G. GRAY.

GAS ENGINE IGNITER.

APPLICATION FILED MAY 5, 1909.

956,075. Patented Apr. 26, 1910.

2 SHEETS—SHEET 1.

Fig. 1

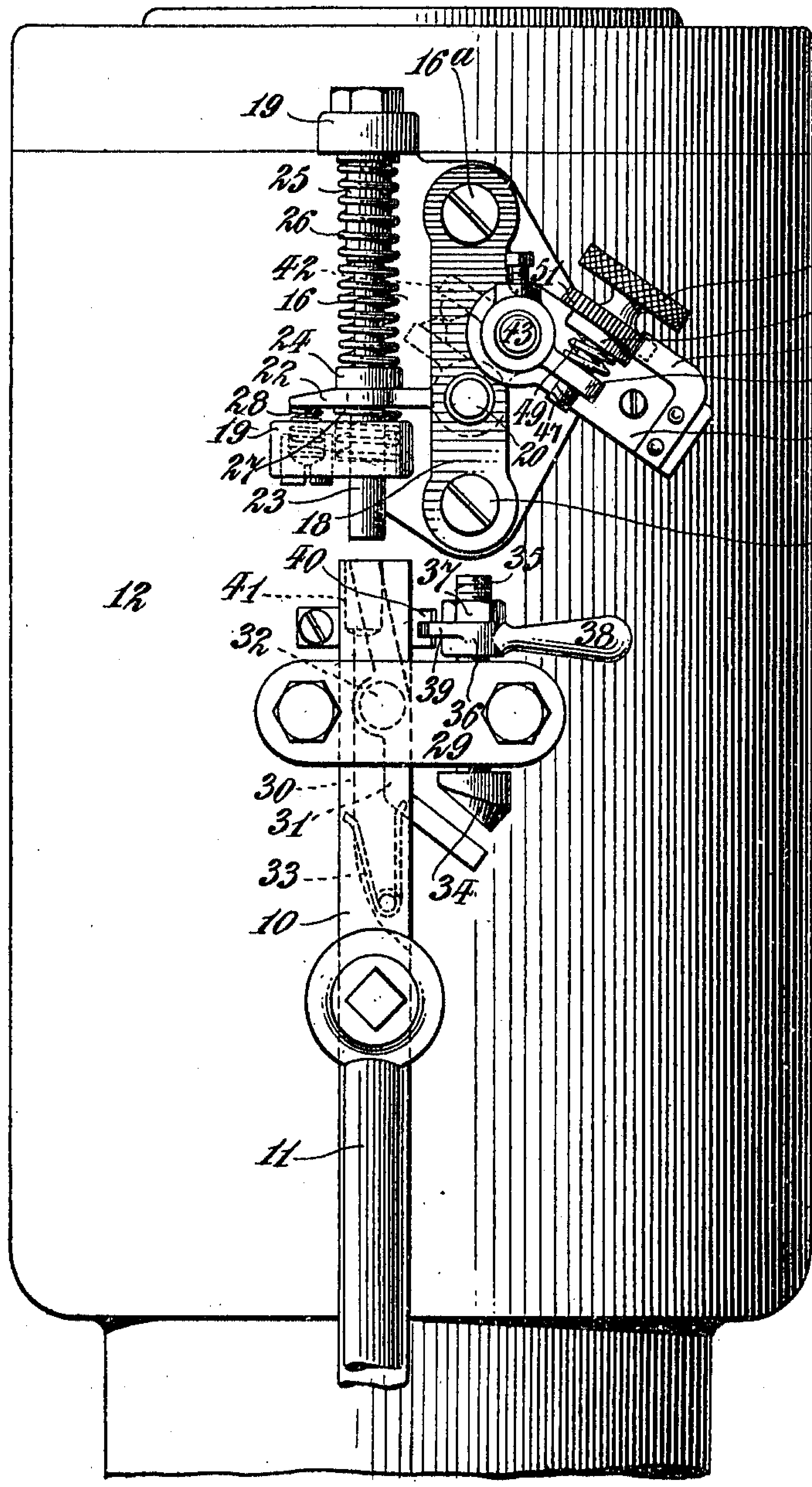
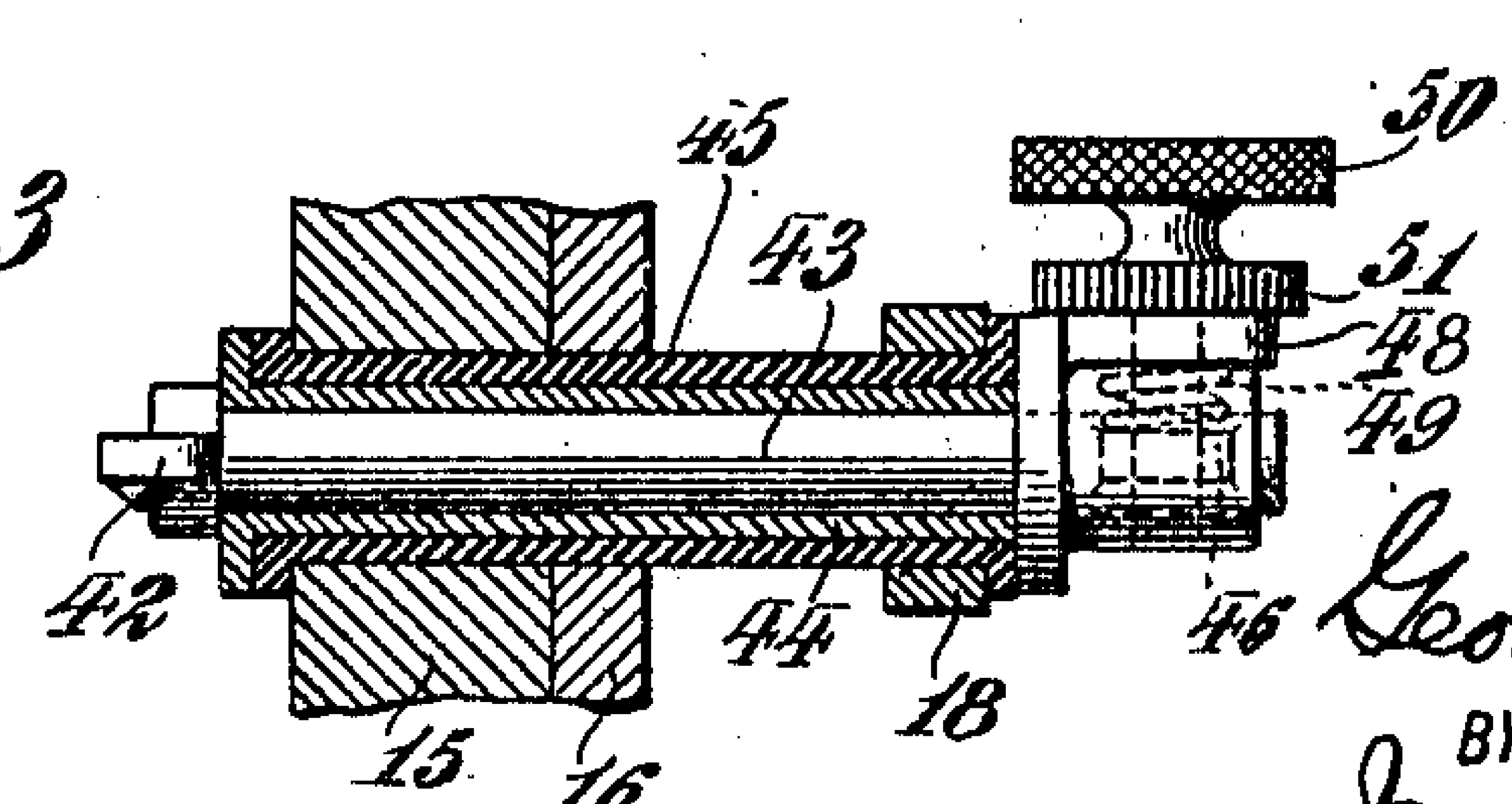


Fig. 3



WITNESSES

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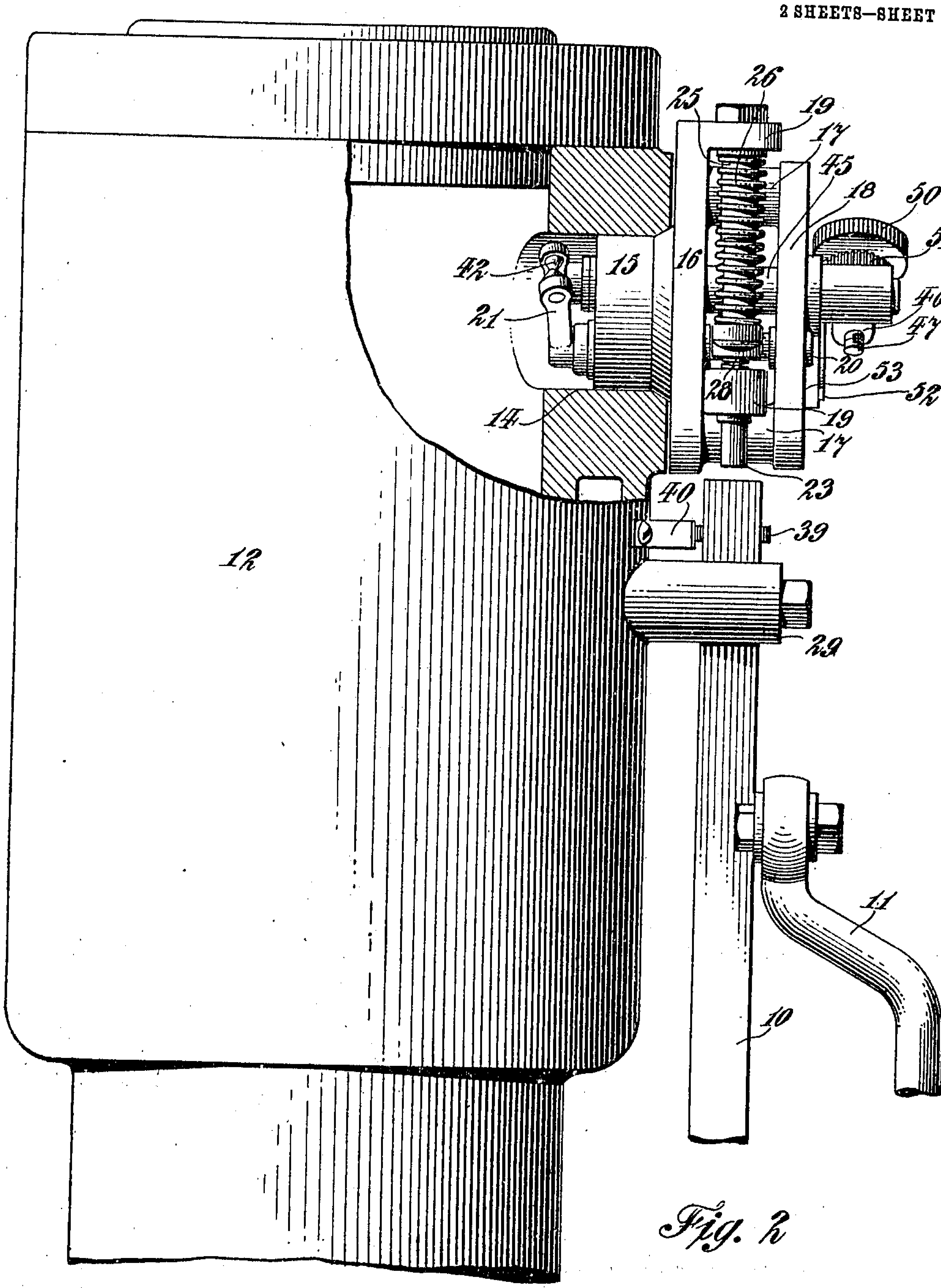

Fig. 2

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UNITED STATES PATENT OFFICE.

GEORGE GRAY, OF MIANUS, CONNECTICUT, ASSIGNOR TO MIANUS MOTOR WORKS, OF MIANUS, CONNECTICUT, A CORPORATION OF CONNECTICUT.

GAS-ENGINE IGNITER.

956,075. Specification of Letters Patent. **Patented Apr. 26, 1910.**

Application filed May 5, 1909. Serial No. 494,110.

To all whom it may concern:

Be it known that I, GEORGE GRAY, a resident of Mianus, in the county of Fairfield and State of Connecticut, have invented certain new and useful Improvements in Gas-Engine Igniters, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and use the same.

The invention relates particularly to contact and release, or what are known as make and break igniting devices. It is especially designed for use in connection with gasolene engines, but can obviously be employed on other types of internal combustion or explosion engines.

The object of my invention is to embody the whole of the igniting gear proper in a single self-contained group of mechanism, so that this group of parts may be bodily removed from the engine without disturbing the other parts of the igniter mechanism, but, nevertheless, to make such mechanism strong and durable and capable of sustained and reliable operation.

It is a further object of my invention to provide for the ready adjustment of the stationary electrode. In mechanisms of the type to which my invention relates, it is frequently experienced that when the electrodes wear or deteriorate from the effects of the voltaic arc, it becomes necessary to change the position of the stationary electrode and ordinarily this is a difficult operation owing, among other things, to the presence of the insulation. My invention seeks to and does provide an easy and effectual means by which this adjustment may be accomplished.

My invention involves various other devices of importance, and all of them will be fully set forth hereinafter and particularly pointed out in the claims.

Reference is now had to the accompanying drawings which represent as an example the preferred manner in which the principles of my invention may be practically embodied.

In these drawings;—Figure 1 is a front elevation of a gas engine cylinder equipped with my invention; Fig. 2 is a side elevation of the same parts with a portion of the cylinder shown broken away; and Fig. 3 is a detailed section along the stationary electrode illustrating the manner in which the same may be adjusted.

In 2-cycle gasolene engines, particularly of the marine type, it is the customary practice to drive the make and break igniter from a reciprocating pump rod 10 through a rod 11 actuated by an eccentric on the crank shaft, and these parts are so shown in the drawings. The cylinder 12 is formed with an opening 14 through its walls, the surface of the walls of which opening is ground so that a tight connection may be effected with the corresponding surface on the plug 15. This plug is of metal and is preferably cast integral with a frame plate 16 which lies against the other surface of the cylinder as shown. I also prefer to cast integral with this frame plate two studs 17 which are connected by an integral bridge 18 lying in a plane parallel to that of the frame plate. The frame plate is further provided with two lugs 19 in vertical alinement with the reciprocating pump rod 10 which serve to carry a reciprocal pin to be hereinafter described. The parts 15, 16 and 18 are fastened to the engine by screws 16ª which pass through the studs 17 and the ends of the bridge 18.

20 indicates the rock-shaft of the movable electrode 21. This movable electrode is in the form of a rocking arm and is fastened to or formed integral with the rock-shaft 20. Said rock-shaft is mounted horizontally in the frame-plate 16 and plug 15 and its outer end is carried in the bridge 18. The shaft is so mounted that it is held against axial movement, but may rock freely. The manner in which this shaft is carried in the frame-plate and plug and in the bridge is important, since I provide a bearing for the shaft along its entire length. The shaft 20 carries fixedly an arm 22 which is located between the frame-plate 16 and bridge 18, intermediate, it will be seen, the two points of bearing of the rock-shaft. This arm 22 is adapted to coact with the vertically reciprocating pin 23 which is mounted in the lugs 19. The pin 23 extends through an opening in the arm 22 and has fastened to it a collar 24 which limits the downward motion of the pin relatively to the arm. At its upper end pin 23 is movable in a sleeve 25 carried by the top lug 19. Bearing between said lug 19 and the collar 24 and surrounding the pin 23 is an expansive spring 26 which tends to hold the pin downward and to press the arm 22 upon a heavy cush-

ion spring 27 which is carried in a cavity in the lower lug 19. This lower lug 19 also carries an expansive spring 28, which engages the free end of the arm 23. Normally the spring 26, being of superior power to the spring 28, holds the arm 22 downward in the position shown in Fig. 1, in which position the arm bears on the spring 28 holding said spring in compression. When the rod or pin 23 is moved upward, the pressure of the spring 26 on the arm 22 is removed, since the collar 24 moves upward away from said arm. At this time the spring 28 asserts itself and moves upward the arm 22 so that this arm follows the collar 24. Upon permitting the pin 23 to return to its downward position the spring 26 again becomes active and forces back the arm 22 compressing the spring 28 until the motion of the arm is arrested by the cushion spring 27, which is the strongest of the three springs.

The reciprocating rod 10 is carried in a suitable guide 29 fastened to or formed on the cylinder 12 and said rod is orificed at its upper end as indicated at 30 in Fig. 1. Within this orifice is arranged a trigger 31. The trigger is in the form of an intermediately pivoted lever, it being mounted on a center pin 32 set in the rod 10 and made flush with the outer surface thereof. The lower end of the trigger is extended outward in a lateral direction as shown in Fig. 1 and such end is pressed outward, holding the trigger in the position shown in Fig. 1, by a spring 33 seated in the lower extremity of the cavity 30. The parts are so arranged that when the trigger is in its normal position as indicated in Fig. 1 the upper end of the trigger will lie directly in the line of the rod 23, so that as the trigger moves upward with the rod 10 the upper end of the trigger strikes the lower end of the pin or rod 23 and raises the rod in the manner above described. The guide 29 also carries a trip 34 which has a coniform face and is carried on a screw 35 engaging threads in the guide 29. The said screw is provided with a nut 36 which is adapted to be fastened on the screw at the desired position with the aid of a jam nut 37. The nut 36 carries a finger 38 for operating it and also a notched quadrant 39 which is engaged by a spring pawl 40 fastened to the cylinder as shown. The parts 39 and 40 operate to hold the nut 36 releasably in the position to which it is put and normally the nut 36 is fastened on the screw 35, so that the screw may be shifted in the guide by operating the finger 38, thus raising or lowering the trip 34. This trip is in alinement with the laterally projecting lower end of the trigger 31, so that when the rod 10 moves upward carrying the trigger with it and causing the upward motion of pin 23 the trigger engages the trip and is caused to move inward at its lower end, thus throwing its upper end laterally out of engagement with the pin 23. This deprives the pin of its support and allows the spring 26 to return the pin to its lower position as explained. When the pin 23 descends in this manner, it momentarily enters an enlargement 41 of the cavity 30, which enlargement is provided to accommodate the pin as described. As the rod 10 moves downward the trigger disengages the trip and the spring 32 returns the trigger to the normal position shown in the drawings.

The stationary electrode 42 is fixed on a shaft 43, which shaft is arranged to turn on and is snugly fitted in a sleeve 44. This sleeve is shown in Fig. 3, is surrounded by an insulation thimble 45, so that the shaft 43 and the electrode 42 while firmly mounted in the plug, are insulated from the walls of the engine and hence from the movable electrode 21. The parts 43, 44 and 45 are fitted in the plug 15, frame-plate 16 and bridge 18, which latter has a lateral extension provided to receive said parts. The shaft 43 has fixed to its outer end an arm 46 and with this arm is engaged a screw 47. Said screw is held to rotate, but not to move axially, in the lug 48 fastened to or formed on the frame-plate 16. Bearing between the arm 46 and lug 48 and surrounding the screw 47 is a spring 49 which serves to prevent idle motion between the arm and screw. The screw is provided with a knurled head 50 and a serrated disk 51. The head 50 facilitates operation of the screw and the serrated disk is provided to be engaged by a spring pawl 52 which holds the screw against idle motion. The said pawl 52 is carried by a projection 53 of the frame-plate 16 or in any other suitable manner. It will thus be seen that by turning the screw 47 a slight turning motion in either direction desired will be imparted to the shaft 43, thus causing a motion of the electrode 42 which adjusts it with respect to the movable electrode. The stationary electrode is held at the adjustment to which it is put by the parts 49, 51 and 52, which secure it against idle motion in any direction.

The operation of the mechanism as a whole may be traced as follows: Assuming the parts to be in the position shown in Fig. 1, in which the electrodes are out of contact and the ignition circuit broken, upon the upward motion of the rod 10 the trigger engages the lower end of the pin 23 and raises the pin, relieving the arm 22 of the pressure of the spring 26 and permitting the spring 28 to raise the arm and bring the electrodes into contact with each other, thus closing the ignition circuit. Upon the continued upward motion of the rod 10 the trigger engages the trip 34, which must be

adjusted to contact with the trigger at the instant that it is desired to ignite the charge in the engine cylinder. Upon so engaging the trip the trigger is thrown as described and the rod or pin 23 is deprived of its support so that the spring 26 is allowed instantly to return the rod to its lower position. This brings about a rapid return of the arm 22 to its lower position and an instantaneous separation of the electrodes, breaking the circuit and producing the spark characteristic of contact and release igniters. The constant passage of the spark causes a deterioration of the electrodes and in time adjustment will become necessary, and this is provided for in a most effective manner by the screw and its coacting parts. The rod 10 makes a complete reciprocation one for each rotation of the crank-shaft and the electrodes are separated correspondingly. This is the arrangement with a 2-cycle engine. For a 4-cycle engine the order of operation may be changed accordingly.

The engines to which this mechanism is adapted operate at comparatively high speeds, the crank-shaft frequently turning over as high as 500 R. P. M. It is therefore necessary that the mechanism should "stand up" under very high speeds of operation and, notwithstanding this, that it operate with absolute certainty and in correct time. The construction and organization which I have set forth is fully adapted to all of these requirements as well as to the ready and accurate adjustment of all of the parts.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent, is;—

1. A make and break igniter having a plug adapted to enter the cylinder, a bridge spaced from the plug and rigid therewith and complementary igniting devices including a rock shaft mounted in the plug and in the bridge intermediate the ends of the latter and an operating member fastened to the rock shaft between the plug and bridge.

2. A make and break igniter, having a plug adapted to enter the cylinder, a bridge spaced from the plug and having its opposite ends rigidly connected therewith and complementary igniting devices including a rock-shaft mounted in the plug and in the bridge intermediate the ends of the latter and an operating member fastened to the rock-shaft between the plug and bridge.

3. A gas engine igniter, having a plug adapted to enter an orifice in the cylinder walls, a bridge spaced from the plug, connecting studs at its ends by which it is fastened to the plug, fastening screws passing through said connecting studs to fasten the igniter to the engine and complementary igniting devices including parts mounted in the plug and bridge.

4. A make and break gas engine igniter, having a frame, a movable electrode, an operating arm in connection with said movable electrode, a reciprocating pin engaged with the arm, lugs in which said pin is mounted, a spring pressing the pin to actuate the arm to separate the electrodes, a second spring carried in one of the lugs and engaging the arm to contact the electrodes, means to periodically reciprocate the rod to relieve the arm of the pressure of the first spring, and a cushion spring carried in the lug and serving to receive the impact of the arm upon the return of the pressure of the first spring.

5. A make and break igniter having a movable electrode, a reciprocating pin, an arm in connection with said movable electrode and engaging with the pin intermediate its ends, a spring encircling the pin for moving it in one direction, a buffer spring engaging with the arm to limit the movement of the pin and arm in said direction, means for moving the pin in the opposite direction and a spring weaker than the first spring for moving the arm in the last mentioned direction when said means operates, one of said last mentioned springs encircling the pin.

6. A make and break igniter having a movable electrode, an arm in connection with said movable electrode, a reciprocating pin, a member for positively moving the pin in one direction, a spring in engagement with the pin for moving it in the opposite direction, a buffer spring in engagement with the arm for limiting the movement of the pin and arm in said opposite direction and a weaker spring in engagement with the arm for moving the arm in the same direction as the pin when the latter is moved by the pin moving member.

7. A make and break igniter having electrodes, an actuating device for the movable electrode, a reciprocating drive rod, a trigger carried thereby and a trip to be engaged by the trigger, said trip being rotatably mounted to adjust the same and presenting a coniform operating surface eccentric in respect to the axis of rotation of the trip.

8. A make and break gas engine igniter, having a stationary electrode, a movable electrode, means for operating the movable electrode, a rod on which the stationary electrode is carried, a metal sleeve in which the rod may turn, a mass of insulation surrounding said sleeve and insulating it from the other parts and means for adjusting the rod around its axis for the purpose specified, said means comprising an arm on the rod, a screw to actuate the arm and means to prevent idle motion of the arm and screw.

9. A make and break gas engine igniter, having a stationary electrode, a movable electrode, means for operating the movable electrode, a rod on which the stationary electrode is carried, a metal sleeve in which the

rod may turn, a mass of insulation surrounding said sleeve and insulating it from the other parts and means for adjusting the rod around its axis for the purpose specified, said means comprising an arm on the rod, a screw engaging the arm, a bearing for the screw, a spring pressing between the arm and said bearing and means for preventing idle motion of the screw.

10. A make and break igniter having a stationary electrode, a movable electrode, means for operating the movable electrode, a rod from which the stationary electrode laterally extends, a sleeve in which said rod may turn, an arm on the outer end of said rod, a screw for actuating the arm to rotate the rod and means for normally preventing rotation of the screw.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses:

GEORGE GRAY.

Witnesses:
LEROY EDDY,
C. A. BOYD.