

No. 622,893.

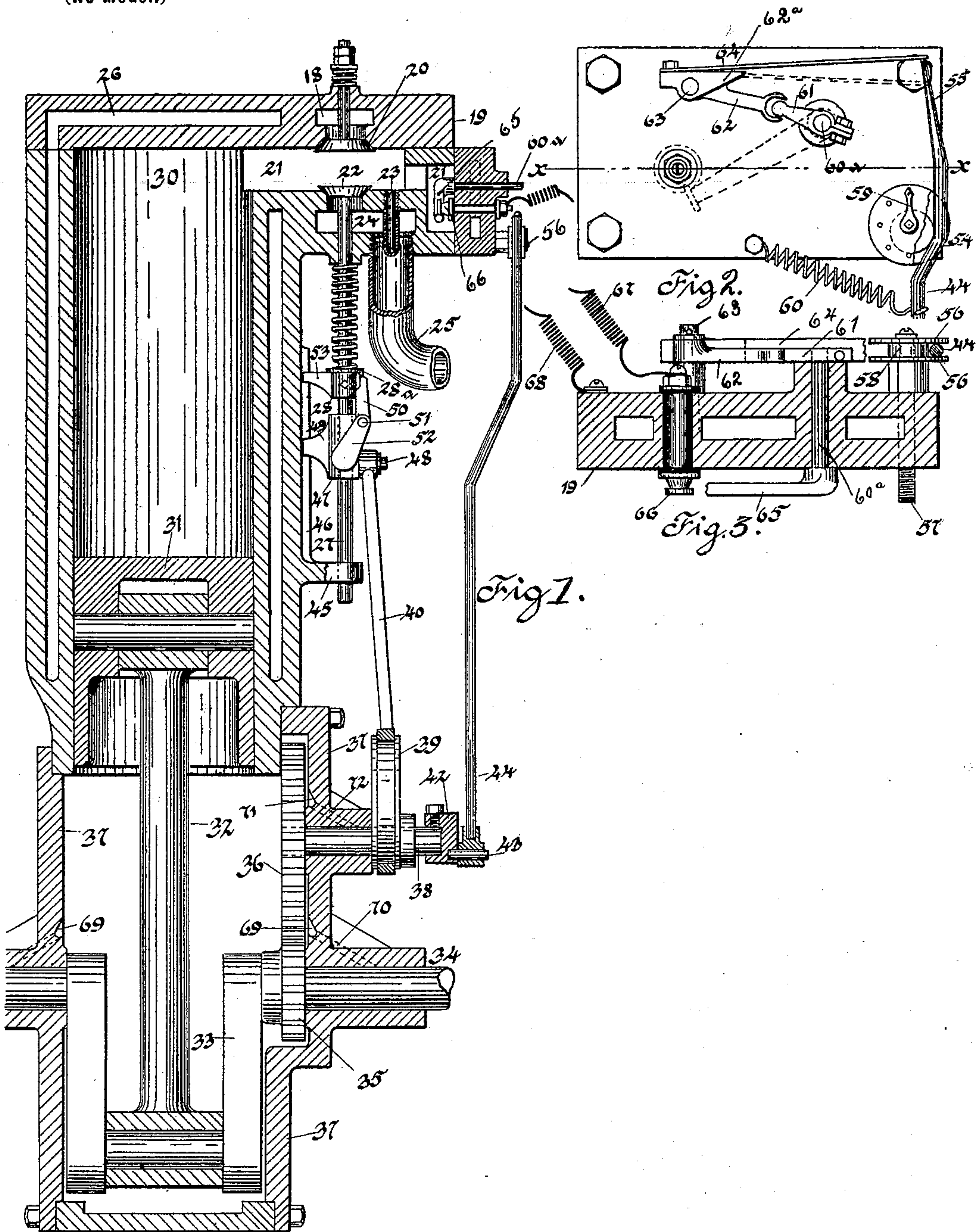
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E. W. GRAEF.

ELECTRIC IGNITER FOR GAS ENGINES.

(Application filed June 23, 1898.)

(No Model.)



Witnesses

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# UNITED STATES PATENT OFFICE.

ERNEST W. GRAEF, OF BALTIMORE, MARYLAND.

## ELECTRIC IGNITER FOR GAS-ENGINES.

SPECIFICATION forming part of Letters Patent No. 622,893, dated April 11, 1899.

Original application filed November 29, 1897, Serial No. 660,022. Divided and this application filed June 23, 1898. Serial No. 684,235. (No model.)

*To all whom it may concern:*

Be it known that I, ERNEST W. GRAEF, a citizen of the United States of America, and a resident of Baltimore, Maryland, have invented certain new and useful Improvements in Electric Igniters for Gas-Engines, of which the following is a specification.

My invention relates to an electric igniter for gas-engines, and has for its object to provide an igniter which is simple and positive in its action and which will surely create a spark when operated, and will do so through the shortest interval of time and with the least consumption of current.

Similar letters of reference indicate similar parts of the operation.

Figure 1 is a vertical section of the cylinder and case surrounding the crank and connecting-rod, also the combustion-chamber and igniting device, with the governor and the electrical igniter. Fig. 2 is an enlarged side elevation of the electrical igniter. Fig. 3 is an enlarged section of the device shown in Fig. 3, taken through a line *x x* in Fig. 2.

18 is a gas-pipe leading from the gas-generating chamber to the valve 20 through a channel in the chest 19 and thence to the explosion-chamber 21.

19 is a chest or casing made integral with the cylinder, a part of which is attached to the side of the cylinder and part to the cylinder-head. The valve 20 is the throttle-valve of the engine in the sense that it is the main valve separating the explosion-chamber from the source of supply of gas. It is an ordinary circular valve mounted upon a stem seated upon a seat and maintained closed by a spring.

21 is the combustion-chamber in which the gas is exploded and which communicates directly with the cylinder 30.

22 is the exhaust-valve, which is a valve similar to 20—a circular valve mounted upon a stem and resting upon a seat.

23 is a thimble secured into the side of the combustion-chamber, the interior of which opens into the combustion-chamber and the exterior of which projects into the exhaust-pipe of the engine. This device serves as an automatic igniter for the gas after it has been

heated sufficiently to accomplish the result. The electric igniter may then be disconnected.

27 is the exhaust-valve stem, journaled at its lower end in a bracket 45. Upon this valve-stem is mounted a governor by which the exhaust-valve is controlled. It consists of a latch 50, pivoted upon a sleeve 49, which slides upon the valve-stem 27.

28 is a collar, and 28<sup>a</sup> is a flange on the bottom end of the collar, secured upon the valve-stem 27.

52 is a weight on the end of the latch 50, the function of which is to keep the latch in contact with the collar 28. As the sleeve 49 reciprocates under the influence of the mechanism connected with the crank the latch 50 will strike upon the flange 28<sup>a</sup> and lift the exhaust-valve 22. The end of the latch 50 is beveled, and on the side of the collar 28 is a lug against which the latch strikes. If the latch strikes this lug too hard, due to a too-rapid motion of the slide, the latch will be thrown by the blow out of the path of the flange 28<sup>a</sup> and will not open the valve. Thus the speed of the engine may be regulated. This structure has been made the subject of another application pending simultaneously with this one, Serial No. 660,022, filed November 29, 1897.

24 is the exhaust-chamber, through which the gas passes in escaping from the cylinder and combustion-chamber.

25 is the exhaust-pipe.

30 is the cylinder.

31 is a piston.

32 is the connecting-rod.

33 is the crank.

34 is the crank-shaft.

35 is a pinion keyed upon the crank-shaft.

36 is a gear keyed upon a counter-shaft 38.

37 is a casing containing the crank and connecting-rod and through the walls of which pass the crank-shaft 34 and the counter-shaft 38, which have bearings therein.

39 is an eccentric mounted upon the counter-shaft 38, surrounded by a strap which is connected to an eccentric-rod 40.

42 is a cap secured upon the end of the counter-shaft 38 and having located eccentrically in its face a crank-pin 43, upon which



is journaled the end of a rod 44, which extends upward and operates the igniter.

44 is the igniter-rod reciprocated by the crank-pin 43. At its upper end it is bent, and at its bend it is provided with a shoulder 54. The extremity of this rod is also bent out of its normal line and is marked 55'. The latter bend is only a matter of connection. 56 56 are a pair of plates loosely mounted upon a stud 57, which is secured into the wall of the valve-chest 19. Upon the stud 57 is also loosely mounted eccentric disk 58, which lies between the plates 56 56, said plates and disks being secured together.

59 is a pointer fixed upon said stud 57. Beyond the exterior disk 56 the pointer is provided on its under side with a projecting pin which engages holes in the disk 56 and holds the same in position when set.

60 is a spiral spring connected to any suitable point of the valve-chest 19 at one end and to the reciprocating rod 44 at the other end, by which the rod is held closely in contact with the eccentric disk 58.

60<sup>a</sup> is a pin or shaft passing through the wall of the valve-chest 19 and projecting both internally and externally. Upon its exterior end is secured the lever 61, the extremity of which is made circular.

62 is a lever pivoted at 63, having a bifurcated end which embraces the circular end of the lever 61 and forms therewith a socket-joint in which there is some lost motion, viz: The fork on the end of the lever 62 is somewhat larger than the end of the lever 61, so that when it has moved the lever 61 as far as it can move it and thrown the lever 65 into contact with the stud 66 there will be an appreciable space between the end of the lever

61 and the opposite side of the fork. The fork will therefore have to travel through this appreciable space before it will again strike the end of the lever 61, thus making it possible for the lever to gain a certain amount of momentum before striking the lever 61. On the rearend of the lever 62 is a block 62<sup>a</sup>, rigidly secured to the lever and also pivoted upon the pivot 63. To the back end of this block 62<sup>a</sup> is secured a flat spring 64, which projects into the path of the extremity 55 of the reciprocating rod 44. Upon the interior end of the shaft 60 is secured the lever 65, the extremity of which makes contact with the stud 66.

66 is an electrical contact-stud which passes through the wall of the chest 19 and is insulated therefrom.

67 is a wire leading to a source of electricity, connected to the contact-post 66 upon the exterior of the valve-chest. 68 is the other pole of the electric generator, connected to any part of the valve-chest, so as to supply a current to the lever 65, by which a spark may be made when the lever 65 breaks contact with the stud 66.

The operation of the device is as follows: In starting the engine the fly-wheel is turned

by hand, and the downward motion of the piston will suck the contents of the generating-chamber 14 into the combustion-chamber and cylinder. Another half-revolution of the fly-wheel will carry the piston to the other end of the cylinder and compress the gas there and in the combustion-chamber. As the crank-shaft is turned the counter-shaft 38 will be turned and the rod 44 reciprocated. As 44 rises, if the eccentric disk 58 is in position to permit it it will strike the extremity of the spring 64, raise said spring and the levers 62 and 61, and throw the lever 65 in contact with the electric stud 66. As the rod 44 continues to rise the shoulders 54 will come in contact with the eccentric disk 58, which will throw the rod 44 off to one side, disengage its extremity 55 from the end of the spring 54, and allow the spring suddenly to return to its normal position. As it does so the forked end of the lever 62, which loosely embraces the end of the lever 61, so that there is a certain amount of lost motion in the joint between 61 and 62, will when moved by the spring 64 strike the end of the lever 61 a sharp blow and thus suddenly break the contact. One of the essential elements of my combination consists in a combination of parts by which an actuating mechanism is caused to move the connecting-levers until the contact of the electrical igniter is made and the circuit closed, when a spring 64, which has been compressed, is suddenly released and by means of a hammer action breaks the contact very suddenly, thereby causing an effective spark. This hammer action is one which may be embodied in various forms of mechanism, the combination being that of an electrical igniter, means for closing the circuit of the igniter, a spring-hammer, and means for compressing the spring-hammer and releasing it at a desired period, so as to permit it by the sharp stroke of the recoil of the spring to break the circuit, thus disengaging the lever 65 from the electrical contact 66 and making a spark in the combustion-chamber which will explode the gas therein and operate the engine. This operation will be repeated with every revolution of the counter-shaft 38 until the apparatus is properly heated.

This application is a division of an application heretofore filed by me November 29, 1897, Serial No. 660,022, and the device herein shown and described, designed for the purpose of governing the engine and automatically igniting the gas, is the subject-matter of claims in an application pending simultaneously with this one in the United States Patent Office.

Having thus described my invention, what I claim, and desire to secure by Letters Patents, is—

In a gas-engine the combination, of an electrical contact device located within the combustion-chamber, an oscillating shaft projecting through the wall of said chamber for op-



erating the same, said shaft and one pole of  
the contact device being connected to a source  
of electricity, the shaft upon the exterior of  
the chamber being provided with a crank, a  
5 pivoted lever connected to the said crank by  
a joint having some lost motion, and a spring  
connected to and operating the second lever,  
means for actuating the spring-lever to move  
it and its connections to make a contact and

then to bend and release it, the spring by its  
recoil actuating the connecting parts to break  
the contact, substantially as described.

Signed by me at Baltimore, Maryland, this  
4th day of June, 1898.

ERNEST W. GRAEF.

Witnesses:

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