Nov. 3, 1925. 1,560,278

W. J. MAHAN

PORTABLE APPARATUS FOR IDENTIFYING ELECTRIC CONDUCTORS

Filed Jan. 23, 1924 3 Sheets-Sheet 1

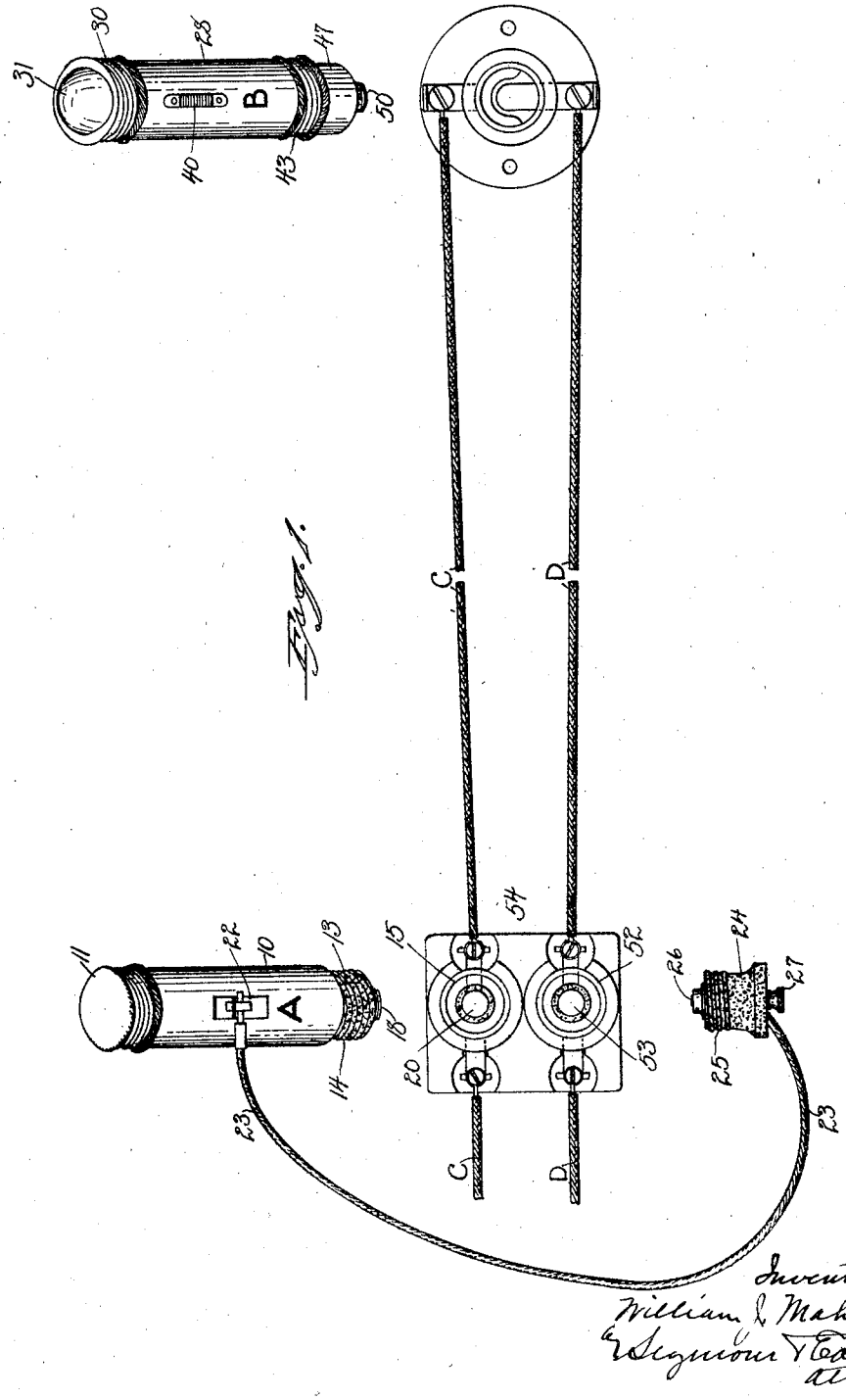


Fig. 1.

Inventor
William J. Mahan
by Seymour & Earle
Attys

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Filed Jan. 23, 1924 3 Sheets-Sheet 2

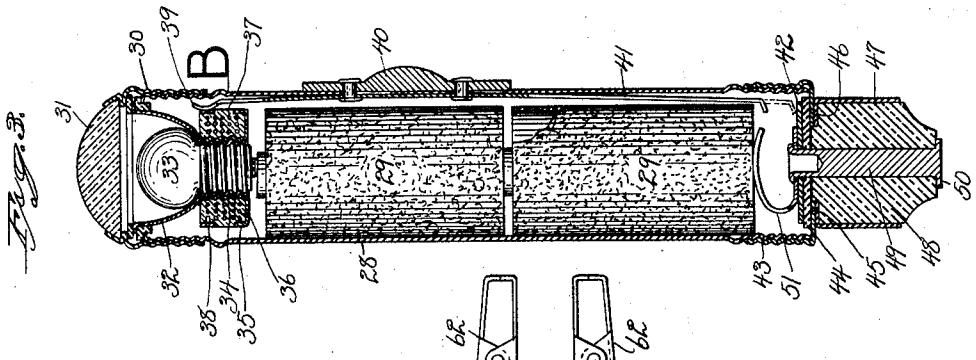


Fig. 3.

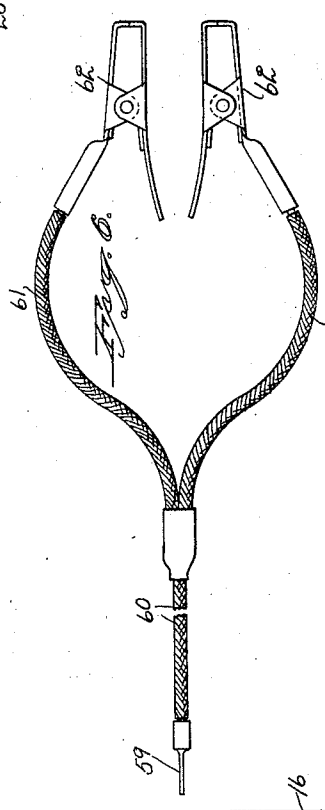


Fig. 6.

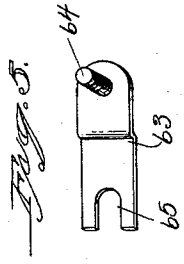
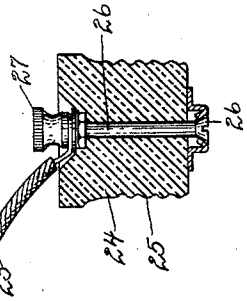


Fig. 5.



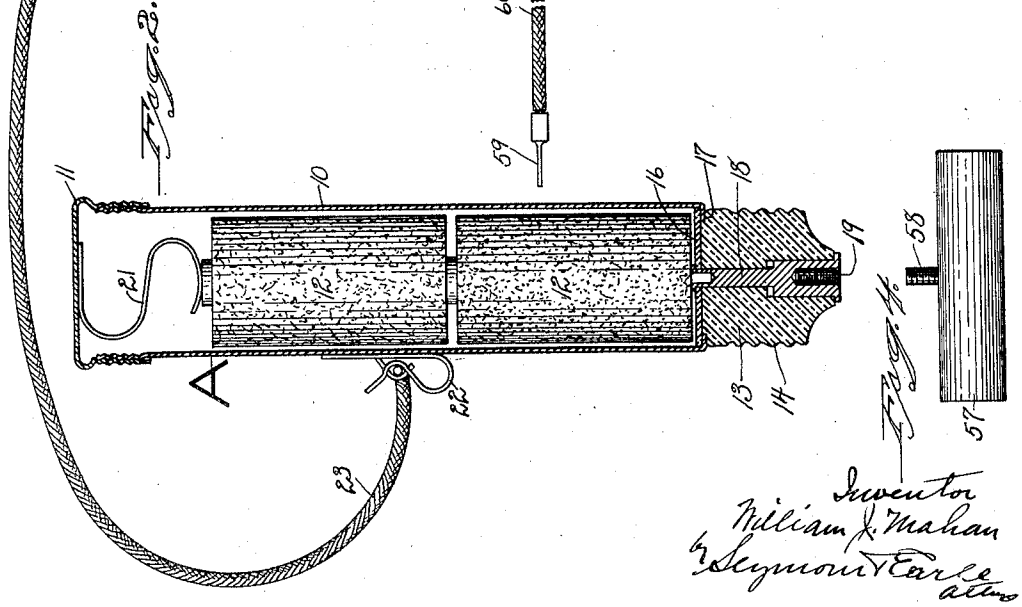


Fig. 2.

Fig. 4.

Inventor
William J. Mahan
by Seymour Earle
Attys

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Filed Jan. 23, 1924 3 Sheets-Sheet 3

Fig. 7.

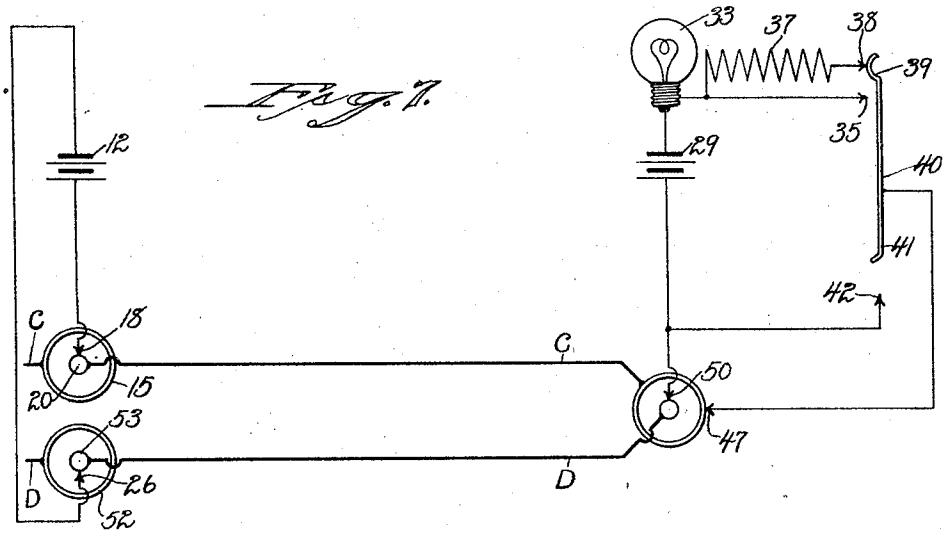


Fig. 8.

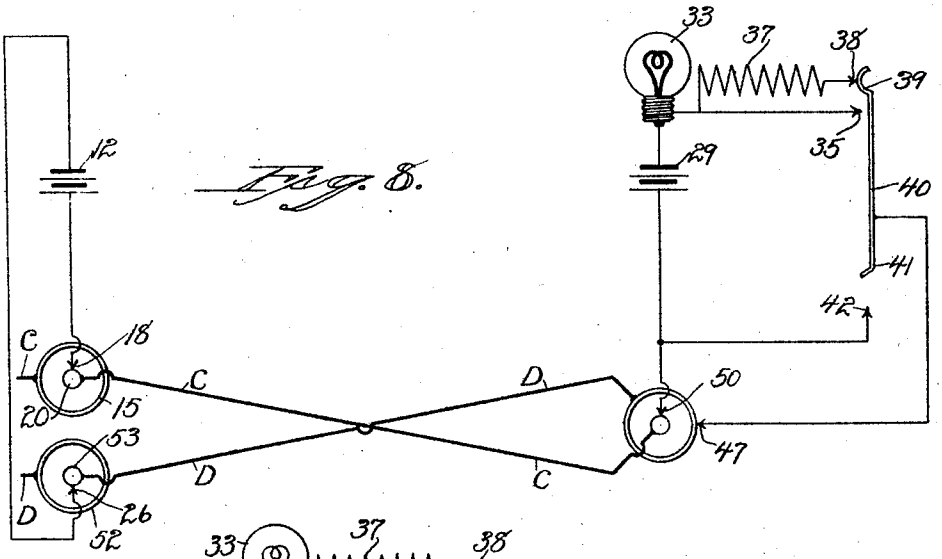
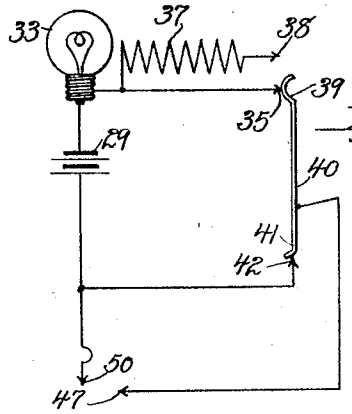


Fig. 9.



Inventor
William J. Mahan
by Seymour Earle
Atty

Patented Nov. 3, 1925. 1,560,278

UNITED STATES PATENT OFFICE.

WILLIAM J. MAHAN, OF NEW HAVEN, CONNECTICUT.

PORTABLE APPARATUS FOR IDENTIFYING ELECTRIC CONDUCTORS.

Application filed January 23, 1924. Serial No. 688,045.

To all whom it may concern:

Be it known that I, WILLIAM J. MAHAN, a citizen of the United States, residing at New Haven, in the county of New Haven and State of Connecticut, have invented a new and useful Improvement in Portable Apparatus for Identifying Electric Conductors; and I do hereby declare the following, when taken in connection with the accompanying drawings and the characters of reference marked thereon, to be a full, clear, and exact description of the same, and which said drawings constitute part of this application, and represent in—

Fig. 1 a schematic view, showing an electric lighting circuit with the two units of my improved apparatus in position for application thereto.

Fig. 2 a view in central, longitudinal section of the unit A of my apparatus.

Fig. 3 a corresponding view of the unit B thereof.

Fig. 4 a plan view of an adapter for cartrige-fuse sockets.

Fig. 5 a perspective view of an adapter for bus-bar connections.

Fig. 6 a plan view of a flexible connector provided with spring-clips.

Fig. 7 a diagrammatic view of a circuit showing my two units A and B coupled thereinto, with the wiring correctly connected to the outlet.

Fig. 8 a similar view, with the exception that the wiring is incorrectly connected.

Fig. 9 a diagrammatic view of the circuit in the unit B when being used as a flashlight.

My invention relates to an improved portable apparatus for identifying electric conductors wherever that may be desired, and for whatever purpose, the object being to produce a simple, convenient and reliable device for the purpose indicated.

With these ends in view, my invention consists in a portable apparatus for identifying electrical conductors characterized by two independently organized but co-operative units, each having a source of electrical energy and two terminals adapted to be connected into a circuit and some approved form of electrically-operated signal brought into play by the co-action in series of the energies of the two units.

My invention further consists in an apparatus of the character above described, in which one of the units is organized to operate as a flashlight.

My invention further consists in an apparatus having certain details of construction and combinations of parts as will be hereinafter described and pointed out in the claims.

For the convenience of illustration and description, I have shown my improved apparatus as constructed for identifying the conductors of an electric lighting circuit, though I would have it understood that my invention is not limited to such a construction, since modifications of it will be required to adapt it for use in other situations, such as testing telephone, telegraph and signaling wires.

In carrying out my invention, as herein shown, I employ two independenty-organized but co-operative units, each functioning as a source of electrical energy, and adapted, when inserted into the circuit to be tested, to act in series to operate an electric indicator, whatever its character, which shall serve to indicate whether the circuit is coupled up right or wrong. For transportation, these two units are packed and carried together, but when in actual use, one becomes stationary, while the other is moved from point to point for identifying purposes. It will be convenient, therefore, to describe one unit as the "stationary" and the other as the "traveling" unit. As an additional matter of convenience, I will apply the letters "A" to the stationary unit in its entirety and "B" to the traveling unit in its entirety.

The unit A consists of a tubular casing 10, threaded at its inner or handle end for the reception of a threaded cap 11 and containing two dry-battery cells 12—12. The outer end of the said casing mounts a cylindrical plug 13 of insulating material having a molded, helical thread 14 adapting it to be screwed into a standard screw-shell 15. The plug 13 is held in place by an insulating washer 16, located within an annular retaining-flange 17 formed by turning inward, at a right angle, the outer edge of the casing 10, as clearly shown in Fig. 2, and pinched between the said plug and washer by the binding action of a long shouldered rivet 18, formed at its flanged outer end with a threaded screw-hole 19, the purpose of which will be described later on, the said

end of the rivet being designed to engage with the center-contact 20 of a standard plug-fuse socket. The outer of the two cells 12 is maintained in engagement with the swaged inner end of the rivet by means of an S-shaped spring 21, secured to the cap 11 aforesaid and engaging with the inner of the two cells. The casing 10 is also furnished with a spring-clip 22, engaged by the inner end of a short length of flexible wire 23, the opposite end of which carries an insulating plug 24 having a molded, helical screw-thread 25 and furnished with a centrally-arranged contact-screw 26, to which the wire 23 is attached by a binding-nut 27.

The traveling unit B has a tubular casing 28 receiving two dry-battery cells 29—29. At its inner or handle end, the casing 28 is threaded for the reception of a threaded cap 30, mounting a lens 31 closing in the reflector 32 of a standard flashlight bulb 33, the threaded stem of which is screwed into the threaded shank of the reflector, the shank of which, in turn, is screwed into the long threaded sleeve 34 of a contact-ring 35 carrying an annular body 36 of insulating material, in which is embedded a resistance-coil 37, one end of which is attached to the said ring, while its other end is attached to a contact-band 38, embracing the said body 36 of insulating material. The said contact-ring 35 and band 38 are alternately engaged by the inwardly-extending spring-arm 39 of a double-throw sliding-switch 40 mounted in the usual manner in the casing 28. The said switch also carries a forwardly-extending spring-arm 41, the outer end of which engages, on occasion, with a metallic washer 42 carried by a threaded cap 43 screwed upon the threaded outer end of the casing 28, the said washer 42 being insulated from the cap 43 by an insulating washer 44 bearing upon the inner face of the inwardly-turned, annular flange 45 of the cap 43. The said flange 45 is clamped between the washer 44 and the inwardly-turned flange 46 of a sheet-metal contact-sleeve 47, encasing a cylindrical plug 48 of insulating material secured to the cap 43 by means of a long contact-rivet 49, furnished at its outer end with a contact-flange 50. The inner end of the rivet 49 passes through the washers 44 and 42 and through the inner end of a spring 51, upon which it is swaged, whereby the parts being described are all drawn together and secured to the cap 43. The said spring 51 acts through the outer cell 29 to maintain the inner cell 29 in engagement with the lamp 33, as required.

It may now be assumed that it is required, for one reason or another, to identify a conductor in its various ramifications in a given lighting circuit. Let it be further supposed that the conductor C is the conductor which, in its various ramifications, it is desired to distinguish from its fellow conductor D. In the first place, the plug 14 of the so-called stationary unit A is screwed into the plug-fuse receiving screw-shell 15, to which the conductor C is connected, whereby its contact-rivet 18 is brought into engagement with the center-contact 20. The insulating plug 25 of the unit A is now screwed into the screw-shell 52 of the companion fuse-socket to which the wire D is attached, so as to bring its contact-screw 26 into engagement with the center-contact 53 thereof. The two fuse-plug sockets above described are of standard construction and mounted in the porcelain block 54. The complementary so-called traveling unit B is now inserted into the outlet to be tested, so as to bring its rivet 50 into contact with the center-contact thereof, and its contact-sleeve 47 into engagement with the threaded screw-shell thereof, the switch 39 having been moved into the position in which it is shown in Figs. 3, 7 and 8. The conductor C of an electric lighting circuit of the character shown should be connected with the screw-shell of the outlet, to comply with certain safety requirements of the national electrical code, from which it follows that the conductor D is connected with the center-contact thereof.

The units A and B having been positioned as described, if the conductor C is connected with the screw shell of the outlet as required, rather than with the center-contact thereof, a circuit will be closed through the batteries of the two units, which will operate, in series, to light the bulb 33 through the resistance-coil 37, which prevents the double set of batteries from burning out the bulb. The lighting of the lamp in this manner indicates to the circuit inspector that the conductors are properly connected, as shown in Fig. 7. If, on the other hand, the conductors C and D are improperly connected or crossed, as shown in Fig. 8, with the conductor C leading to the center-contact of the outlet, the dry-battery cells 12 and 29 will "buck" each other, as the common phrase is, or nullify each other, so that the lamp will not be lighted, and hence no signal will be given. In other words, the absence of a signal, under the circumstances, indicates that the connections in the outlet must be transposed or that the circuit is incomplete. In this manner, all of the outlets, in any given electrical circuit, are successively tested, the unit A being left, as heretofore described, in the fuse-block 54, while the unit B, which has been designated as the traveling unit, is moved on from outlet to outlet, until all the outlets in the particular circuit have been tested. It will be understood that the answer of the test takes place imme-

diately upon the insertion of the traveling unit B into the outlet, so that the testing of the outlets may be done rapidly. While the traveling unit B is being moved from outlet to outlet, it may, if desired, be used as a flashlight, for which purpose its switch 39 is moved back into the position in which it is shown in Fig. 9, whereby its battery 29 is coupled into a local circuit through the bulb 33, the resistance-coil 37 being now cut out of the circuit to the lamp by moving the switch as described. The adaptation of the traveling unit to be used as a flashlight is a matter of great convenience, as these inspections must often be carried on of necessity, in the dark.

In case the circuit to be tested is equipped with so-called "cartridge" fuses, instead of "screw-plug" fuses, a metallic adapter 57, having the general form and size of a standard cartridge fuse and provided with a screw-stud 58, is employed, its said stud being screwed into the hole 19 of the rivet 18 of the unit A, whereby the same is adapted to be applied to standard cartridge-fuse sockets. Under such circumstances, the connector 23 is disengaged from the clip 22 of the unit A and replaced by a connector of the type shown in Fig. 6, comprising, as shown, a member 59 for engagement with the clip 22 and a flexible conductor 60, having branches 61—61, carrying clips 62—62, one of which will be clipped upon the fuse socket of a conductor corresponding to the conductor D. The other clip adapts such a connector to be used in testing three-wire and bus-bar installation circuits.

In Fig. 5 I have shown a coupling-plate 63 having a screw-stem 64 adapted to be screwed into the hole 19 of the rivet 18, the plate 63 having a slot 65 for co-action with the bus-bar screws of a circuit equipped with bus-bars of standard construction. The modifications of Figs. 5 and 6 show the units A and B are not limited to use in testing circuits having screw-shell plug-sockets.

It is apparent that my improved apparatus might be constructed and connected on the principal of having a signal given, such as by the lighting of a lamp, when the test showed an improper connection of the conductors to the outlets, instead of a proper connection thereof, as herein illustrated, this being merely a matter of choice, and would be effected by differently connecting the batteries in their cases, as readily understood by any electrician. Furthermore, the signal chosen may be a light, a buzzer or a bell, or any electrically-operated signal, whether visible or audible, these being details comprehended by my invention, which is broadly characterized by the use of two independently-organized but complementary units, each having a source of electric energy and each having two terminals adapted to be connected into a circuit and having some approved form of electrically-operated signal brought into play by the co-action of the energies of the two units.

I claim:

1. A portable apparatus for identifying electric conductors, comprising two independently-organized, physically seperate complementary units, each having a separate source of electric energy and each having two terminals adapted to be connected into a circuit, and the said apparatus also comprising an electrically-operated signal brought into play only by the co-action in series of the electric energy of the physically separate two units.

2. A portable apparatus for identifying electric conductors, comprising two independently-organized, complementary units, each having a source of electric energy and each having two terminals adapted to be connected into a circuit, and also comprising an electrically-operated signal brought into play only by the co-action in series of the electric energy of the two units, the terminals of one unit being positioned to respectively engage with the center-contact and screw-shell of a standard socket when inserted thereinto.

3. A portable apparatus for identifying electric conductors, comprising two independently-organized, complementary units, each having a source of electric energy and each having two terminals adapted to be connected into a circuit, and also comprising an electrically-operated signal brought into play only by the co-action in series of the electric energy of the two units, the terminals of one unit being positioned to respectively engage with the center-contact and screw-shell of a standard socket when inserted thereinto, and the other unit having a terminal, by means of which it is supported in a fuse-socket and having a flexibly-mounted terminal for engagement with its companion fuse-socket.

4. A portable apparatus for identifying electric conductors, having two independently-organized, complementary units, each having a source of electric energy, and each having two terminals adapted to be connected into a circuit, one unit carrying an electric bulb adapted to be lighted by the co-action in series of the electric energy of the two units, and a switch for placing the said bulb in series with the electric energy of the bulb-carrying unit.

5. A portable apparatus for identifying electric conductors, comprising two independently-organized, complementary units, each having a source of electric energy and each having two terminals adapted to be connected into a circuit, one unit having an electric bulb adapted to be lighted by the co-action in series of the electric energy of the

two units, a resistance interposed between the said bulb and the electric energy of the two units, and a switch for placing the said bulb in series with the electric energy of the unit by which it is carried and for cutting out the said resistance at such time.

6. A portable apparatus for identifying electric conductors, having two independently-organized, complementary units, each having a source of electric energy and each having two terminals adapted to be connected into a circuit, and also comprising an electrically-operated signal brought into play by the co-action in series of the electric energy of the two units, one of the said units being provided with a center-contact terminal for co-action with the center-contact of a standard screw-shell socket, and also provided with a contact-band concentric with the said terminal for engagement with the interior wall of the screw-shell of the said socket.

7. A portable apparatus for identifying electric conductors, comprising two independently-organized, complementary units, each having a tubular casing and a dry-battery cell located therein and each unit having two terminals adapted to be connected into a circuit, one unit having a terminal adapted to support it in a fuse-socket and the other unit having terminals positioned to respectively engage with the center-contact and screw-shell of a standard socket, and also having an electrically-operated signal brought into play by the co-action in series of the cells of the two units.

In testimony whereof, I have signed this specification.

WILLIAM J. MAHAN.