E. D. BRIGHT.

IGNITION APPARATUS.

APPLICATION FILED MAR. 26, 1909.

945,262.

Patented Jan. 4, 1910.

3 SHEETS—SHEET 1.

Fig. 1.

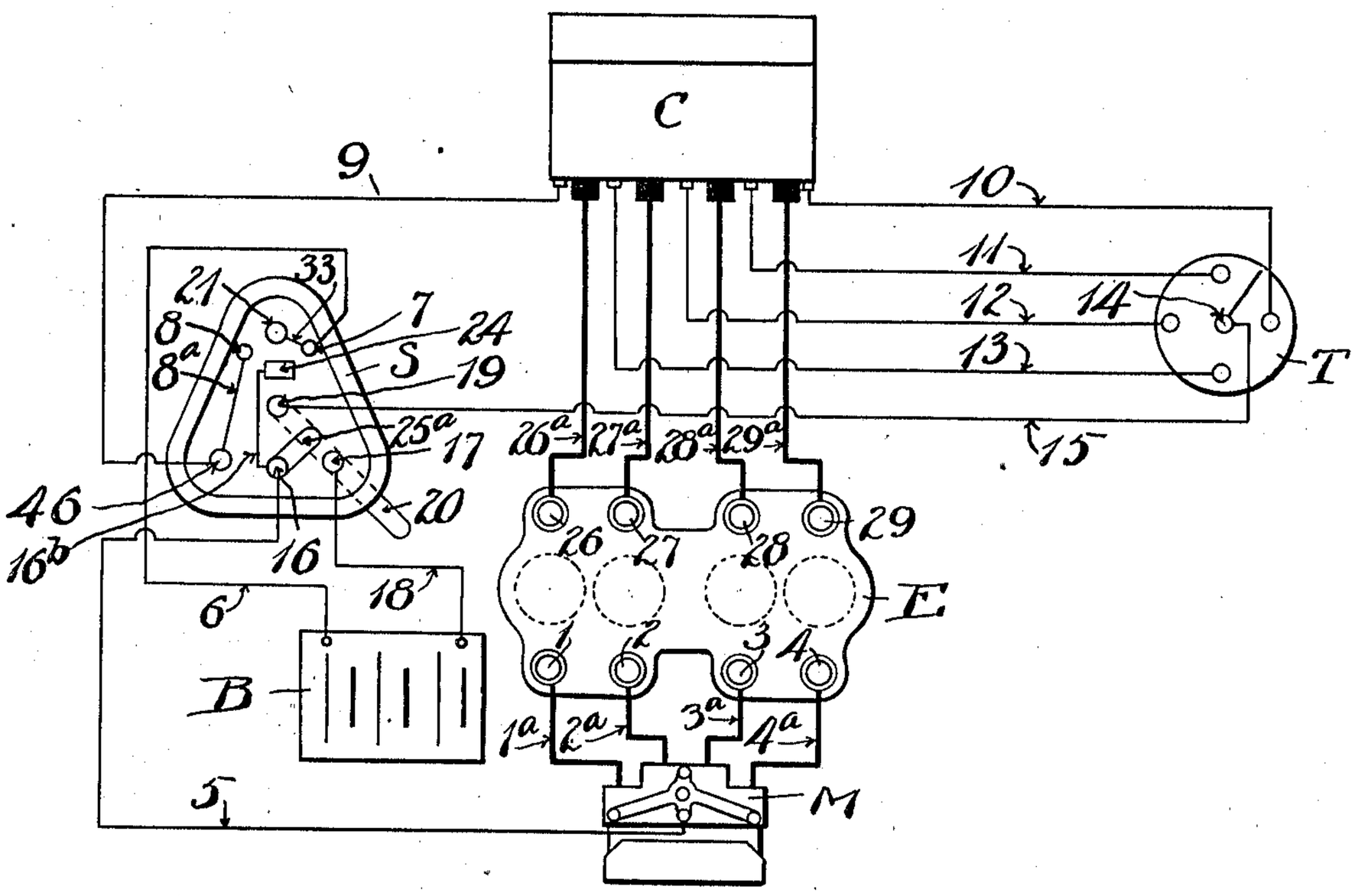
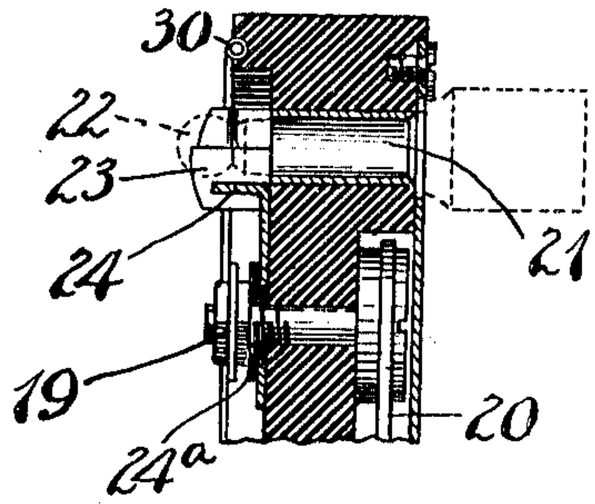


Fig. 5.



Witnesses:
Chas. A. Sears
Fred M. Dannenfelser.

Inventor
E. D. Bright
By his Attorney
Barker Brownell & Church

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3 SHEETS—SHEET 2.

Fig. 2.

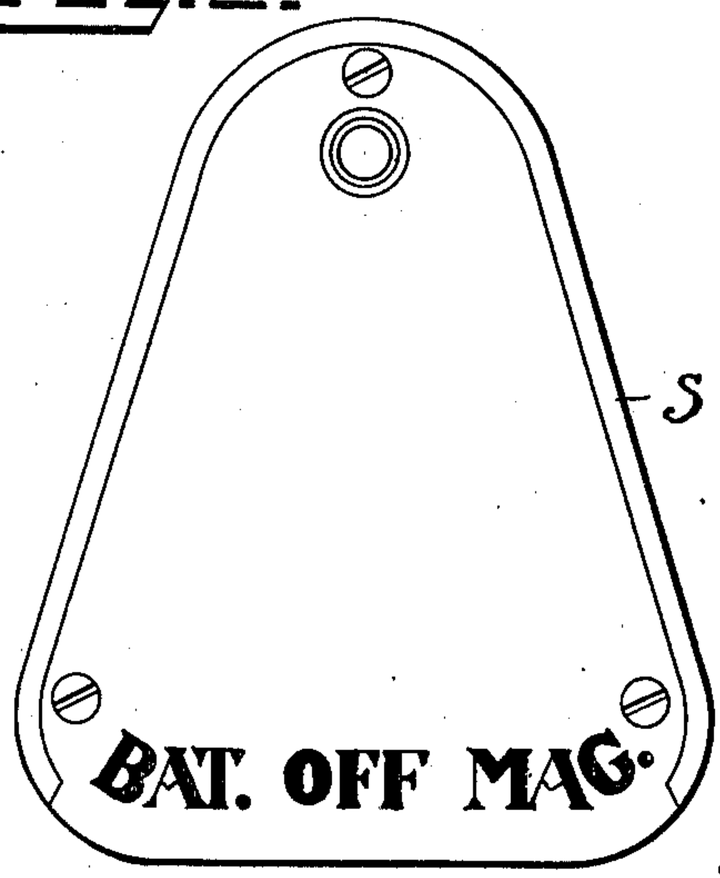

Fig. 7.

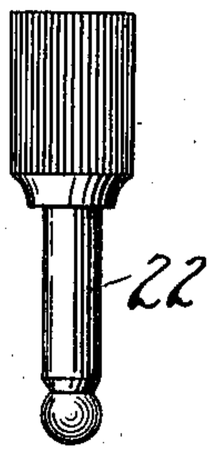

Fig. 8.

Fig. 3.

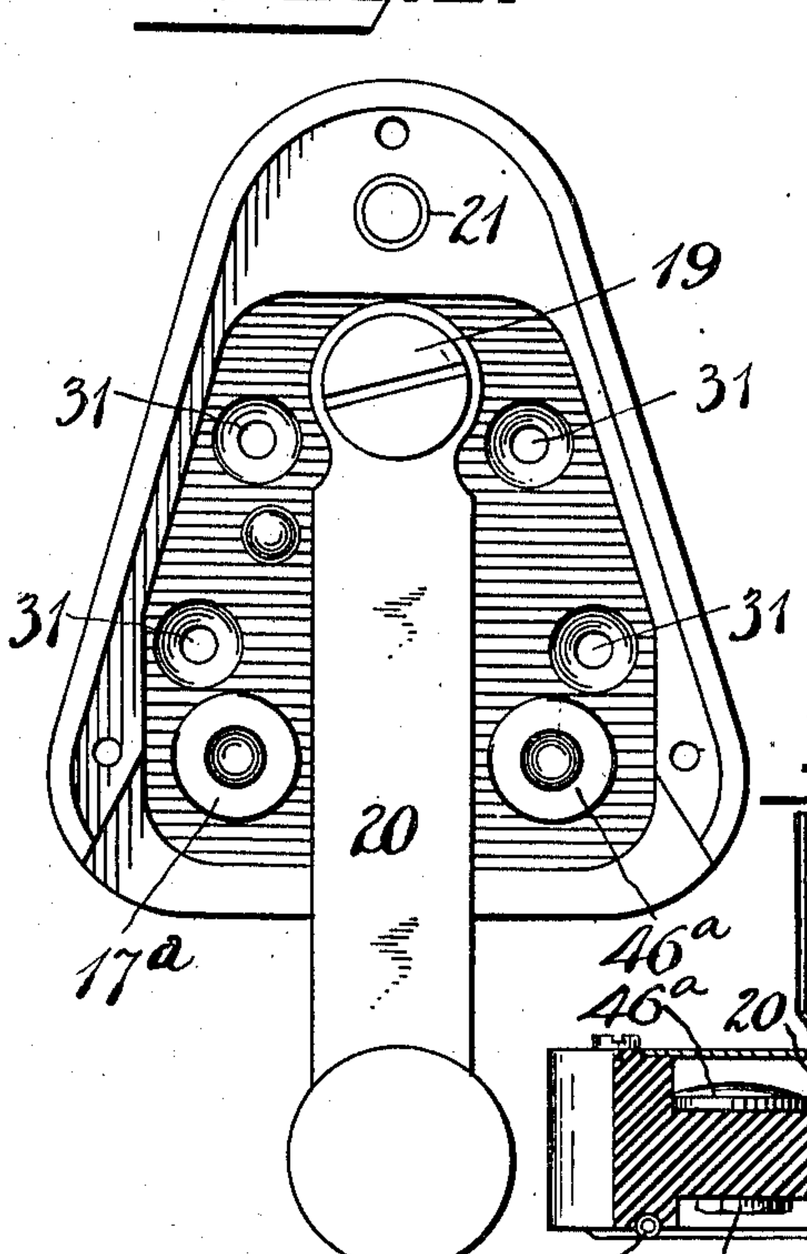

Fig. 4.

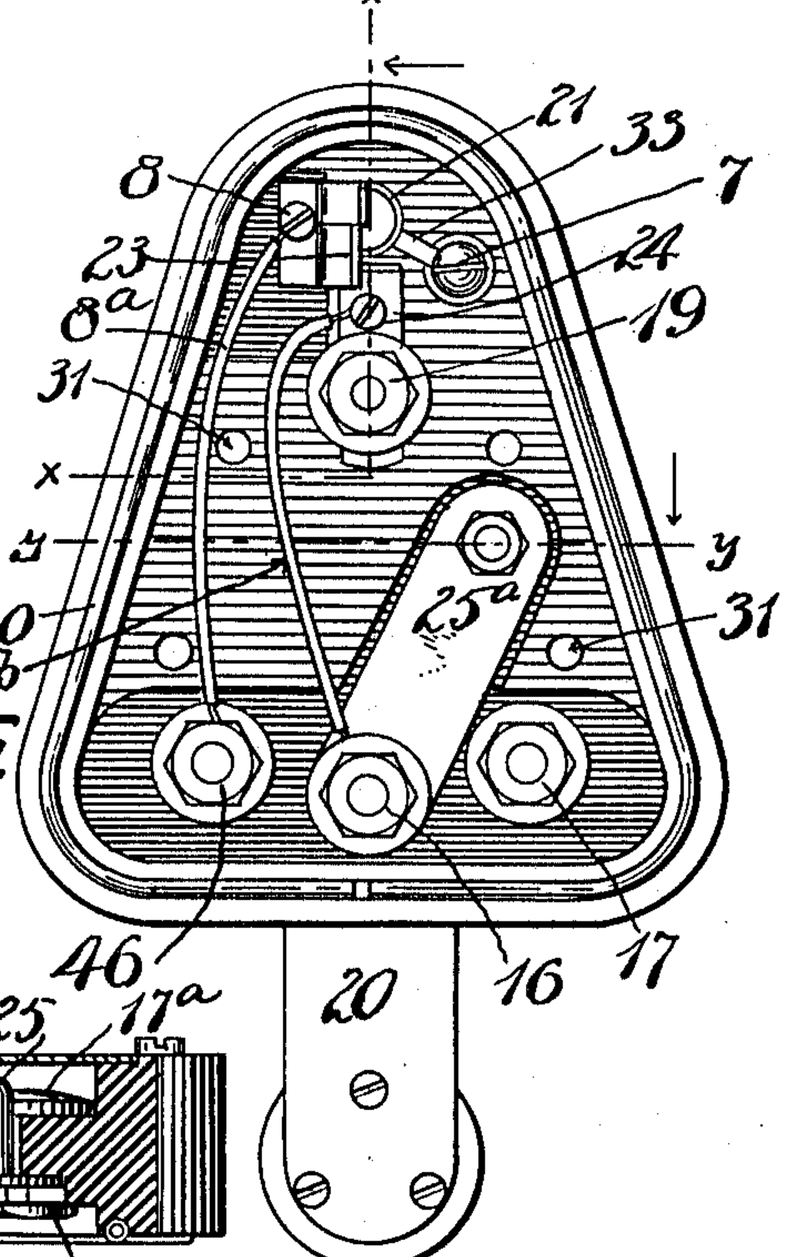

Fig. 6.

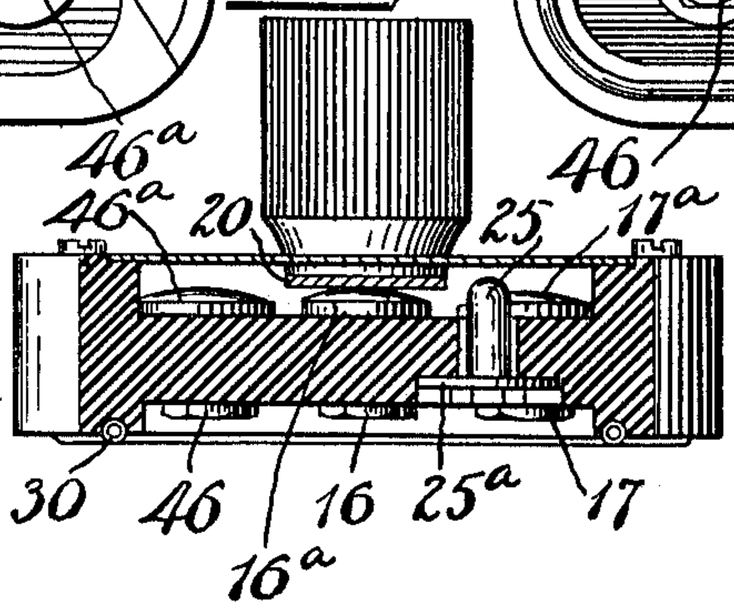

Fig. 5.

Witnesses:

Chas. A. Peard

Fred. H. Dannenfelser.

Inventor

E. D. Bright

By his Attorneys

Bakewell Brownell & Mitchell.

E. D. BRIGHT.

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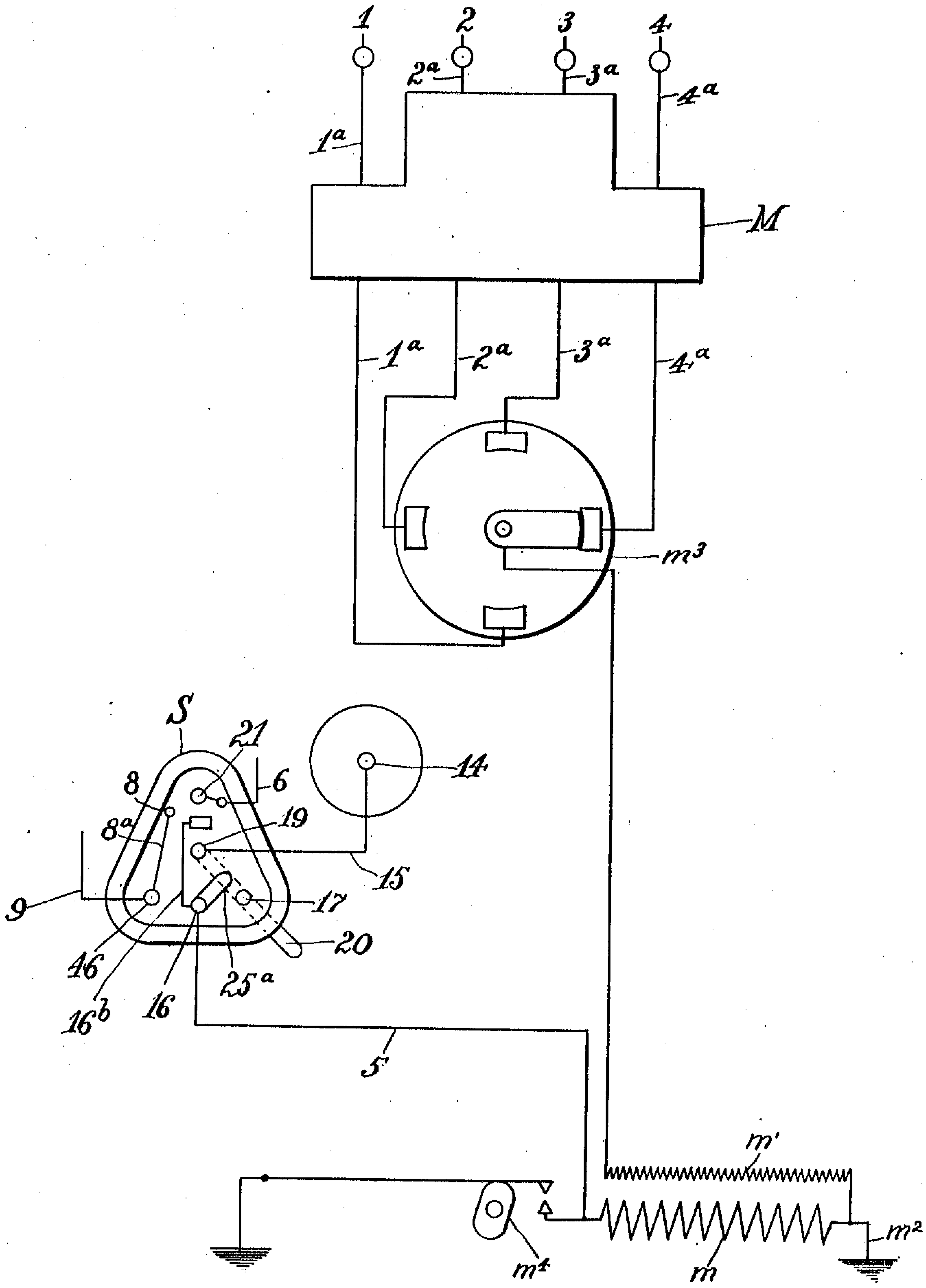
3 SHEETS—SHEET 3.

Fig. 9.



Witnesses:

Fred M. Dannenfelser

Chas. A. Peard

Inventor

E. D. BRIGHT.

By his Attorneys

Porter Pinnell Mulleau

UNITED STATES PATENT OFFICE.

EVAN D. BRIGHT, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO THE CONNECTICUT TELEPHONE & ELECTRIC COMPANY, INCORPORATED, OF MERIDEN, CONNECTICUT, A CORPORATION OF CONNECTICUT.

IGNITION APPARATUS.

945,262. Specification of Letters Patent. Patented Jan. 4, 1910.

Application filed March 26, 1909. Serial No. 485,921.

To all whom it may concern:

Be it known that I, EVAN D. BRIGHT, a citizen of the United States, residing at Philadelphia, county of Philadelphia, Pennsylvania, have invented certain new and useful Improvements in Ignition Apparatus, of which the following is a full, clear, and exact description.

My invention relates to improved ignition systems for engines of the internal combustion variety, the object being to provide a duplex system of electrical ignition whereby one or the other of said systems may be readily employed at any time by the operation of a switching mechanism, at which mechanism the circuits of the two systems overlap in such manner as to permit said single means to effect the desired change. Incidentally the construction of the switching mechanism is such that, by the switch blade, either of said systems may be rendered non-operative for ignition purposes. I also may provide separate means whereby the switching apparatus may be rendered entirely inoperative. In systems of this kind it is preferable to employ a battery for one system and a high tension magneto for the other system, the sparking apparatus being of the jump-spark or high tension variety. By the use of this duplex system and duplex switch, the operator of an engine of the variety referred to may at any instant readily ascertain whether trouble that is manifesting itself is due to ignition or to some other cause, and, if due to ignition, he can readily ascertain what system is at fault by simply shifting, without perceptibly stopping the motor, from one system to the other.

In the accompanying drawings and in the following description I shall proceed to describe the invention as employed in a duplex system, in which one set of spark plugs is operated by a battery and the other by a magneto.

In the drawings Figure 1 is a diagrammatic illustration of my improved system, the mechanical parts being conventionally illustrated. Fig. 2 is a front view, relatively enlarged, of the cover plate and frame of the switch minus the switch blade proper, and minus the so-called running plug. Fig. 3 is a front view of the switch with the running plug and cover plate removed. Fig. 4 is a rear view of the switch. Fig. 5 is a vertical section of the upper part of the switch, taken on the line X—X of Fig. 4. Fig. 6 is a cross section on substantially the line Y—Y Fig. 4, looking in the direction of the arrow. Fig. 7 is a side elevation of the running plug. Fig. 8 is a perspective view of a circuit closer. Fig. 9 is a diagrammatic view of the parts of the magneto and of the switch showing the shunt connection between the primary winding of said magneto and the switch.

E conventionally represents the head of a four-cylinder engine.

T conventionally represents the timer, of any well known construction and provided with the usual circuit closer (not shown) operated from the engine.

C conventionally represents the casing of a four-unit coil.

M represents a magneto of the high tension variety having primary and secondary windings m and m' respectively, Fig. 9.

S represents the body of the switch.

B represents a battery.

When the battery circuit is closed, sparking will occur in one set of plugs. When the primary winding of the magneto armature is interrupted or broken, sparking will occur in another set of plugs.

1, 2, 3 and 4 represent spark plugs of the well-known jump-spark type. 1^a, 2^a, 3^a and 4^a represent the secondary or high tension wires leading from the magneto to said plugs respectively. In practice one end of the primary winding m of the magneto armature is permanently grounded at m^2. The other end of this primary winding is indicated at 5. As shown herein, this wire 5 (which may be spoken of as the magneto shunt) leads to a terminal 16 of the switch.

6 is a wire leading from one side of the battery to a terminal 7 of the switch. 8 is another terminal of the switch from which wire 8^a leads to terminal 46. 9 is a wire leading from terminal 46 to the primary winding of the four coil units within the casing C. 10, 11, 12 and 13 represent the ends of the primary windings of the several coil units in the coil C, which ends lead to the segment terminals of the timer T. 14 conventionally represents the ground terminal of the timer. 15 is a wire leading from the ground terminal 14 to the terminal 19 of the switch. 17 is another switch terminal. 18

is a wire leading from terminal 17 to the other side of the battery B.

20 is a switch blade electrically connected with the terminal 19 of the switch. The terminals 46 and 17 are located on opposite sides of the terminal 16 and each of said terminals is provided on the opposite side of the switch with a head or recessed stud, as indicated respectively at 46^a 16^a and 17^a (Fig. 6).

21 is a sleeve arranged to receive a running plug 22. The sleeve 21 is connected by wire 33 with terminal 7.

23 is a spring circuit closer operated by the end of the running plug 22. The closer 23 is electrically connected with a terminal 24 in any suitable manner upon the body of the switch and said terminal 24 being insulated from all other parts, excepting terminal 16, with which it may be connected in any suitable manner, as by a wire 16^b.

25 is a contact post yieldingly mounted on a spring support 25^a, said post being about in line with contacts 17—19, or slightly to one side thereof.

26, 27, 28 and 29 are spark plugs designed to be operated from the coil C through high tension wires 26^a, 27^a, 28^a and 29^a, respectively.

30 is a rubber gasket or packing which may be provided for the back of the switch body.

31 are screw holes through which wood screws may be passed to hold the switch in place upon its mounting.

Having thus described the main parts of my system and one form of effective wiring, I will now describe the operation.

When the switch blade 20 stands in the middle position on contact 16 (see Fig. 3) no sparking in any of the plugs will occur, because the battery circuit will be broken between the terminals 17—19, and because the primary winding of the magneto armature will be shunted or short-circuited, as follows: wire 5, terminal 16, blade 20, terminal 19, wire 15, ground 14. This dead short-circuit prevents any interruption of the primary current generated at the magneto, and hence no secondary current is delivered to the spark plugs 1, 2, 3 and 4. When it is desired to operate the system by the battery, switch blade 20 is moved so that it will rest upon the terminal 17, thus closing the battery circuit, assuming the running plug 22 is in place. The battery circuit will then be as follows: wire 6, terminal 7, wire 33, sleeve 21, plug 22, closer 23, terminal 8, wire 8^a, terminal 46, wire 9; thence through the several primary windings of the coils and to the timer through the wires 10, 11, 12 or 13; thence to ground 14 through the circuit closer (not shown) of the timer, and back through the ground wire 15 to terminal 19; thence through blade 20 to terminal 17 and wire 18 to battery. If at any time the plug 22 is pulled, this battery circuit will be broken between the sleeve 21 and the terminal 8, thus preventing sparking at the plugs 26, 27, 28 and 29. When the switch blade 20 engages either the terminal 16 or 17, the primary winding of the magneto will be shunted either directly from terminals 16 to 19 through the switch blade 20, or, indirectly through the parts 16, 25^a, 25 and blade 20, this last mentioned shunt being established when the switch blade is in position to connect the battery with the coils. It follows that so long as the switch blade contacts with the terminals 16 or 17, the magneto primary will be dead short-circuited and no sparking will occur in plugs 1, 2, 3 or 4.

When it is desired to run on the magneto, the switch blade 20 is moved to contact with terminal 46. This breaks the shunting of the primary winding of the magneto between points 16 and 19, and hence said magneto operates after its intended manner to produce sparking at plugs 1, 2, 3 and 4, at definite intervals and successively, according to the operation of the self-contained timer m^3 and interrupting mechanism m^4 characteristic of magnetos of this type, and which needs no description herein. If while the switch blade 20 connects the terminals 46—19, the running plug 22 is pulled, that act will serve to short-circuit the primary winding of the magneto as follows: through wire 5 to terminal 16, through wire 16^b to terminal 24, through closer 23 to terminal 8, through wire 8^a to terminal 46, through switch blade 20 to terminal 19, through wire 15 to ground 14.

From the foregoing it will be seen that this duplex system and switch therefor may be successfully operated for the purposes already described, and two positive means are provided whereby the operator may render operative or inoperative at will the two sets of sparking plugs 1 to 4 and 26 to 29. The switch blade 20 is one of such controlling means. The plug 22 is a coöperating means, the proper displacement of the former or the removal of the latter accomplishing the desired results.

In the following claims I shall use the terms "normally open primary coil circuit" and "normally closed magneto shunt circuit," by which I mean that when the switch mechanism is in the neutral position, the primary coil circuit will be open and the magneto shunt will be closed, thus rendering both ignition systems inoperative.

What I claim is:

1. In a jump-spark ignition system, a normally open primary coil circuit, a normally closed magneto shunt circuit, a switch adapted to said circuits, said circuits overlapping at said switch, means for opening

and closing the primary coil circuit without opening the magneto shunt, and separate means in said switch for closing the magneto shunt and for opening the primary coil circuit independently of the first mentioned means.

2. In a jump-spark ignition system, a normally open primary coil circuit, a normally closed magneto shunt circuit, a switch, two separate controlling devices therein, said devices coöperating whereby said shunt circuit may be closed by either of said devices.

3. In a switch for a jump-spark ignition system, overlapping magneto shunt and primary coil circuits, terminals arranged to receive the same, a switch arm and a running plug, contacts adapted to said plug and arm and coöperating whereby the removal of the running plug may open the coil circuit and close the magneto shunt circuit.

4. In a jump-spark ignition system, a switch, terminals therein, a primary coil circuit and a magneto shunt circuit in contact with said terminals, a running plug, a switch arm, and means whereby the shunt circuit is maintained at all times excepting when the running plug is in place and the switch arm is in a certain position.

5. In a jump-spark ignition system, a coil, a timer, a primary circuit for said coil, a magneto, a shunt circuit therefor, a switch, said primary coil circuit overlapping the magneto shunt circuit at said switch, a single means adapted to said switch for simultaneously closing both circuits or opening both circuits or opening one and closing the other of said circuits, and a separate cooperating means arranged to close one of the circuits and open the other when the switch arm is in a certain position.

6. An ignition system for gas engines including a coil and timer, a magneto, a spark plug connection for the coil and a spark plug connection for the magneto, a battery circuit for the coil, a shunt circuit for the magneto, a single switching device at which said circuits overlap, two separate controlling members carried by said switching device, one of said members being removable, and means coacting with said removable controlling member whereby when the same is removed the battery coil circuit will be opened and the magneto shunt circuit will be closed.

7. In a jump-spark ignition system, a plug, a battery, a timer, an induction coil in operative electrical connection between said battery and plug, a second plug, a magneto in operative electrical connection with said second plug, the primary circuit of the magneto armature being in electrical connection with the ground of said timer, and a switch including a blade arranged to make and break said primary magneto circuit and the battery circuit leading to the coil, said switch including a second manually operable means for preventing sparking at said plugs irrespective of the position of the switch.

8. In a duplex jump spark ignition system, a battery and a high tension magneto, a coil and a timer, a switch, a primary circuit leading from the battery to the coil through said switch, a magneto shunt circuit also leading through said switch, a switch blade arranged to simultaneously open one of said circuits and close the other when moved into one position, and means whereby both circuits are opened when the blade is in a second position and closed when in a third position, and means manually operable independently of the blade to prevent ignition independently of the position of said blade.

9. An ignition system for gas engines including a coil and timer, a primary circuit for the coil, a high tension magneto, a primary circuit therefor, a shunt therefor, a switch, the primary coil circuit overlapping the magneto shunt at said switch, two independent controlling means in said switch, one operating to control the circuits for ignition purposes, the other operating to render the first means inoperative or operative for said purposes.

10. In an ignition system for gas engines including a coil and a timer, a primary coil circuit for the coil, a magneto, a primary shunt circuit therefor, a switch, the primary coil circuit overlapping the magneto shunt circuit at said switch, two manually controllable means at said switch, one of said means operating to simultaneously close both of said primary circuits when in one position and to open both primary circuits when in another position and to open one and close the other of said primary circuits when in a third position, the second means operating to render the first means effective or ineffective in two of its three positions.

EVAN D. BRIGHT.

Witnesses:
JOHN J. MINNICK,
E. B. MCLAUGHLIN.