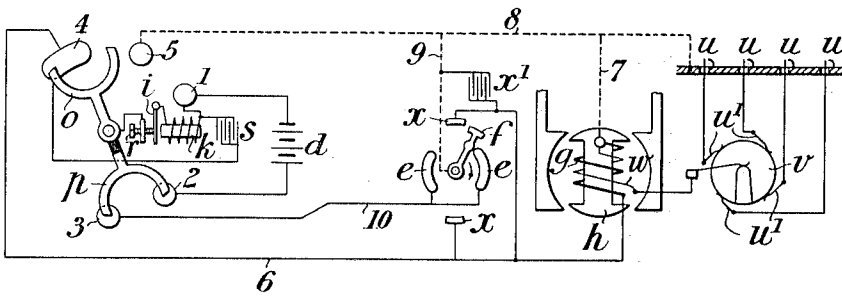
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**1,048,362.**

3 SHEETS—SHEET 3.



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# UNITED STATES PATENT OFFICE.

FREDERICK RICHARD SIMMS, OF WILLESDEN LANE, ENGLAND, ASSIGNOR TO SIMMS MAGNETO CO., INC., OF NEW YORK, N. Y.

## STARTING INTERNAL-COMBUSTION ENGINES.

1,048,362.

Specification of Letters Patent.

Patented Dec. 24, 1912.

Application filed December 10, 1910. Serial No. 596,638.

*To all whom it may concern:*

Be it known that I, FREDERICK RICHARD SIMMS, a subject of the King of Great Britain, residing at Welbeck Works, Kimberley Road, Willesden Lane, Middlesex, England, have invented new and useful Improvements in Starting Internal-Combustion Engines, of which the following is a specification.

My invention relates to the starting of internal combustion engines by sparking effected by current from an accumulator, which current passes through the primary coil of a magneto machine, so as to induce a high tension current in the secondary coil thereof suitable for ignition purposes.

The object of my present invention is to provide an effective form of switch and trembler device, and to so arrange the parts and the connections thereof, that the accumulator current can be used for starting purposes or can be used as an alternative to the magneto during normal running.

In the embodiment of the invention herein shown and described I provide a switch comprising a base block having five terminals or connections, two of which namely, numbers 1 and 2, are connected respectively to the positive and negative poles of the battery, while number 3 is connected to the contacts of the auxiliary circuit breaker in connection with the magneto machine, and number 4 to the magneto coil. Furthermore, number 1 terminal, in addition to being connected to the positive pole of the battery, is also connected to the electric trembler. In conjunction with the switch block there is provided a cover which carries on the inside a pair of forked contacts insulated from one another and a screw for pressing upon the electric trembler and making contact between the said trembler and one of the forked contacts. The switch cover is arranged to move through a predetermined arc on the base block, and the movement through this arc suffices to adjust the contact forks, so as to either bring the parts into position for sparking from the accumulator or for disconnecting the accumulator and short circuiting the armature of the magneto or for bringing the magneto into connection for sparking in lieu of the accumulator.

To enable the invention to be fully under-

stood I will describe it by reference to the accompanying drawings, in which:—

Figure 1 is a sectional elevation of a switch constructed according to the invention, and Fig. 2 is a plan thereof. Fig. 3 is an underside view of the cover of the switch. Fig. 4 is a plan of the switch with the cover removed. Fig. 5 is a diagrammatic view showing the electrical connections between the switch the accumulator and the magneto, and Figs. 6 and 7 are similar views to Fig. 5 showing different positions of the switch.

*a* is the base block of the switch of insulating material carried by the casing *b* and *c* is the switch cover screwed within the casing *b*.

1, 2, 3, 4 and 5 are the terminals or connections carried by the base block *a*, 1 and 2 being connected respectively to the positive and negative poles of the accumulator *d*, Figs. 5 to 7, while 3 is connected to the contacts *e, e* of an auxiliary circuit breaker in circuit through the brush *f'* with one end of the primary coil *g* on the armature *h* of a magneto of the Simms type, the said auxiliary circuit breaker having an arm rotating with the said armature which carries the brush *f'*. In this instance the arm which carries the brush *f'* is the rotating arm of the usual contact breaker of the magneto, and also carries a brush *f* for engagement with the contacts *x, x*, the same being connected in the magneto circuit in the usual manner. The terminal 4 is in connection with the other end of the primary coil *g*.

*i* is the electric trembler mounted on a plate *j* on the block *a* and designed to be attracted by the electro-magnet *k* through the medium of the spring armature *l*, the latter being provided with a bent or right-angled projection *m* which embraces the free end of the trembler *i* and draws it down with it when the armature is attracted by the said magnet.

*o, p* are the forked contacts carried by a bar *q* on the cover *c* but insulated therefrom, the fork *o* being in electrical contact with the said bar *q* and the fork *p* insulated from the said bar. The said forks are designed to make contact with the terminals or contact pieces 2, 3, 4, 5 in the manner hereinafter described.

$r$  is the screw for making contact with the trembler  $i$ , the said screw being carried by the bar  $q$  and being adjustable therein relatively with the trembler in the usual manner, a cap or plug  $c'$  being arranged in the cover  $c$  by removing which the screw  $r$  is accessible for adjustment.

$s$  is a condenser contained within a casing  $t$  which surrounds the magnet and is supported in the block  $a$ , the said condenser being arranged in connection with the coil of the magnet  $k$  through the spring  $k'$ , Fig. 1, and with the terminal 4 as shown in Figs. 5 to 7, the casing  $t$  and a ring  $s'$  having a lug  $s^2$ , Figs. 1 and 4, forming the connection of the said condenser to the said terminal 4. The magnet  $k$  is also connected to the terminal 1 and the trembler  $i$ .

$u, u, u, u$  are the sparking plugs, one element of each of which is in connection with a brush  $u'$  bearing on the usual high tension distributor  $v$  in connection with one end of the secondary coil  $w$  around the armature  $h$ , and the other element in connection with the other end of the said coil as indicated by the dotted line or earth connection.

$x, x$  are the contact pieces on the magneto with which the brush  $f$  makes and breaks contact when the magneto is operating and  $x'$  is the condenser in connection therewith, the said contacts and brush constituting the main or low tension contact breaker of the magneto. It will be noted that the relation of the contacts  $x, x'$  of the contact breaker of the magneto primary circuit, and the commutator contacts  $e, e$ , is such that the arm  $f$  passes off of one or other of contacts  $x$  before it can engage a contact  $e$  and vice versa. This construction holds the accumulator circuit open during the time that the contacts of the contact breaker ( $f^x$ ) are in contact, and prevents short circuiting which would otherwise occur.

By turning the switch cover  $c$  relatively with the casing  $b$  through an arc determined by a stop-pin  $y$  in the said cover engaging a slot  $y'$  in the said casing, the contact forks  $o$  and  $p$  can be moved to complete circuits for sparking at the plugs  $u, u$  by means of the accumulator  $d$ , or for disconnecting the accumulator and short circuiting the primary coil  $g$  and thus rendering the magneto inoperative, or for sparking by the magneto in lieu of the accumulator.

$z$  is a thumb-piece to enable the switch cover to be turned and  $Z'$  is a spring ball or bolt in the switch base designed to engage with either one of three holes  $z^2$  in the cover  $c$  to determine and hold the cover in any one of the three positions into which it can be turned.

The device operates as follows, that is to say, by turning the switch so as to bring the forked contacts  $o, p$  into the position shown in Fig. 5, in which the two limbs of the

fork  $p$  rest respectively on terminals 2 and 3, and one limb of the other fork  $o$  rests upon contact 4, then current is supplied from the battery  $d$  to the primary coil  $g$  of the magneto and thence to the sparking plug in the usual manner, the current passing from the battery  $d$  by way of the magnet  $k$  trembler  $i$ , screw  $r$ , fork  $o$ , contact 4, line 6, coil  $g$ , earth connections 7, 8 and 9, brush  $f'$  either contact  $e$ , line 10, contact 3, fork  $p$ , contact 2, back to battery. By turning the switch so as to bring one of the limbs of the fork  $p$  on to terminal 3 and the limbs of the other fork  $o$  into an intermediate position, as shown in Fig. 6, the magneto supplies the current for sparking purposes, in the usual manner.

For cutting off both the battery and the accumulator the switch is turned to the position indicated in Fig. 7 in which the limbs of the fork  $p$  are out of contact with the contacts 2 and 3, and the limbs of the fork  $o$  in contact with the contacts 4 and 5 whereby the primary coil  $g$  of the magneto is short circuited.

The ignition system herein shown in connection with my improved switch, forms the subject matter of another application filed July 22, 1912, Serial No. 710,940 and is not claimed herein.

I claim—

1. In internal combustion engines provided with magneto sparking devices and in which the sparking when starting is effected by current from an accumulator passing through the magneto primary coil, the combination therewith of a switch for controlling the sparking either from the accumulator or the magneto comprising a block having an electromagnet and trembler and two pairs of fixed contacts, the members of one pair being respectively connected to one terminal of the accumulator and to the contacts of an auxiliary contact breaker on the magneto and the one member of the other pair connected to the brush of the auxiliary contact breaker, and main contact breaker to one terminal of the magneto primary and secondary coils and to one member of the sparking plugs and the other member of the said pair to one terminal of the electromagnet, to the contacts of the main contact breaker and to the other terminal of the magneto primary coil, and movable contacts formed by a connected pair of forks insulated from each other, one fork being connected to the other terminal of the electromagnet and having its prongs designed to contact with one pair of the fixed contacts of the switch and the other fork designed to contact with the other pair of fixed contacts, substantially as described.

2. In internal combustion engines provided with magneto sparking devices and in which the sparking when starting is effected

by current from an accumulator passing through the magneto primary coil, the combination therewith of a switch for controlling the sparking either from the accumulator or the magneto comprising a block carrying two pairs of fixed contacts, an electromagnet, a trembler and condenser in circuit therewith, a cover which can turn relatively to the block, a pair of forked contacts carried by the cover but insulated therefrom and from one another, and respectively operating in conjunction with the two pairs of fixed contacts, one of the forks being in circuit with the electromagnet, substantially as described.

3. In an ignition system provided with igniting devices, a magneto and an accumulator, a controlling switch comprising a main body provided with an electric trembler and a plurality of fixed contacts for connecting said magneto, or said accumulator and trembler in circuit with the igniting devices, a movable part, a pair of forked contacts connected to said movable part, insulated from each other, and cooperating with said fixed contacts.

4. In an ignition system provided with igniting devices, a magneto and an accumulator, a controlling switch comprising a main body provided with an electric trembler and a plurality of fixed contacts for connecting said magneto, or said accumulator and trembler in circuit with the igniting devices, a movable part, a pair of forked contacts connected to said movable part, insulated from each other, and cooperating with said fixed contacts and yielding means for holding said movable part in any one of the positions to which it may be moved, to disconnect both magneto and accumulator from the igniting devices, or to connect the igniting devices with the magneto, or with the accumulator and trembler.

5. In an ignition system provided with igniting devices, a magneto, an accumulator, of a switch casing having a cylindrical part, and provided with a plurality of contacts connected with the accumulator, the primary coil of the magneto, an electric trembler in said casing, a movable cover rotatably engaging the cylindrical portion of the casing, a pair of forked contacts connected to said cover and constructed to cooperate with and engage the said casing contacts, said forked contacts being insulated

from each other, means for arresting the said movable cover at predetermined positions and holding it with the forked contacts in one or other position into which they may be moved with respect to the casing contacts and means for limiting the rotary movement of said cover in both directions.

6. In an ignition system, provided with igniting devices, a magneto and an accumulator, a switch comprising a casing having a cylindrical threaded portion, and provided with a plurality of fixed contacts for connecting the magneto or the accumulator with the ignition system, an electric trembler in said casing adapted to be connected in circuit with the accumulator, a movable cover for said casing having threaded portions to engage the threaded portions of the casing, to hold the cover in position while permitting its rotary movement with respect to the casing, contact devices carried by said cover and cooperating with the fixed casing contacts, yielding means for holding said cover in different predetermined positions, and a detachable device for limiting the rotary movement of said cover with respect to the casing.

7. In an ignition system, provided with igniting devices, a magneto and an accumulator, a switch comprising a casing having a cylindrical threaded portion, and provided with a plurality of fixed contacts for connecting the magneto or the accumulator with the ignition system, an electric trembler in said casing adapted to be connected in circuit with the accumulator, a movable cover for said casing having threaded portions to engage the threaded portions of the casing, to hold the cover in position while permitting its rotary movement with respect to the casing, contact devices carried by said cover and cooperating with the fixed casing contacts, yielding means for holding said cover in different predetermined positions, a detachable device for limiting the rotary movement of said cover with respect to the casing, said cover being provided with an aperture therein to give access to the trembler without removing said cover, and a detachable closure for said aperture.

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