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PATENTED SEPT. 12, 1905.

V. G. APPLE.

ELECTRICAL SPARKING IGNITION SYSTEM FOR GAS ENGINES AND STARTING
SWITCHES THEREFOR.

APPLICATION FILED NOV. 9, 1903.

2 SHEETS—SHEET 1.

Fig. 2

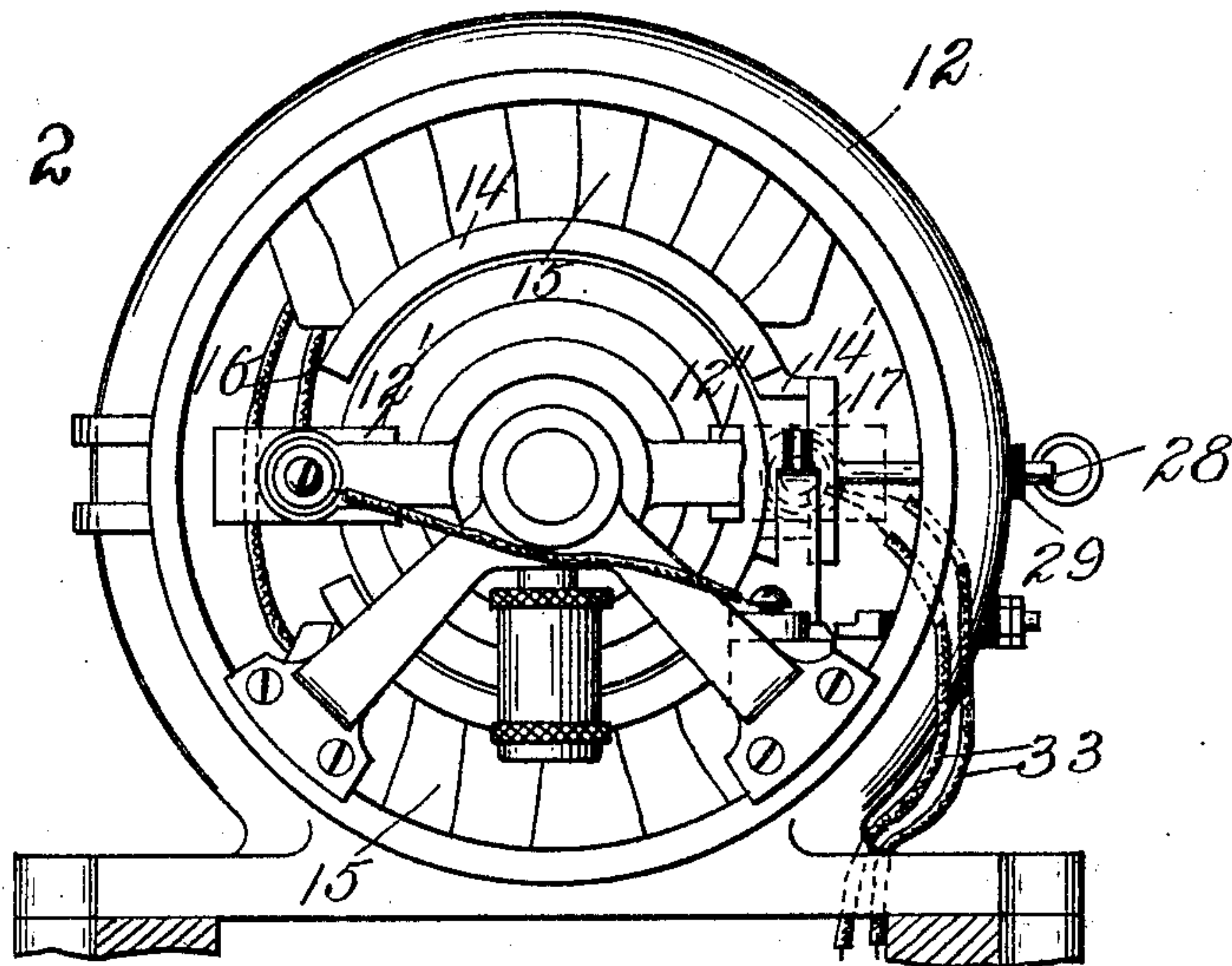
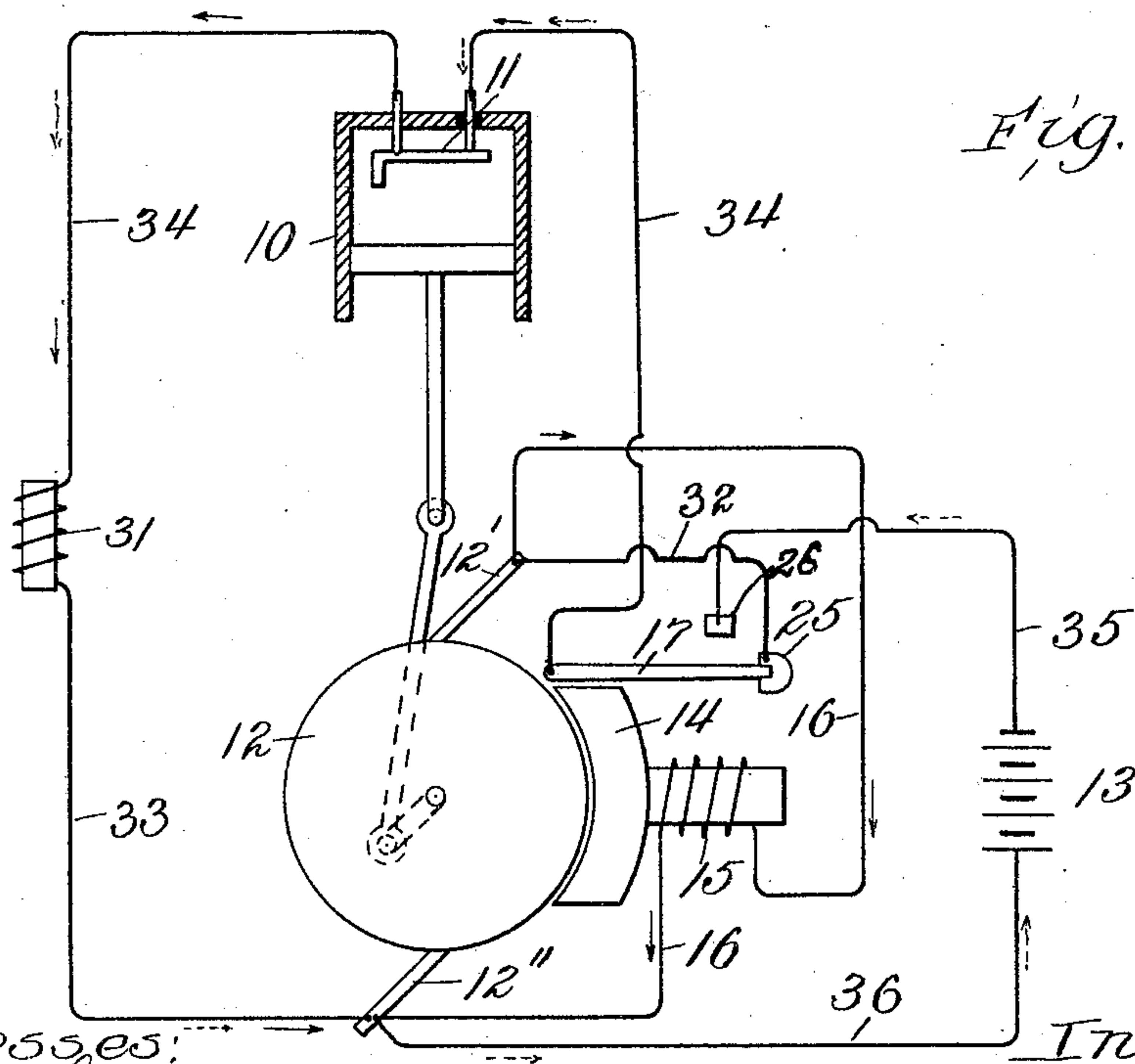


Fig. 1



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Ray White.
Harry R. L. White

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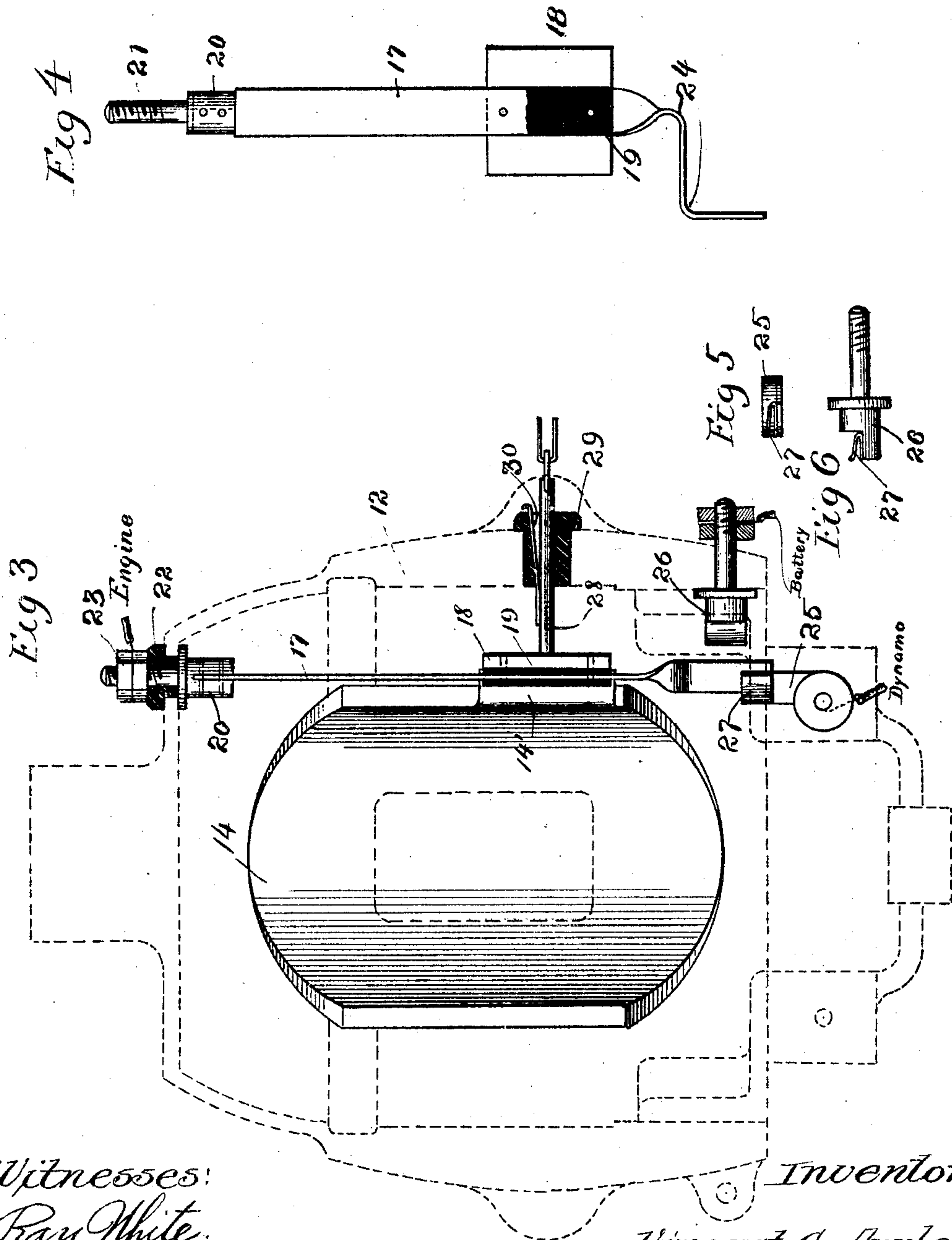
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UNITED STATES PATENT OFFICE.

VINCENT G. APPLE, OF DAYTON, OHIO.

ELECTRICAL SPARKING IGNITION SYSTEM FOR GAS-ENGINES AND STARTING-SWITCHES THEREFOR.

No. 799,368.

Specification of Letters Patent.

Patented Sept. 12, 1905.

Application filed November 9, 1903. Serial No. 180,464.

To all whom it may concern:

Be it known that I, VINCENT G. APPLE, of Dayton, in the county of Montgomery and State of Ohio, have invented certain new and
5 useful Improvements in Electrical Sparking Ignition Systems for Gas-Engines and Starting-Switches Therefor; and I hereby declare that the following is a full, clear, and exact description thereof, reference being had to
10 the accompanying drawings, which form part of this specification.

My invention relates to electrical sparking ignition systems for gas-engines and starting-switches therefor.

15 In gas-engine ignition systems it is common to provide as a source of electrical supply for the ignition devices a dynamo driven from or arranged to run with the engine and a battery, either primary or secondary, ar-
20 ranged to constitute an alternative source of electrical supply for the ignition devices. In starting the engine, for instance, the dynamo being initially at a standstill, the battery is cut into the proper circuit to supply electrical
25 power to the ignition devices until the engine has attained such a speed that the dynamo operating therewith is actuated to produce sufficient current to operatively supply the engine-igniter. At such time the battery may
30 be cut out and the dynamo cut into the igniter-circuit to conserve the battery power.

It is with a view to providing a system wherein are provided means for automatically controlling the inclusion of the alternative
35 sources of electrical power—to wit, the dynamo and the battery in the igniter-circuit—that my invention is designed; and to such end it consists in the combinations of parts and features of construction and arrangement
40 hereinafter more fully described, as specified in the claims.

In the drawings, Figure 1 is a diagrammatic illustration of the circuit connections and relative arrangement of devices embody-
45 ing my invention in operative association with coacting parts of an ignition system. Fig. 2 is an end elevation of a dynamo provided with a switch constructed in accordance with my invention. Fig. 3 is a plan view of the switch,
50 indicating in dotted lines its collocation with the adjacent parts of the dynamo shown in Fig. 2. Fig. 4 is a detached view of the switch-arm. Fig. 5 is an end view of one of the contact-pieces shown in Fig. 3, and Fig. 6
55 is a side view of the other contact-piece.

Throughout the drawings like numerals of reference refer to like parts.

Referring now to the drawings, 10 indicates an explosive or rapid-combustion engine.

11 indicates an ignition device or igniter 60 designed when supplied with suitable electric current and actuated at suitable intervals to emit sparks to fire the combustible charge within the engine-cylinder. Any desired form of igniter may obviously be employed, 65 that conventionally illustrated being of the "touch-spark" type.

12 indicates a dynamo-electric machine arranged to run with the engine—that is to say, arranged to be operated only when the engine 70 is in operation. The dynamo 12 is illustrated as directly driven from the engine 10; but it may be driven in any suitable way to insure its running with the engine.

12' and 12'' indicate the dynamo-brushes. 75

13 indicates a battery, either primary or secondary, of sufficient strength for ignition purposes.

14 indicates an electromagnet whose coil 15 is arranged in a constantly-closed circuit 80 16 from the dynamo. As herein indicated, the electromagnet 14 may be and preferably is one of the field-magnets of the dynamo itself, said dynamo being shunt-wound. Co-acting with the electromagnet 14 is arranged 85 a magnetically-responsive switch-arm 17, arranged to be actuated by the magnet. To this end the faces of the magnet pole-pieces 14 are extended laterally, as indicated at 14', while the switch-arm 17 carries an armature-plate 18, 90 of magnetic material, insulated therefrom, as illustrated at 19. Preferably in the form of dynamo shown the arm 17 is a spring-leaf mounted at one end in a terminal stud 20, having a screw-threaded end 21 arranged to 95 extend through an insulated bushing 22 and carrying on its outer end terminal clamping-nuts 23. From its point of support in the dynamo-casing the switch-arm 17 extends longitudinally of the casing in parallelism to 100 the field-magnet pole-pieces 14' beyond the point of attachment of the plate 18, whence it is bent vertically downward and then outward, as at 24, so that its free end passes beneath the brush 12'' of the dynamo into prox- 105 imity to two contact-pieces 25 and 26, mounted in the dynamo-casing. Each of the contact members 25 and 26 is provided with a contact spring-clip 27, designed when the free end of the arm 17 is brought in contact there- 110

with to exert a pressure upon the same tending to hold it against movement from such position.

The arrangement of the contact members is such that when the armature-plate 18 is in contact with the magnet ends 14' the free end of the arm 17 contacts with the contact-piece 25, while when the armature is removed from the magnet ends it contacts with the member 26.

28 indicates a manually-operable actuating-rod secured to the armature member 18 and projecting through an insulating-bushing 29 to the exterior of the dynamo-casing.

30 indicates a spring secured to the actuating-rod 28 and arranged within the bushing 29 to exert a pressure thereon tending to frictionally hold the arm 17 against movement in either direction.

The spring-clips 27 and spring 30 or such equivalent devices as may be employed to resist the movement of the lever-arm from one position to another is of such strength as to hold the arm 17 in either of its contact positions with a force greater than that exerted by the spring-arm itself, so that an application of extraneous force is necessary to effect a movement of the free end of the arm from one of its coacting contact members to the other.

31 indicates a spark-coil for use if the igniter 11 is of the touch-spark type and which may be permanently associated with the dynamo, as illustrated in Fig. 2.

The circuit connections of the devices heretofore described are herein indicated as follows: The positive pole of the dynamo is connected by wire 32 with the switch contact member 25. The negative pole of the dynamo is connected by a wire 33 with the spark-coil 31, if employed. From the opposite terminal of the spark-coil 31 extends a wire 34, operatively including the igniter devices 11, and thence extends to the fixed end of the switch-arm 17. From the contact-piece 26 of the switch mechanism a wire 35 extends into connection with the battery 13, from whose other terminal extends a wire 36, electrically connected with the wire 33, for instance, at the binding-post of dynamo-brush 12''.

The use and operation of my device will be as follows: Assuming that the engine, and consequently the dynamo, are at rest and that it is desired to start said machines in operation, the lever 17 is manually pulled over into the position illustrated in dotted lines in Fig. 1, making contact with the contact-piece 26 of the switch. In such position a circuit is established, as indicated by the dotted arrows in the drawings, including in series the battery and the ignition devices. Such circuit may be traced from the battery 13 through wire 35, contact-piece 26, switch-arm 17, wire 34, (including the igniter 11,) spark-coil 31,

(if employed,) wire 33, and wire 36 back to the battery 13. The battery-current being sufficient for ignition purposes the engine may now be started, the dynamo 12 also starting therewith. It will be noted that under the circuit conditions above described the dynamo-circuit exterior to the shunt 16 is broken at the contact-piece 25, so that the entire current developed by the dynamo in the starting of the engine is passed through the winding 15 of the electromagnet 14, which is preferably the field-magnet of the dynamo. When now the engine has reached such a speed, the dynamo running therewith is caused to energize the magnet 14 to such a degree as to insure that the dynamo is producing sufficient current to supply the necessary power to the igniter 11. The magnet 14 overcomes the resistance opposing the movement of the switch-arm 17 and attracts the armature 18, carried by the switch-arm, to its ends 14'. The movement of the switch-arm 17 under the influence of the magnet 14 brings the ends of the arm into contact with the contact-piece 25, breaking the battery-circuit as the arm leaves the piece 26 and establishing a circuit including in series the dynamo and the ignition devices. The said circuit may be traced from the dynamo-wire 32, contact-piece 25, switch-arm 17, wire 34, including the igniter-wire 11, and back by the wire 33 to the brush 12'' of the dynamo. If now the engine be stopped, the holding effort of the clip 27, or the tension of the spring-arm 17 itself, or the pressure of the arm 30 against its bushing 29, or such other means as is employed to resist the movement of the arm 17 prevents the return of the arm 17 to contact with the contact-piece 26 until positively moved, as by a pull upon the rod 28. Thus it will be seen that the switch affords means for unfailingly preserving the life of the batteries, for while it is absolutely necessary to throw the lever 17 to contact with the contact-piece 26 to start the engine (the dynamo being always in the same condition of rest or motion as the engine) the arm 17 remains in contact with the contact-piece 25 until manually moved therefrom. Thus the possibility of the operator negligently leaving his battery in closed circuit with his ignition device is obviated, and such fruitful source of loss of battery power is avoided.

While I have described in some detail the embodiment of my invention which I have found best adapted for the accomplishment of my invention, I do not desire to be understood as limiting myself thereto in all details, as it will be apparent that many slight departures might be made therefrom without departing from the spirit and scope of my invention.

Having described my invention, what I claim, and desire to secure by Letters Patent of the United States, is—

1. In combination with an engine-igniter, a

dynamo arranged to operate consistently with the engine, a battery, a magnetically-responsive switch member adapted to complete a circuit connecting the igniter with either the
5 dynamo or the battery, an electromagnet included in a constantly-closed circuit with the dynamo arranged when energized to attract the switch member to close the circuit connecting the dynamo and igniter, and suitable
10 circuit connections for the parts specified.

2. In combination with an engine, an igniter therefor, a dynamo arranged to operate with the engine, a battery, a magnetically-responsive switch member adapted to complete a circuit connecting the igniter with either the
15 dynamo or the battery, an electromagnet, included in a constantly-closed circuit including the dynamo, and in shunt with the igniter-circuit, arranged when energized to attract the
20 switch member to close the circuit connecting

the dynamo and igniter, and suitable circuit connections for the parts as specified.

3. In combination with an engine, an igniter therefor, a shunt-wound dynamo driven by the engine, a battery, a movable switch, and circuit
25 connections whereby the switch is adapted to complete a circuit including either the dynamo or the battery in operative electrical association with the ignition devices, said
30 switch being magnetically responsive, and arranged to be actuated by the field-magnet of the dynamo to close the dynamo-circuit.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

VINCENT G. APPLE.

In presence of—

N. H. KELLEHER,
L. M. ARNOLD.