

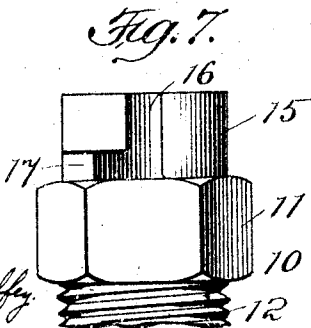
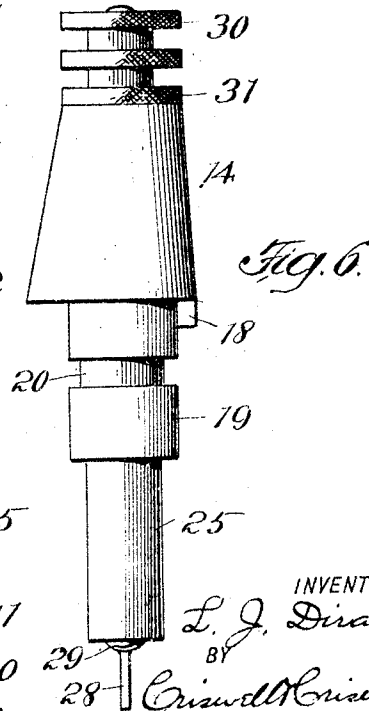
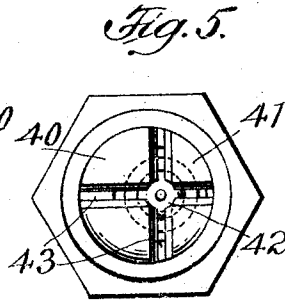
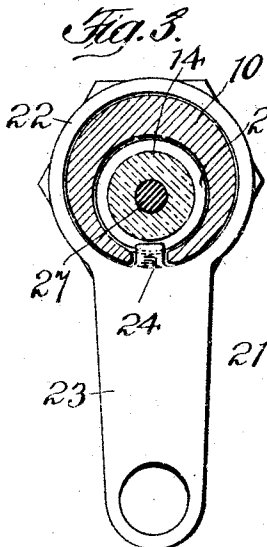
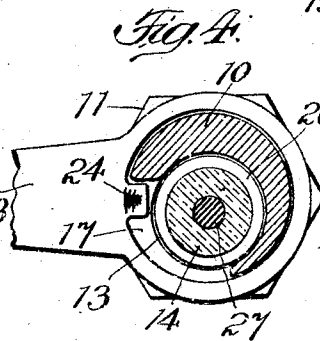
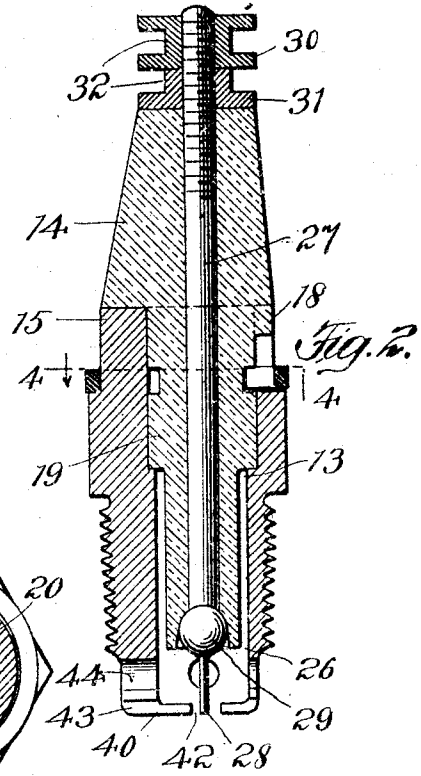
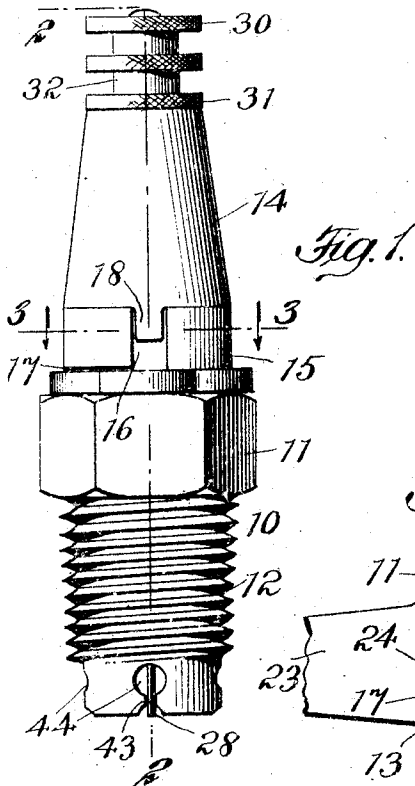
L. J. DIRAND.
SPARK PLUG.

APPLICATION FILED NOV. 20, 1907. RENEWED AUG. 30, 1911.

Patented Apr. 30, 1912.

2 SHEETS-SHEET 1.

1,024,834.



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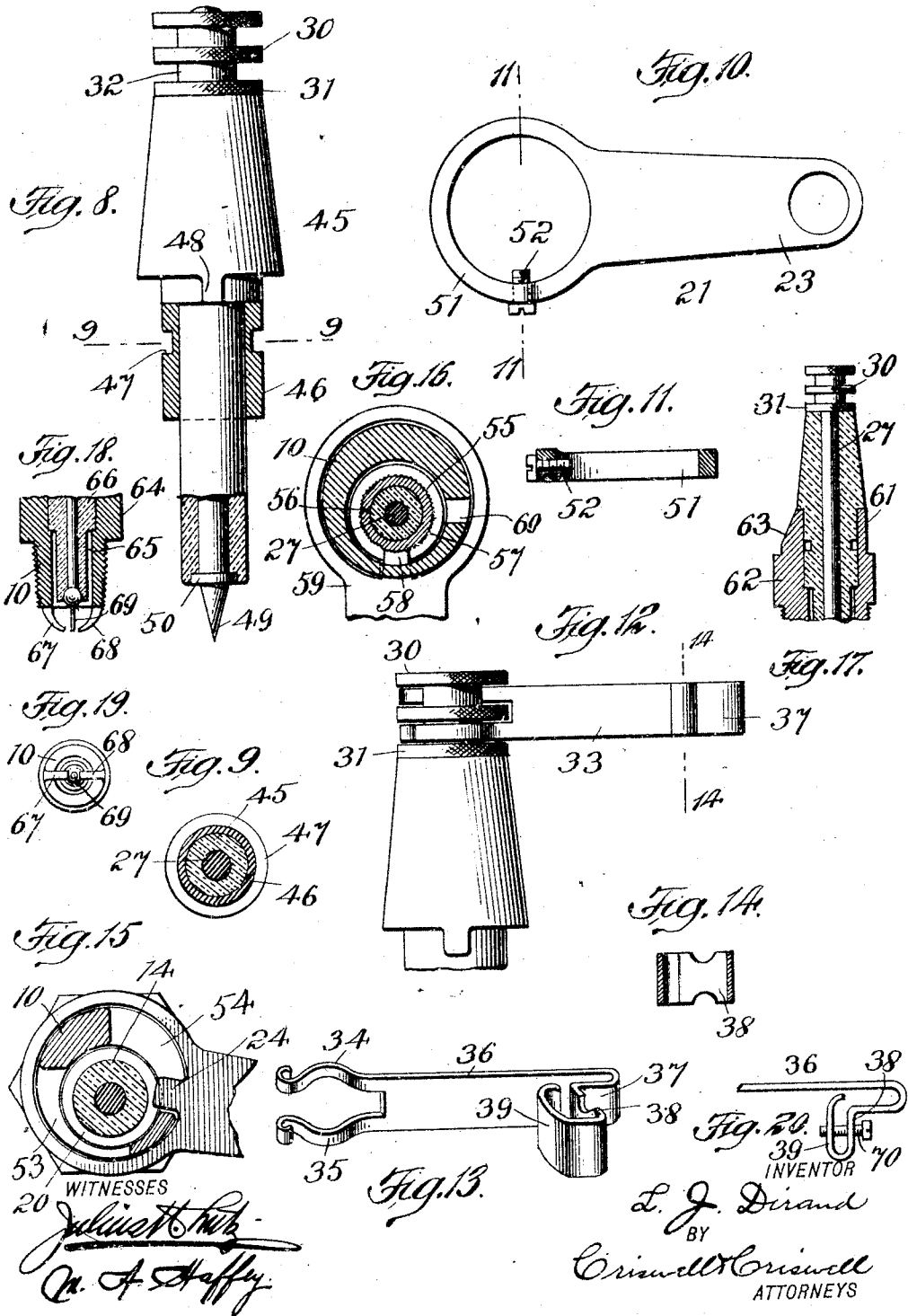
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SPARK-PLUG.

1,024,834.

Specification of Letters Patent.

Patented Apr. 30, 1912.

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To all whom it may concern:

Be it known that I, LOUIS J. DIRAND, a citizen of the United States, and a resident of Torrington, county of Litchfield, and State of Connecticut, have invented certain new and useful Improvements in Spark-Plugs, of which the following is a full, clear, and exact description.

This invention relates more particularly to spark plugs employed in connection with explosive engines.

The primary object of the invention is to provide a simple and efficient device which has its parts so made that they may be readily and quickly separated or locked together in order that one of the terminals may be quickly removed or replaced by another in case this is desired to be accomplished, and which may be readily attached to the engine cylinder by the means which serves to lock the parts together.

A further object of the invention is to provide a sparking device or plug which may be readily and cheaply made; which is strong and does not easily get out of order; which reduces to a minimum the liability of creating an explosion by the device not making a proper spark; which is so constructed that should the insulating-sleeve or member become broken it is not likely to drop into the cylinder; which provides means to assist in keeping the insulating-member or sleeve cool; and in which the device is not likely to be short circuited by soot or other objectionable matter collected in such a way as to prevent a proper spark being produced.

With these and other objects in view, the invention will be hereinafter more particularly described with reference to the accompanying drawings, which form a part of this specification, and will then be pointed out in the claims at the end of the description.

In the drawings, Figure 1 is an enlarged elevation of one form of device embodying my invention. Fig. 2 is a vertical section taken on the line 2—2 of Fig. 1. Fig. 3 is a sectional plan taken on the line 3—3 of Fig. 1. Fig. 4 is a fragmentary sectional plan taken on the line 4—4 of Fig. 2 showing the locking device or wrench in position for removing the insulating-member or sleeve, or using the wrench to secure the plug-member to the cylinder. Fig. 5 is an inverted plan

view. Fig. 6 is a detail elevation of the insulating-member carrying one of the electric terminals. Fig. 7 is a fragmentary detail side elevation of the plug-member and terminal. Fig. 8 shows an elevation, partly in section, of a slightly different form of insulating-sleeve or member. Fig. 9 is a section taken on the line 9—9 of Fig. 8. Figs. 10 and 11 show a slightly different form of locking device or wrench. Fig. 12 shows how the wire from the electric supplying means may be connected to the terminal carried by the insulating-member. Fig. 13 is a detail perspective view of the electric wire attaching device. Fig. 14 is a section taken on the line 14—14 of Fig. 12. Fig. 15 is a sectional plan view, showing slightly different means in which the locking device may be operated from two sides instead of one; and Figs. 16 to 20 show changes that may be made in parts of the sparking device.

The spark plug or device has a plug-member 10 either of steel or other material, which may have a polygonal or other surface 11 to adapt the same to be rotated by a wrench, and has a tapering screw-threaded portion 12 which is adapted to fit snugly in a threaded aperture in the cylinder in the usual manner. This plug member 10 has an eccentrically arranged opening 13 in which is adapted to fit an insulating-member or sleeve 14 which may be of porcelain, mica or any other suitable material. The plug 10 has a boss or cylindrical portion 15, and is provided with a longitudinal slot 16, which extends into the opening 13 of said member, and at the lower portion of the slot 16 is a transverse and peripheral slot 17 forming a continuation of the slot 16, so that they form together a substantially L-shaped slot above the part 11 of the plug-member, and in the slot 16 is adapted to fit a lug or projection 18 forming a part of the insulating member 14, so that when said member is placed in the position shown in Figs. 1 and 2 the said lug will prevent independent rotary movement of said insulating-member.

To lock the insulating-member to the plug-member 10 so that the two parts may be readily and quickly separated from each other or locked in their proper positions, I provide the member 14 with an enlarged part 19, which is adapted to fit in an en-

larged part of the opening 13 of the plug-member, and in the enlarged part 19 is arranged an annular groove 20. As the opening 13 in the plug-member 10 is eccentrically arranged with respect to the outer surface of the part or boss 15 of the plug-member 10, the insulating-member will be nearer the periphery of the boss 15 at one part than the other owing to this eccentric arrangement as shown best in Figs. 3 and 4. A locking device or wrench 21 having a body or spanner portion 22 and a handle portion 23 is adapted to fit over the boss 15, so as to be rotatably held thereon. The spanner portion of the locking device 21 is provided with an inward-projecting lug or tooth 24, which is adapted to move in the transverse slot 17 of the plug-member 10, and said lug has its surface slightly raised above the main surface of the locking device, so that it will frictionally engage the upper surface of the slot 17 and hold said device in any position that it may be placed. As will be seen when the locking device is in the position shown in Fig. 3, the lug 24 will enter the groove 20 of the insulating-member 14, and when given a slight rotary movement will hold the same from being removed from the member 10, while if the device is moved to the position shown in Fig. 4, the said lug or tooth will be removed from the groove so that the insulating-member may be readily removed, or can be placed in position without detaching the locking device from the plug-member 10, the said locking device being adapted to be placed in position on the boss 15 by causing the tooth 24 to register with the slot 16, thus making the locking device entirely independent of the insulating-member and the plug-member 10. By this means the insulating-member 14 may be quickly attached to or removed from the plug-member 10, and the locking device or wrench 21 may be used to detach the plug-member 10 from the cylinder, or attach said member thereto by causing the tooth 24 to engage the plug at either end of the slot 17.

The lower part or extension 25 of the member 14 is somewhat smaller than the opening 13, so as to provide a chamber 26 within the plug-member, so that the explosive mixture may enter the chamber for the purpose of keeping said extension cool, and to provide means whereby a spark will be created at the proper time, which will reduce the liability of not causing an explosion to a minimum. The plug 14 is provided with a longitudinal opening in which is arranged a conductor 27 having its lower end somewhat reduced so as to provide a terminal point 28 for the electric current. This conductor or electrode 27 has an enlarged part 29 which is adapted to fit in a recess in the end of the extension 25 of the insulating-

member and said conductor has its upper end screw-threaded, and on the threaded ends are the nuts 30 and 31. These nuts may be of any desired shape and may each have a cylindrical body 32 and serve in connection with the part 29 to hold the conductor in the insulating-member. The nuts also serve as the means for connecting the electric wire to the conductor, and for this purpose a device 33 as shown in Figs. 12 and 14 may be employed. This device is made of conducting metal and has two spring members 34 and 35 which are bent in opposite directions and are adapted to span the body portions 32 of the nuts 30 and 31, so that said device 33 may be readily detached from the nuts. The device 33 has its body portion 36 bent, as at 37, so as to lie in the same plane, and has a projecting part 38 which extends at an angle to the part 37, and in said part 38 are grooves in which the end of the wire leading from the electric source may be fastened, the outer end 39 of the device being bent inward toward the body portion to protect the conducting wire, though it will be understood that the device 33 may be dispensed with and the conducting wire fastened between the nuts 30 and 31 through which the electric current passes to the conductor 27.

It is desirable in case of injury to the insulating-member, particularly when made of a fragile material as porcelain, that the parts when broken do not drop into the cylinder, and further that the parts be protected as much as possible at the sparking end to prevent injury and to avoid the collection of soot to prevent a spark being made, or in other ways to short circuit the terminals and thereby prevent the ignition of the explosive mixture. To accomplish these results, I make the end 40 of the plug-member 10 in the form of a cap 41 and provide an opening 42 for the end or terminal point 28 of the conductor 27. The aperture or opening in the cap 41 is large enough to prevent the end 28 from coming in contact with the wall of the opening 42, and extending radially from the opening 42 are the intersecting slots 43 which extend across the cap 41 and terminate in openings 44. These slots serve to prevent short circuiting in case of the end 28 of the conductor being bent or out of alinement as they provide an elongated opening, and by employing the slots and openings the explosive mixture will enter the chamber 13 to cause proper ignition thereof, while the wall of the opening 42 and the size of the point 28 provides but a small surface for the collection of carbon or other objectionable matter to prevent the proper working of the device. The nature of the sparking end of the device might be changed if desired, though as shown it is effective for igniting the ex-

plosive mixture, and at the same time the parts likely to be injured are properly protected.

As will be seen the upper part of the insulating-member or sleeve is enlarged to form a continuation of the boss 15 of the plug-member 10, and said insulating-member is entirely independent of the locking device 21, and serves to carry one of the terminals so that by a rotary movement of the locking device the terminal may be quickly locked to or removed from the plug-member without removing said locking device.

In Figs. 8 and 9 the insulating-member 45 has a metal or other sleeve 46 in which is the annular groove 47. This sleeve is to take the strain off the insulating-member in locking it to the plug-member, particularly when the insulating-member is made of porcelain or some fragile material. The metal sleeve 46 may be extended far enough to include the lug 48, which is adapted to enter the slot 16 of the plug-member to hold the insulating-member against independent rotary movement. The insulating-member whether of the construction shown or of any other form may have one end of the conductor reduced to a point, as at 49, for the terminal, and may have a collar 50 which fits in a recess in the inner end of the insulating-member instead of the enlarged ball-shaped part shown in Fig. 2.

The locking device shown in Figs. 10 and 11 is substantially the same as in the other figures, except that the spanner or body portion 51 has a pin or screw 52 to serve as the engaging and locking means for the insulating-member.

Fig. 15 shows two laterally or peripherally extending slots 53 and 54 for the locking device, so that said device may be made to lock the insulating-member to the plug-member from opposite sides. This is useful when the engine cylinders are small in which case the handles of the locking devices might interfere with each other.

In Fig. 16 the insulating member 55 is substantially the same as that shown in Fig. 8, except that the sleeve 56 fitting around the porcelain part of said insulating-member is provided with teeth or a roughened surface 57 along the vertical part of the annular groove, and this roughened part is adapted to be engaged by the tooth 58 of the locking device 59. In this case the slot 60 is at one side, and as the locking device is moved from the position when the tooth 58 is aligned with the slot 60 to the position shown, the inner edge of said tooth will positively engage the teeth or roughened surface of the sleeve 56, and will rigidly hold the porcelain member against rotary movement. In this case the lug 48 of the insulating-member may be dispensed with if

desired, and instead of the insulating-member being provided with a sleeve the teeth or roughened surface may be made directly on the porcelain or other material of which the said member is made, or said tooth 58 may be so made that it will engage the surface of said insulating-member in such a way as to prevent independent movement thereof. As in the other views the plug-member has the L-shaped slot for the movement of the tooth 58, and to adapt the locking device to be removed from the plug-member when necessary, but the movement of the locking device is opposite to that of the other figures to lock the two members together.

In Fig. 17, the boss 61 of the plug-member 62 has the bearing surface for the locking device as in the other figures, but it is tapered, as at 63, toward the upper part of the boss at one side thereof so as to be concentric at the upper edge thereof with the opening for the insulating member. This permits the insulating-member to be cylindrical throughout its entire length.

Figs. 18 and 19 show a plug-member provided with an open end. Here the plug-member 64 has an opening 65 for the insulating-member 66, and is provided with two terminal points 67 and 68, which are preferably integral with said plug-member. These terminal points are separated from each other and between them is the terminal 69. The terminals 67 and 68 may be formed by rounding the end of the plug-member as well as the opening 65 and then cutting away part of the end of the plug-member according to the size of said terminals.

The construction shown in Fig. 20 is substantially the same as in Figs. 13 and 14, except that there are no grooves in the part 38, and the end 39 may be forced by the screw 70 toward the part 38 to clamp the wire between said part and the end 39.

From the foregoing it will be seen that a simple and efficient sparking device is provided in which one member carrying a terminal may be readily and quickly detached from the other member; that the locking means while held to one of the members may be independent thereof; that effective means is provided to reduce to a minimum the liability of failure of the device igniting the explosive mixture; and that the device may be easily made, and is so constructed that the parts are protected from injury.

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

1. A sparking device, comprising a plug-member having an L-shaped slot at one end and a screw-threaded portion adapted to be attached to the engine cylinder and provided with an eccentrically arranged opening therein, an insulating-sleeve provided

with a peripheral groove adapted to be alined with the L-shaped slot, and a locking device having a handle movable around the plug-member and provided with an inward-projecting tooth adapted to enter the groove of the sleeve and detachably lock said sleeve to the plug.

2. A sparking device, comprising a plug-member having an L-shaped slot at one end and a screw-threaded portion adapted to be attached to the engine cylinder and provided with an eccentrically arranged opening therein, an insulating-sleeve provided with a peripheral groove adapted to be alined with the L-shaped slot, and a locking device rotatable on the plug-member and having an operating handle and a part adapted to enter the groove of the sleeve and detachably lock said sleeve to the plug.

3. A sparking device, comprising a plug-member forming one terminal and having an eccentrically arranged opening therein and a cylindrical boss at one end provided with an L-shaped slot having one part thereof extending peripherally, said member having a screw-threaded portion for attachment to the engine cylinder and provided with intersecting slots at its other end, an insulating-member fitting the opening of the plug-member and having a peripheral groove adapted to be alined with a part of the L-shaped slot, a locking device having a handle and fitting the boss of the plug-member so as to rotate thereon and provided with an inward-projecting tooth adapted to enter the groove of the insulating-member and detachably hold said insulating-member to the plug-member, a conductor passing through the insulating-member and having a reduced end forming a terminal adjacent to the intersecting slots of the plug-member, nuts for holding the conductor to the insulating-member, and a detachable device having members adapted to slip over the body of the nuts and connect an electric wire to the conductor.

4. A sparking device, comprising a plug-member forming one terminal and having an eccentrically arranged opening therein and a cylindrical boss at one end provided with an L-shaped slot having one part thereof extending peripherally, said member having a screw-threaded portion for attachment to the engine cylinder and provided with intersecting slots at the other end, an insulating-member fitting the opening of the plug-member and having a lug fitting the L-shaped slot and a peripheral groove adapted to be alined with a part of the L-shaped slot, a locking device held on the boss of the plug-member so as to rotate thereon and provided with an inward-projecting tooth

adapted to enter the groove of the insulating-member and detachably hold said insulating-member to the plug-member, a conductor passing through the insulating-member and having a reduced end forming a terminal adjacent to the intersecting slots of the plug-member, and nuts for holding the conductor to the insulating member.

5. A sparking device, comprising a plug-member forming one terminal and having an eccentrically arranged opening therein and a cylindrical boss at one end provided with an L-shaped slot having one part thereof extending peripherally, said member having a screw-threaded portion for attachment to the engine cylinder and provided with intersecting slots at the other end, an insulating-member fitting the opening of the plug-member so as to provide a chamber within the plug-member adjacent to the intersecting slots and having a peripheral groove adapted to be alined with a part of the L-shaped slot, a locking wrench fitting the boss of the plug-member so as to rotate thereon and provided with an inward-projecting tooth adapted to enter the groove of the insulating-member and detachably hold said insulating-member to the plug-member, a conductor passing through the insulating-member and having a reduced end forming a terminal adjacent to the intersecting slots of the plug-member, and means for holding an electric wire to the conductor.

6. A sparking device, comprising a plug-member having means for attachment to an engine cylinder, and with a cylindrical boss at one end, an insulating-member eccentrically arranged in the plug-member and having a lug engaging a part of said plug-member, a rotatable locking device removably held to the plug-member and having a part thereof adapted to engage a part of the insulating-member, and electric conducting means carried by the insulating-member.

7. The combination with a plug-member having an eccentrically arranged opening therein and a slot at one end thereof and an insulating-member having an annular groove and arranged in said opening, of a locking device having a handle and a spanner portion adapted to fit over a part of the plug-member and provided with a tooth adapted to enter said slot and the annular groove of the insulating-member and lock the same to said plug-member.

This specification signed and witnessed this 18th day of Nov. A. D. 1907.

LOUIS J. DIRAND.

Witnesses:

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