

M. A. THIEL.
 IGNITION APPARATUS FOR COMBUSTION ENGINES.
 APPLICATION FILED JAN. 15, 1903.

1,045,639.

Patented Nov. 26, 1912.

4 SHEETS—SHEET 1.

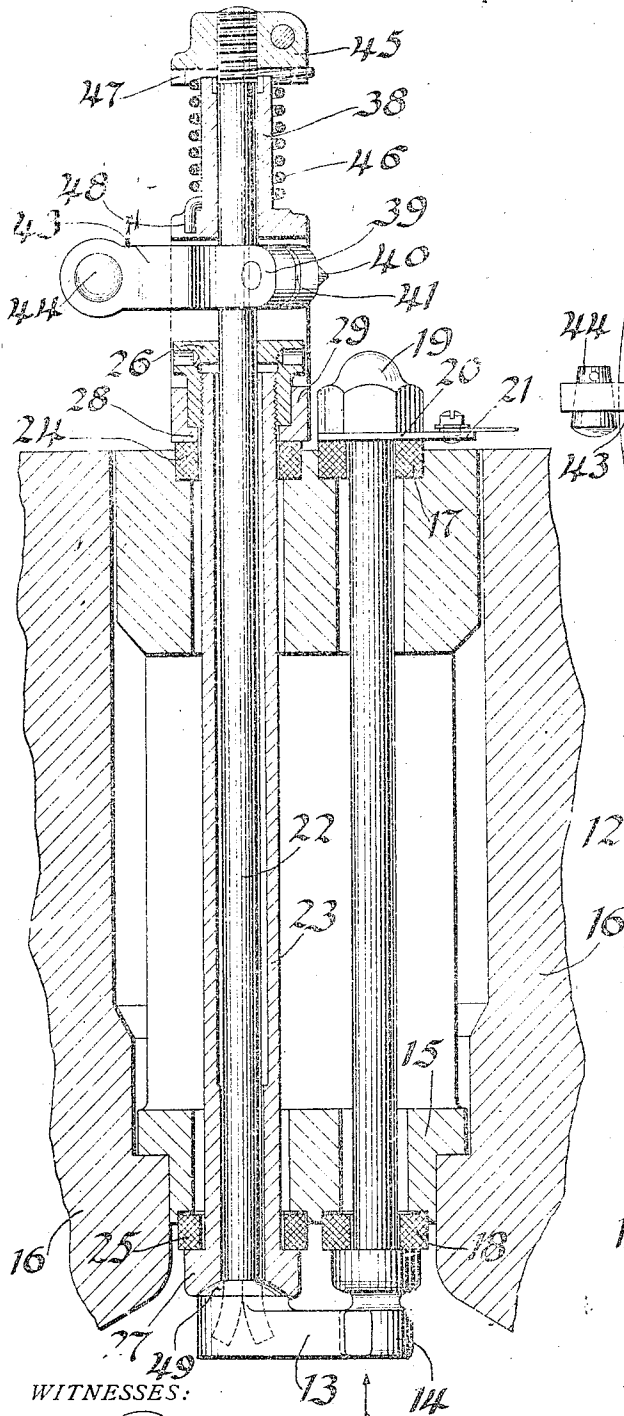


Fig. 1.

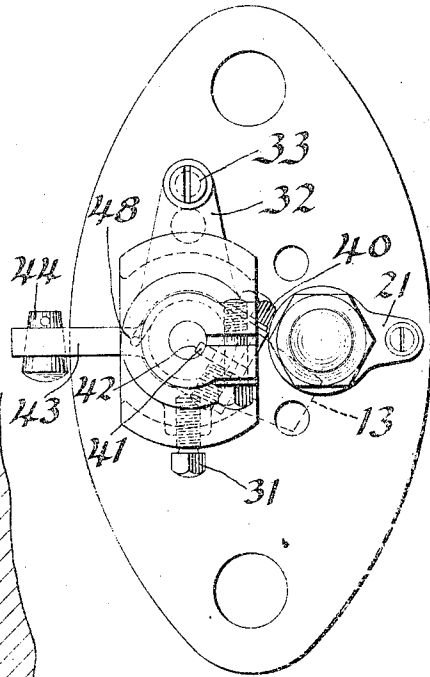


Fig. 2.

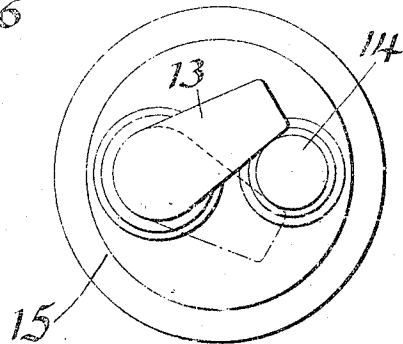


Fig. 3.

WITNESSES:

[Signature]

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BY

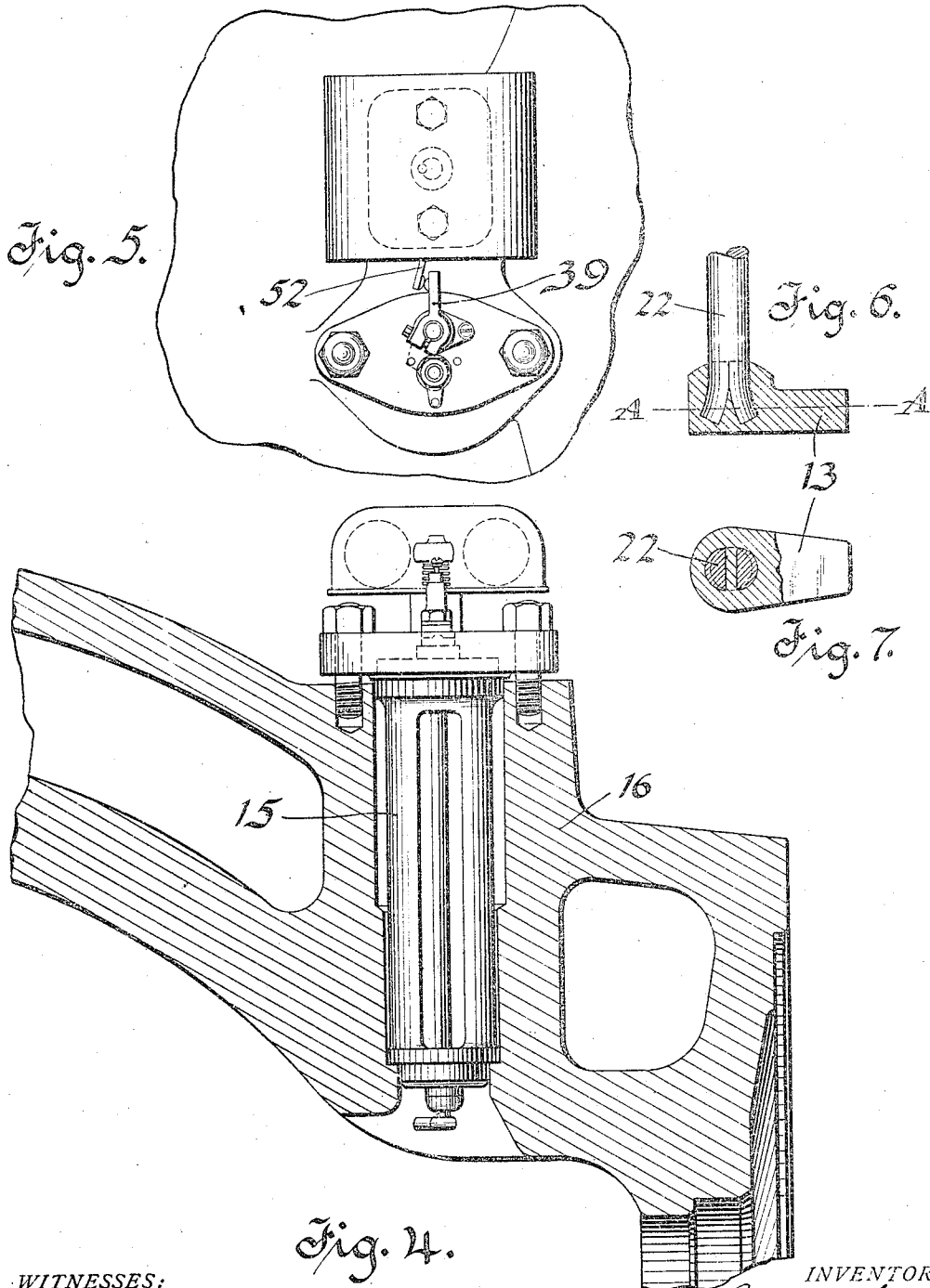
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Fig. 4.

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4 SHEETS-SHEET 3.

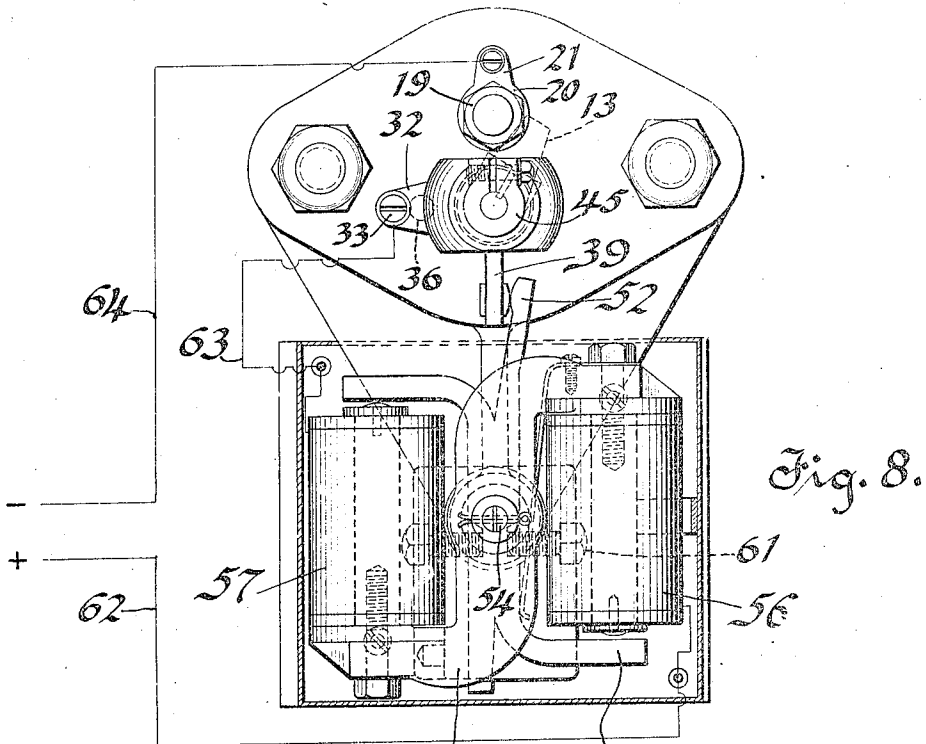


Fig. 8.

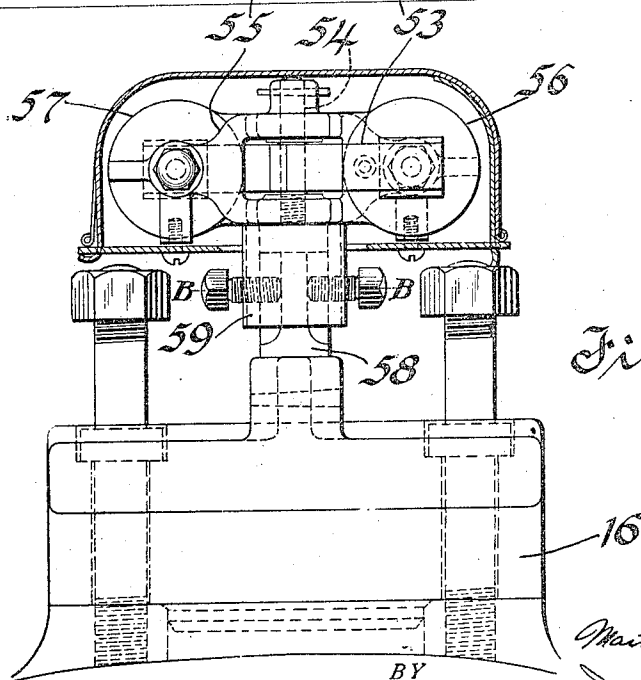


Fig. 9.

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4 SHEETS—SHEET 4.

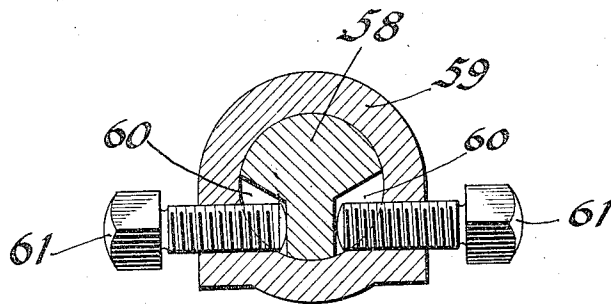
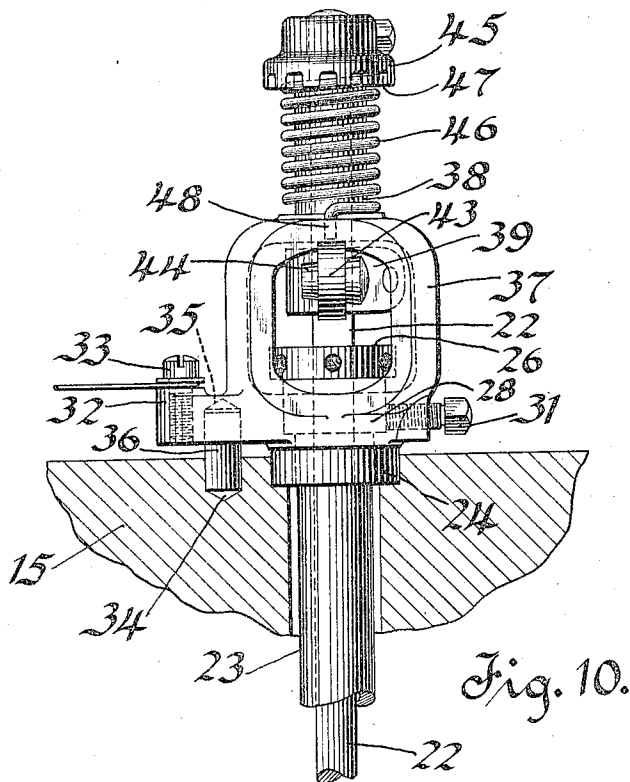


Fig. 11.

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UNITED STATES PATENT OFFICE.

MARTIN A. THIEL, OF WILKINSBURG, PENNSYLVANIA.

IGNITION APPARATUS FOR COMBUSTION-ENGINES.

1,045,639.

Specification of Letters Patent.

Patented Nov. 26, 1912.

Application filed January 15, 1903. Serial No. 410,924.

To all whom it may concern:

Be it known that I, MARTIN A. THIEL, a citizen of the United States, and a resident of Wilksburg, in the county of Allegheny and State of Pennsylvania, have made a new and useful Invention in Ignition Apparatus for Combustion-Engines, of which the following is a specification.

This invention relates to internal combustion engines and more particularly to ignition apparatus for such engines.

An object of this invention is the production of a simple, accurate and effective ignition apparatus.

A great deal of difficulty has been encountered in ignition apparatus of the make and break type because of the wearing away, the burning away, or the breaking of the sparking terminals, and a particular object of this invention has been the production of an apparatus of this type in which the sparking terminals are designed of materials peculiarly adapted to resist the tendency to wear, burn away and break, and at the same time which are adapted to perform the functions required of them.

A further object is the production of an igniter mechanism which in itself is an organized apparatus and which may be applied to any internal combustion engine.

A further object is the production of a self contained operating mechanism for the make and break device which is simple in construction and which may be readily mounted on the engine cylinder.

These and other objects, some of which are perfecting of the details of the ignition mechanism, I attain in an apparatus illustrated in the drawings which form a part of this application.

In the drawings accompanying this application and forming a part thereof: Figure 1 is a sectional elevation of an igniter mechanism embodying my invention; Fig. 2 is a plan view of Fig. 1; Fig. 3 is a plan view of Fig. 1, looking in the direction of the arrow on Fig. 1; Fig. 4 is a side elevation of the detail shown in Fig. 1, in connection with a fragmental section of an engine cylinder; Fig. 5 is a partial plan view of Fig. 4; Fig. 6 shows in partial section a detail of my invention; Fig. 7 is a partial section along the line A—A of Fig. 6; Fig. 8 is a plan view of an operating mechanism forming a detail of my inven-

tion and is shown in connection with a plan view of the apparatus illustrated in Figs. 1 and 2; Fig. 9 is an end elevation of the apparatus shown in Fig. 8 in connection with a portion of an engine cylinder; Fig. 10 is an elevation of a detail of my invention; and Fig. 11 is a section along the line B—B of Fig. 9.

The apparatus consists of a make and break device 12 which employs an especially constructed cast iron sparking terminal 13, which, with a steel stationary terminal 14, is mounted on a cylindrical cover portion 15 and which is actuated by means of a self-contained magnetic operating device.

Referring more particularly to Figs. 1, 2, 3, 4 and 10; the igniter mechanism proper consists of the cover portion 15, which is adapted by its design to project through a suitable opening formed in the wall 16 of a gas engine cylinder and which is securely mounted on the cylinder. A stationary terminal 14 projects through the cylindrical cover 15 into the gas engine cylinder and is surrounded with insulating bushings 17 and 18, which are located between it and the cover portion 15. The terminal 14 consists of a steel rod which is enlarged at its inner end to form the sparking terminal and which is threaded at its other end and provided with a nut 19 adapted to secure the rod firmly to the cover portion 15 by drawing the terminal end of the rod tight against the bushing 18 and compressing the bushing 17. This arrangement not only holds the rod in place but packs the joints between it and the sleeve portion and insulates the rod from the sleeve portion. A washer 20 is located between the nut 19 and the bushing 17 and is provided with an extending lug 21 to which a wire of the ignition circuit may be secured.

A rod 22 extends through a sleeve 23 which extends through the cover portion 15 and is mounted thereon by means of insulating bushings 24 and 25, and a cooperating spanner nut 26. The sleeve is provided at its inner end with an enlarged flange 27 and the bushing 25 surrounds the sleeve and is secured in place between the shoulder formed by the flange 27 and a shoulder formed on the cover portion 15. The bushing 24 is secured between a specially formed washer 28 and the cover portion 15, and the

sleeve is held in place by means of the spanner nut 26, which is threaded onto the outer end of the sleeve and through which the rod 22 extends and in which it is journaled. With such a construction bushings 24 and 25 pack the joints between the sleeve and the cover portion 15 and hold the sleeve securely in place. The washer 28 is cup-shaped and is located between the spanner nut 26 and the bushing 24. A flange 29 of the washer surrounds the threaded flange of the spanner nut 26 and is provided with a set screw 31 which extends through it and is adapted to hold the spanner nut rigidly in place relative to the washer. A lug 32 is formed integrally with the washer and is provided at its outer end with a terminal screw 33 for connecting it to a wire of the ignition circuit. A cylindrical hole 34 is drilled in the cover portion 15 and a hole 35 of the same diameter is drilled into the adjacent side of the lug 32. An insulating block 36 is mounted in the hole 34 and extends into the hole 35 of the lug 32, and thereby locks the washer 28 in position, relative to the cover portion 15 and prevents it from turning about the sleeve 23. A two-part bonnet 37 is integrally formed with the washer 28 and is provided at its outer end with a sleeve portion 38, through which the rod 22 extends and in which it is journaled. A clamp arm 39 is secured to the rod 22 between the bearing in the sleeve 38 and the bearing in the spanner nut 26 by means of a clamp screw 40 and a key wedge 41, which is held in place by the screw and which cooperates with a key-way 42 formed in the rod 22 and extending longitudinally along the rod to its outer end. The clamp arm 39, at its outer end, is provided with an insulating operating block 44, secured in place by means of a cotter pin. The rod 22 projects beyond the sleeve 38 and is provided at its outer end with a clamp nut 45, between which and the bonnet a coil spring 46, which surrounds the sleeve portion 38, operates. The clamp nut 45 is provided with a number of notches 47 which are adapted to receive one end of the spring 46 and the bonnet 37 is provided with an opening 48 in which the other end of the spring is rigidly secured. With such a construction the tension of the spring may be adjusted by moving the free end from one notch to another without interfering with the adjustment of the rest of the device. The rod 22 is provided at its inner end with the cast iron terminal 13 which is welded to it. The inner end of the rod is bifurcated as shown in Figs. 6 and 7 and this bifurcated portion is placed in the mold for casting the terminal 13 and molten metal is run through the mold until a welded connection is assured between the steel of the rod and the cast iron of the terminal. Under such conditions the cast iron portion of the terminal

is secured in place on the rod by the bifurcated portion and also by the weld which exists between it and the rod. The flange 27, at the inner end of the sleeve 23, is provided with a concave or cup shaped depression and the terminal 13 is provided with a convex boss 49 which extends into the concave depression of the sleeve and which with the concave portion forms a bearing for the rod. The rod, as has been described, is journaled at its outer end in the spanner nut 26 and in the sleeve 38 of the bonnet 37. The spring 46 operates longitudinally along the rod 22 to pull the rod outwardly and thereby forces the convex boss 49 of the terminal 13 into the concave depression at the inner end of the sleeve 23 and forms a gas tight joint and also, as outlined, a bearing for the end of the rod.

The operating block 44, which is mounted at the end of the clamp arm 39 contacts with an operating arm 52 of an electrical operating apparatus for the movable terminal 13 and is moved by the arm 52 through a predetermined arc which is sufficient to produce the necessary arcing gap between the terminal 13 and the stationary terminal 14. The arm 52 is formed integrally with an S shaped armature 53 of an electro-magnet, which is pivotally mounted on a pin 54 secured to an S shaped keeper 55. The keeper 55 is provided at one end with a magnetic coil 56 which extends in one direction and at the other end with a magnetic coil 57, which extends in the other direction, thereby forming an S shaped electro-magnet and presenting the north and south poles of the magnet to the ends of the S shaped armature 53. The S shaped magnet is mounted on a straight pin 58, which is secured to the wall 16 of the engine cylinder by means of a sleeve 59, which is secured to the S shaped keeper of the magnet and which is adapted to cap the pin 58. Longitudinally extending grooves 60 are cut along each side of the pin 58, as shown in Fig. 11. Set screws 61 extend through each side of the sleeve 59 and contact with cut-away portion of the pin and are adapted to hold the S shaped magnet in place. Such a construction permits the magnet to be adjusted longitudinally of the pin and also to be rolled around the pin. This latter adjustment is obtained by loosening on one set screw and tightening on the other. A timing device (not shown) periodically delivers current to the igniter circuit during the operation of the engine. The current is transmitted through a wire 62 connected to the timing device, the coils 56 and 57 and wire 63, and is delivered to the movable terminal 13 which, contacting with the terminal 14, completes the circuit, through the terminal rod 14 and a wire 64. These periodical currents cause the armature 53 to oscillate about its mounting pin 54 in re-

sponse to the magnetic pull due to the current traversing the magnet and to operate through the agency of the clamp-arm 39 and the rod 22, the movable terminal 13. This operation consists in moving the terminal 13 out of contact with the stationary terminal 14, which breaks the operating circuit of the magnetic operating device and causes a spark in the engine cylinder. The spring 46 operates in opposition to the armature 53 and when the current ceases to flow through the magnetic coils, returns the terminal 13 into contact with the stationary terminal 14. Because of the tendency of the terminals 13 and 14 to wear and burn away, it is necessary to provide the rolling adjustment around the pin 58 referred to in connection with the magnetic operating device. By means of this adjustment any lost motion occasioned by a slight wearing away of either of the terminals may be taken up. It is found in practice that the wear and tear on the bearings and operating parts of the rod 22 is excessive when the rod overhangs its bearings and for this reason the bonnet portion 37 has been provided. With the construction illustrated the clamp-arm 39 is located between the bearing provided in the sleeve 38 and the bearing provided in the spanner nut 26 and the difficulties ordinarily encountered are overcome. The clamp-arm 39 is of novel design and so arranged that by reversing it on the rod 22 the terminal 13 is reversed relative to the terminal 14; that is, it is caused to contact with the opposite side of the stationary terminal, as shown in the dot-dash line of Fig. 3. Such an arrangement increases the life of both the moving and stationary terminals and is accomplished by so constructing the clamp arm that when it is in place on the rod the arm 43 will extend at an angle of about 150° from the general axis of the movable terminal 13. The key-way 42 is so located on the rod that a line extending through its center and the center of the rod is parallel to the general axis of the movable terminal 13. This, together with the arrangement of the clamp arm 39 permits the clamp arm to be reversed for the purpose of reversing the terminal 13.

In accordance with the provisions of the patent statutes, I have described the principle of operation of my invention, together with the apparatus which I now consider to represent the best embodiment thereof, but I desire to have it understood that the apparatus shown is only illustrative and that the invention can be carried out by other means. What I claim is:

1. An igniter for gas engines comprising a support, a stationary spark terminal, a rotatable rod, a spark terminal on the rod adapted to engage the stationary terminal, the position of said spark terminal on the

rotatable rod capable of being reversed, a bonnet mounted on the support, a reversible contact arm on the rotatable rod, a nut connected to the movable rod and a spring connecting the bonnet and nut for retaining the movable spark terminal in engagement with the stationary terminal in either position.

2. An igniter for gas engines comprising a stationary terminal, a movable terminal, means for resisting the movement of the movable terminal, and means to which said first named means is connected for resisting the movement of the movable terminal.

3. An igniter for gas engines comprising a support, a stationary spark terminal, a rotatable rod, a spark terminal on the rod adapted to engage the stationary terminal, the position of said spark terminal on the rotatable rod capable of being reversed, a reversible contact arm on the rotatable rod, and means for retaining the movable spark terminal in engagement with the stationary terminal in either position.

4. An igniter for gas engines comprising a supporting member, a stationary terminal carried thereby, a reversible movable terminal journaled in the supporting member, a spring for resisting the movement of the movable terminal, and means connected to the movable terminal for engagement with the spring for holding it under tension, the tension of said spring being reversed upon the reversal of the movable terminal.

5. In combination in an ignition apparatus, a cover portion, a stationary sparking terminal mounted on said cover portion, a movable terminal comprising a rod extending through said cover portion and a cast iron terminal block cooperating with said stationary terminal, a sleeve mounted on said cover portion and surrounding said rod, means for securing said sleeve to said cover portion, and a bonnet cooperating with said means and provided with a journal for said movable terminal.

6. In combination in an ignition apparatus, a cover portion, a stationary sparking terminal secured thereto, a movable terminal comprising a rod extending through said cover portion and a cast iron terminal block cooperating with said stationary terminal, a sleeve mounted on said cover portion and surrounding said rod, means, in which said rod is journaled, for securing said sleeve to said cover portion, and a bonnet cooperating with said means and provided with a journal for said rod.

7. In combination in an ignition apparatus, a cover portion, a stationary sparking terminal secured thereto, a movable terminal comprising a rod extending through said cover portion and a cast iron terminal block cooperating with said stationary terminal, a sleeve mounted on said cover portion and surrounding said rod, means, in which said

rod is journaled, for securing said sleeve to said cover portion, a bonnet cooperating with said means and provided with a journal for said rod, and an operating arm secured to said rod between said means and the journal provided in said bonnet.

8. An igniter for gas engines, comprising a movable steel rod, and a stationary steel rod, forming a spark terminal, said movable rod provided with an upset bifurcated end, and a cast iron head for said rod, serving as a spark terminal for said rod, and cast to said rod in such a manner that the upset end is embedded in said cast iron head, said cast iron head adapted to make contact with the stationary terminal.

9. In combination in an ignition apparatus, a movable terminal and an operating mechanism therefor comprising an S shaped electro-magnet, a pivotally mounted S shaped armature cooperating therewith and adapted to actuate said movable terminal, and means for mounting said magnet whereby it is movable longitudinally of said mounting means for the purpose of adjusting said mechanism relative to said movable terminal.

10. In combination in an ignition apparatus, a movable terminal and an operating mechanism therefor comprising an S shaped electro-magnet, a pivotally mounted S shaped armature cooperating therewith and adapted to actuate said movable terminal, and means for mounting said mechanism whereby said mechanism is movable longitudinally along and is capable of rolling about its mounting element for the purpose of adjustment relative to said movable terminal.

11. In an ignition apparatus, a support member provided with supporting portions with an intervening space therebetween, a rod projecting through and extending beyond said supporting portions so that one end may serve as the stationary spark terminal of the system, insulating means for mounting said rod in said supporting portions, a sleeve extending through and projecting beyond said supporting portions, insulating means for mounting said sleeve in said supporting portions, a rockable rod extending through said sleeve, a spark terminal secured to said rod and adapted to make contact with said stationary rod, a spring tending to yieldingly rock said rockable rod in one direction, an electro-magnetic device for rocking said rod in the opposite direction and an adjustable and reversible contact piece between said rod and said electro-magnetic device.

12. In an ignition apparatus, a support member provided with supporting portions with an intervening space therebetween, a rod projecting through and extending beyond said supporting portions so that one

end may serve as the stationary spark terminal of the system, insulating means for mounting said rod in said supporting portions, a sleeve extending through and projecting beyond said supporting portions, insulating means for mounting said sleeve in said supporting portions so that its axis is parallel to the axis of said rod, a rockable rod extending through said sleeve, a spark terminal secured to said rod and adapted to make contact with said stationary rod, a spring tending to yieldingly rock said rockable rod in one direction, an electro-magnetic device for rocking said rod in the opposite direction and an adjustable and reversible contact piece between said rod and said electro-magnetic device.

13. In an ignition apparatus, a rockable terminal member, a contact arm secured to said member, rocking mechanism for said rockable terminal comprising an electro-magnet, a pivotally-mounted armature for said magnet provided with means for contacting with said contact piece and means for mounting said magnet whereby it is adjustable longitudinally relative to said movable terminal.

14. In an ignition apparatus, a rockable terminal member, an adjustable contact arm secured to said member, rocking mechanism for said rockable terminal comprising an electro-magnet, a pivotally-mounted armature for said magnet provided with means for contacting with said contact piece and means for mounting said magnet whereby it is adjustable longitudinally relative to said movable terminal.

15. In an ignition apparatus, a stationary terminal, a movable terminal, a contact arm secured to the movable terminal, an S-shaped electro-magnet, a pivotally mounted S-shaped armature therefor and a contact arm secured to said armature.

16. An igniter for gas engines comprising a supporting member, a stationary terminal supported in the member, a movable terminal journaled in the supporting member, a bonnet mounted on the member, and one end of the movable terminal journaled therein, a contact arm on the movable terminal extending through the bonnet, means for operating the arm for actuating the movable terminal, and a spring surrounding the bonnet for moving said movable terminal.

17. An igniter for gas engines, comprising a support member, a stationary spark terminal mounted in the support member, a sleeve mounted in the support member and having one end thereof concave, a movable rod journaled in the sleeve, a contact terminal on the rod having a convex portion adapted to enter the concave portion of the sleeve, a spring tending to yieldingly hold said spark terminal in contact and holding the convex portion of the terminal in the

sleeve for forming a tight connection; a notched nut on the movable rod adapted to receive one end of the spring whereby the torsion of the spring can be regulated and means for causing said terminal to break contact.

18. An igniter for gas engines comprising a stationary terminal, a movable rod, a contact terminal on the rod adapted to engage the stationary terminal, a contact arm on the movable rod, means for operating the arm for actuating the movable rod, a spring for rotating the arm in the opposite direction, and a notched nut on the rod engaging one end of the spring for regulating the torsion of the spring.

19. An igniter for gas engines comprising a supporting member, a stationary terminal supported in the member, a movable terminal journaled in the supporting member, a coiled spring surrounding the movable terminal for resisting the movement thereof, and a notched nut connected to the movable terminal adapted to be engaged by one end of the spring whereby the torsion of the spring can be regulated.

20. An igniter for gas engines comprising a support, a stationary terminal supported therein, a movable spark terminal journaled therein, a reversible contact arm mounted on the movable terminal, a spring for resisting the movement of the movable terminal, and means on the movable terminal whereby the torsion of the spring can be regulated, adapted to allow for the changing of the

torsion of the spring upon the reversal of the contact arm.

21. An igniter comprising the support, the stationary terminal carried thereby, a reversible movable terminal journaled therein; a bonnet connected to the support, a spring for resisting the movement of the terminal connected to the bonnet, and means connected to the movable terminal engaging the spring for holding it under tension, said spring adapted to be adjusted with respect to the means connected to the movable terminal for regulating the torsion of said spring for either position of the movable terminal for producing a resistance to the movement of said movable terminal.

22. An igniter for gas engines comprising a supporting member, a stationary terminal supported on the member, a movable terminal journaled in the supporting member, a bonnet connected to the support for having a sleeve in which the outer end of the movable terminal is journaled for forming a support for the terminal and a contact arm connected to the movable terminal intermediate the support and sleeve of the bonnet.

In testimony whereof, I have hereunto subscribed my name this 6th day of January, 1908.

MARTIN A. THIEL.

Witnesses:

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