E. APPERSON.

EXPLOSION ENGINE.

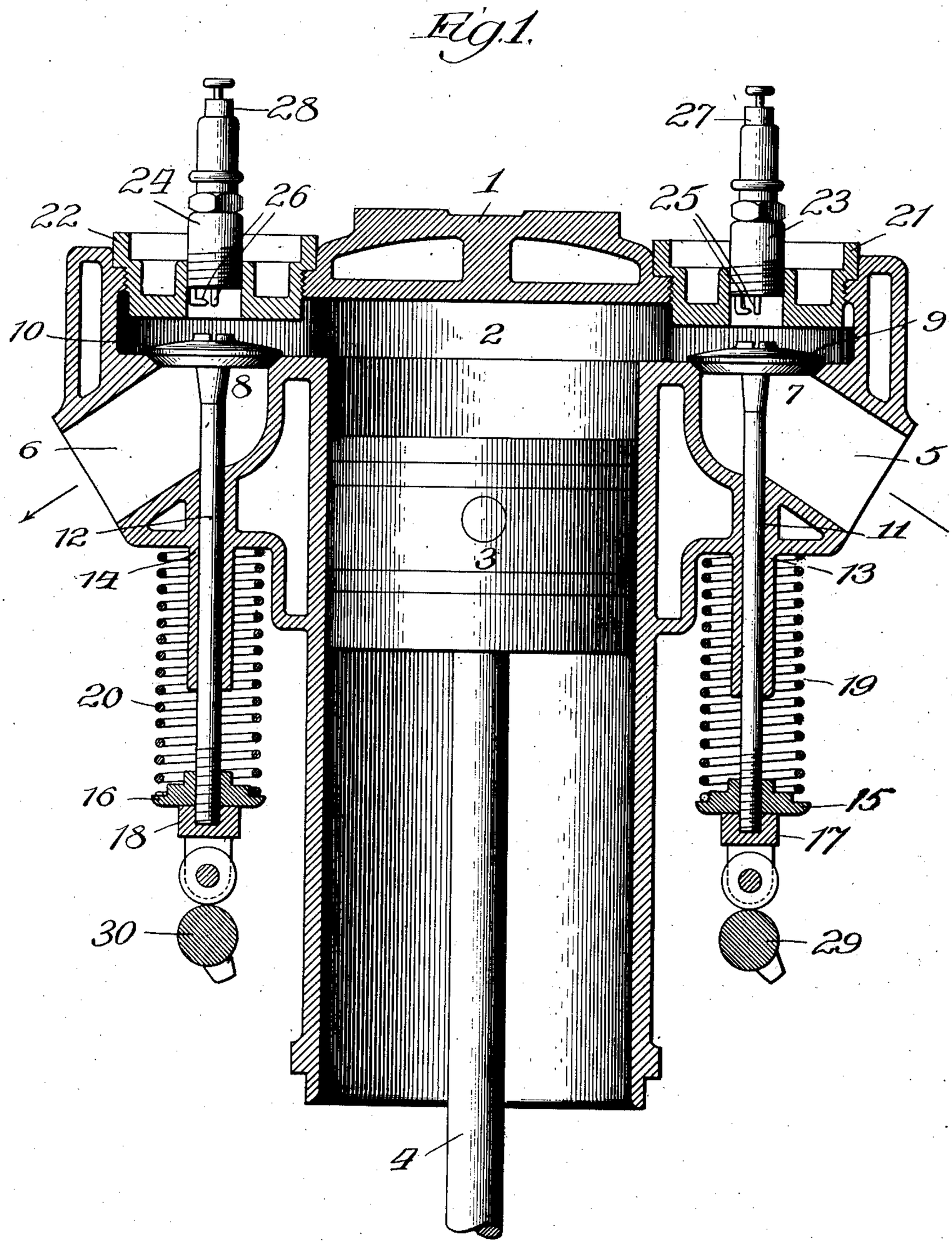
APPLICATION FILED JULY 3, 1906.

905,625.

Patented Dec. 1, 1908.

3 SHEETS—SHEET 1.

Fig. 1.



Witnesses:
Chas. E. Gaylord.
John Enders

Inventor:
Elmer Apperson,
By Thomas F. Sheridan,
Atty.

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3 SHEETS—SHEET 2.

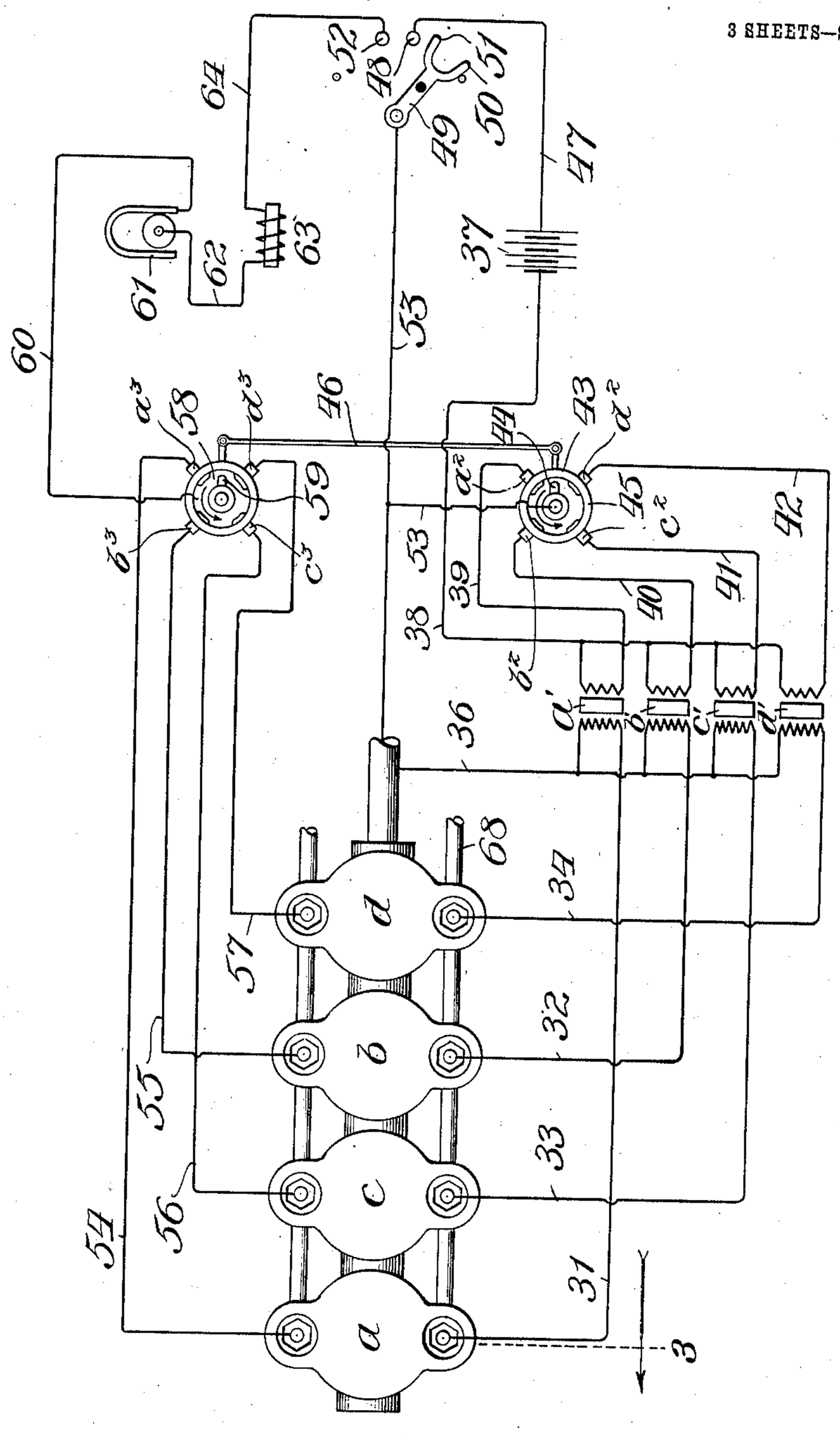

Fig. 2.

Witnesses:
Chas. E. Gaylord.
John Enders.

Inventor
Elmer Apperson,
By Thomas F. Sheridan,
Atty.

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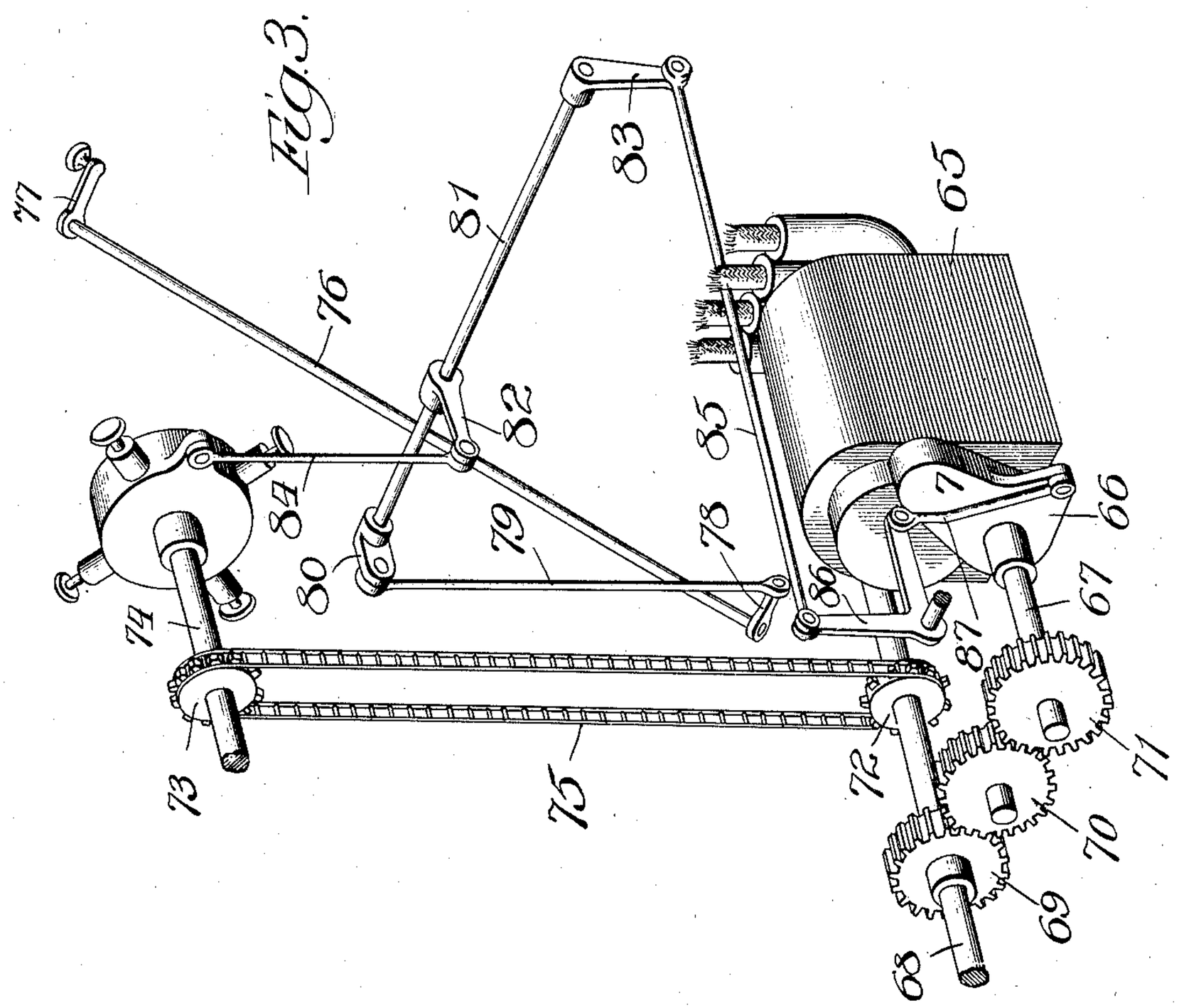
3 SHEETS—SHEET 3.

Fig. 3.



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Elmer Apperson,
By Thomas F. Sheridan,
Atty.

UNITED STATES PATENT OFFICE.

ELMER APPERSON, OF KOKOMO, INDIANA.

EXPLOSION-ENGINE.

No. 905,625. Specification of Letters Patent. Patented Dec. 1, 1908.

Application filed July 3, 1906. Serial No. 324,653.

To all whom it may concern:

Be it known that I, ELMER APPERSON, a citizen of the United States, residing at Kokomo, in the county of Howard and State of Indiana, have invented certain new and useful Improvements in Explosion-Engines, of which the following is a specification.

My invention relates to explosion engines of the type used in automobiles, and has as an object the provision of means for overcoming the necessity of removing the ignition plugs from the cylinders to clean the contacts carried thereon when they become covered with oil, soot, or other undesirable deposit.

It has heretofore been the practice to supply the cylinders of engines of the above type with one ignition plug, and it has been necessary to remove this plug and wipe or scrape the contacts carried thereon in order to clean them. In my present invention I provide two such plugs entering the explosion cavity of the cylinder at different points. I also provide two distinct electric circuits—one connected with each of the plugs, and means for using the circuits and plugs separately so that the plugs may be used alternately, whereby, when the ignition contacts upon one plug become coated with oil, so that the spark does not pass properly, the other plug may be thrown into use and the explosions occurring therefrom may be allowed to burn the oil or other deposit from the contacts of the plug just abandoned.

In carrying out my invention, I preferably use electric circuits of different character associated with the different plugs—that is, when used in connection with automobiles I prefer to connect one of the plugs with a battery circuit and the other with a magneto-generator circuit. I also preferably arrange these circuits so that they may both be used at once, as it may frequently occur in an engine comprising a plurality of cylinders that one of the plugs of one cylinder may become coated while the opposite plug of another cylinder may become coated, so that in order that all cylinders may explode properly, it is necessary to use both of the electric circuits at once.

My invention relates further to certain details of construction hereinafter described and shown in the accompanying drawings forming a part of this specification, in which—

Figure 1 is a cross-section through the cylinder of the engine, showing the arrangement of valves and positions of the ignition plugs; Fig. 2, a diagrammatic sketch of the circuit arrangement when used with an engine comprising four cylinders and two electric circuits. Fig. 3, an isometric drawing of the means for simultaneously adjusting the timing devices.

In carrying out my improvements, I provide a cylinder case 1, having an interior cavity 2, in which the usual piston 3 oscillates to drive the rotary portion of the engine by means of the piston rod 4. This cylinder is provided with an intake opening 5 and an exhaust opening 6, these openings being normally closed at the valves 7 and 8 by the valve heads 9 and 10.

I have applied my improvements to an engine of the mechanical valve type, and therefore provide the rods 11 and 12, extending through the casings 13 and 14 and terminating in threaded portions on which the spring seats 15 and 16 and the roller bearings 17 and 18 are secured. Beneath the rollers carried upon these bearings are the cams 29 and 30, rotated in any desirable way from the shaft of the engine to control the position of the valves.

Between the spring seats and the frame of the cylinder and around the valve rods 11 and 12 are the coil springs 19 and 20, which are under sufficient normal compression to hold the valve heads 9 and 10 under proper pressure bearing upon the valve seats at 7 and 8. Directly above these valves are nuts 21 and 22, threaded into the head of the cylinder and closing openings large enough to give free access to the valves beneath them, or to allow the valves to be entirely removed when necessary for cleaning or repairing. Through the centers of these nuts 21 and 22 the ignition plugs 23 and 24 are threaded, these plugs carrying the usual contacts 25 and 26, one of which, in each plug, is grounded to the frame of the cylinder and the other of which passes through the porcelain or other fire-proof insulator on the inside of the plug and terminates at the top in the binding post 27 on one plug and 28 on the other.

Referring to Fig. 2, the four cylinders, lettered *a*, *b*, *c* and *d* to indicate the order in which the explosions occur, are diagrammatically shown with the ignition plugs upon one side connected by conductors 31, 32, 33 and 34 with the secondaries of the four simi-

lar induction coils a', b', c' and d', and thence through the conductor 36 to the metallic portion of the engine. The primaries of these induction coils each have one terminal connected to a pole of battery 37 through conductor 38, while their other terminals are connected through conductors 39, 40, 41 and 42 with the insulated contacts a^2, b^2, c^2 and d^2 of the mechanically driven timer 43. This timer is provided with a central shaft, upon which the contact 44 is secured and adapted to rotate with the shaft in the direction of the arrow, so as to make contact with the points a^2, b^2, c^2 and d^2 in proper succession. The outer shell 45, which carries the latter contacts, is adapted to be slightly rotated by means of the rod 46, in order to slightly adjust the time of making the connection between the rotary and stationary contacts. The other pole of the battery 37 is connected through conductor 47 with the contact 48 of a three-point switch, having a lever 49 carrying two prongs 50 and 51, either of which may be thrown in contact with the point 48 or with the point 52, as will be hereinafter described. This lever 49 is connected, through conductor 53, with the metallic portion of the engine, and also with the rotary contact of the timer 43. The ignition plugs upon the other side of the engine cylinders are connected, through conductors 54, 55, 56 and 57, with the ring contacts a^3, b^3, c^3 and d^3 of a similar timer 58, the rotary contact 59 of this timer being connected, through conductor 60, with one pole of the magneto generator 61, while the other pole is connected, through conductor 62, with the contact 52 of the previously mentioned switch. The ring timer 58 is likewise connected with rod 46, so that the two timers may be simultaneously adjusted by the movement of said rod.

In the operation of the system shown in Fig. 2, the lever 49 is first thrown so that the prong 51 is in contact with point 48. The shaft of the engine is now turned and the rotary portion of the timer 44, which is preferably geared from the engine shaft, is caused to first make connection with the contact a^2. This closes a circuit from the battery 37, through conductor 38, primary of induction coil a', conductor 39, contacts 44 and a^2 of the timer 43, conductor 53, and the then-closed contacts of the switch, and back to battery through conductor 47. The current in the path just described, by passing through the primary of induction coil a', induces a high voltage at the terminals of the secondary winding of said induction coil, which is of sufficient tension to cause current to pass between the contacts of the ignition plug in the cylinder a, thus exploding this cylinder at the proper time to drive the piston down in the cylinder. As the rotation of the shaft of the engine continues, the shaft portion of the timer 43 continues in its rotation, making contact with points b^2, c^2 and d^2 and exploding cylinders b, c and d at the proper intervals. The engine is now in operation and being exploded by current from battery 37, and the plugs upon the battery side only of the cylinders are in use. If it is now desired to make use of the generator circuit and allow the battery circuit to stand idle, the lever 49 is thrown so that its prong 50 is in contact with the point 52. This closes the circuit from the metallic portion of the engine through conductor 53, the then-closed contacts 50 and 52 of the switch, conductor 64, the winding of the coil 63, conductor 62, generator 61, conductor 60, to the rotary contact 59 of the timer 58. This rotary contact, being likewise geared to the shaft of the engine and rotated in the direction shown by the arrow, may now be considered as making contact with the point a^3, and thereby exploding the cylinder a through conductor 54, and continuing, exploding cylinder b through conductor 55, cylinder c through conductor 56, and cylinder d through conductor 57.

It is usual for the engine to be allowed to run upon the generator circuit, but if it so happens that one of the plugs upon the generator side of the cylinder becomes oil-coated, the lever 49 may again be thrown into the position with prong 51 making contact with point 48, thus bringing the battery side of the cylinder again into action, and leaving the generator side idle. The explosions which continue in the cylinders soon burn the undesirable oil or other deposit from the contacts upon the generator side, and the switch 49 may be thrown back into its generator position. It may occasionally occur, however, that one or more of the contacts upon the generator side and one or more of the contacts upon the battery side become coated or otherwise disabled. In such case the lever arm 49 may be thrown so that its prong 51 makes contact with the point 52 and prong 50 with the point 48. In this position the cylinders will be exploded from both circuits if both plugs in the cylinders are in good condition; but if one of the plugs is out of condition, that cylinder will only be exploded from the plug which remains intact, while if another cylinder has its opposite plug out of condition it will be exploded from the plug connected with the other circuit, thus almost entirely eliminating the liability of any cylinder becoming inoperative.

It is customary in automobile practice to place the timer from the generator circuit in a position under the car, and that for the battery circuit in another more exposed position, and it becomes necessary to arrange link mechanism, as shown in Fig. 3, to simul-

taneously adjust the rings of the timers to cause the sparks of the two systems to pass exactly at the same time.

In Fig. 3 I have shown the generator case 65, in which is inclosed any suitable generator and timer, the latter being adjusted by the movement of the portion 66 upon the generator shaft 67. To rotate the timers at exactly the same rate, the engine shaft 68 is provided with a gear 69 meshing with an idler 70, which, in turn, meshes with the gear 71 upon the shaft 67 of the generator, the timer within the generator case being carried upon the generator shaft, and with a sprocket wheel 72, which is secured upon the shaft 68, and drives the sprocket wheel 73 upon the shaft 74 of the battery timer, through the medium of the chain 75.

In order to provide ready means for adjusting the rings of the timers, the rod 76 is carried up through the steering post and terminates before the operator in a so-called "spark lever" 77. Upon the lower end of the rod 76 is arranged a crank 78 with its extending end pivotally secured to the end of the rod 79, which, in turn, communicates with the end of the lever 80 upon the auxiliary crank rod 81. In order to deliver equal motion to the two timer rings placed in different positions, the similar crank arms 82 and 83 are secured to the auxiliary crank shaft 81, and extend from such shaft in planes substantially at right angles one to the other—the lever 82 being connected through rod 84 with the ring of the battery timer, while the lever 83 is connected through the rod 85, the equal arm bell crank 86, and rod 87 to the generator timer previously described. It will be seen from this arrangement that movement of the spark lever 77 communicates equal movement to the rings of the battery and generator timers, thus securing simultaneous adjustment.

In the foregoing specification only such parts have been illustrated and described as it is deemed necessary or important for completely disclosing my improvements in such manner that they may be practiced by those skilled in the art. It will be understood, however, that while I have illustrated and described my improvements in connection with a specific form of engine, that I do not wish to so limit the scope of my invention, many features of which are applicable to different types of engine.

I claim:

1. An explosion engine having a cylinder in which the explosive is adapted to ignite, a pair of spark plugs extending into the cylinder, a magneto, electrical connections from the magneto to one of the spark plugs, a battery, separate electrical connections from the battery to the second spark plug, and a switch for throwing the spark plugs into and out of operation.

2. An explosion engine having a cylinder in which the explosive is adapted to ignite, a pair of spark plugs extending into the cylinder, one of said spark plugs having a fixed spark gap, a magneto electrically connected with one of the spark plugs, a battery electrically connected with the other spark plug, a periodic circuit interrupter in the connection to the spark plug having the fixed gap, and means to control the connections to the spark plugs.

3. An explosion engine having an explosion chamber with two spark plugs therein, a magneto electrically connected with one spark plug, a battery electrically connected with the other spark plug, adjustable timers in the respective circuits, and means for adjusting the timers similarly and simultaneously.

4. An explosion engine having a cylinder in which the explosive is adapted to ignite, a pair of permanent spark gaps within said cylinder, a magneto electrically connected to the terminals of one spark gap, a battery electrically connected to the terminals of the other spark gap, and circuit interrupting devices in each of said connections.

5. An explosion engine having a cylinder in which the explosive is adapted to ignite, a pair of spark plugs extending into the cylinder, a magneto in circuit with one of said spark plugs, an induction coil having its secondary in circuit with the other spark plug, and a battery in circuit with the primary of said induction coil.

ELMER APPERSON.

Witnesses:
ANNA L. SAVOIE,
W. T. JONES.