

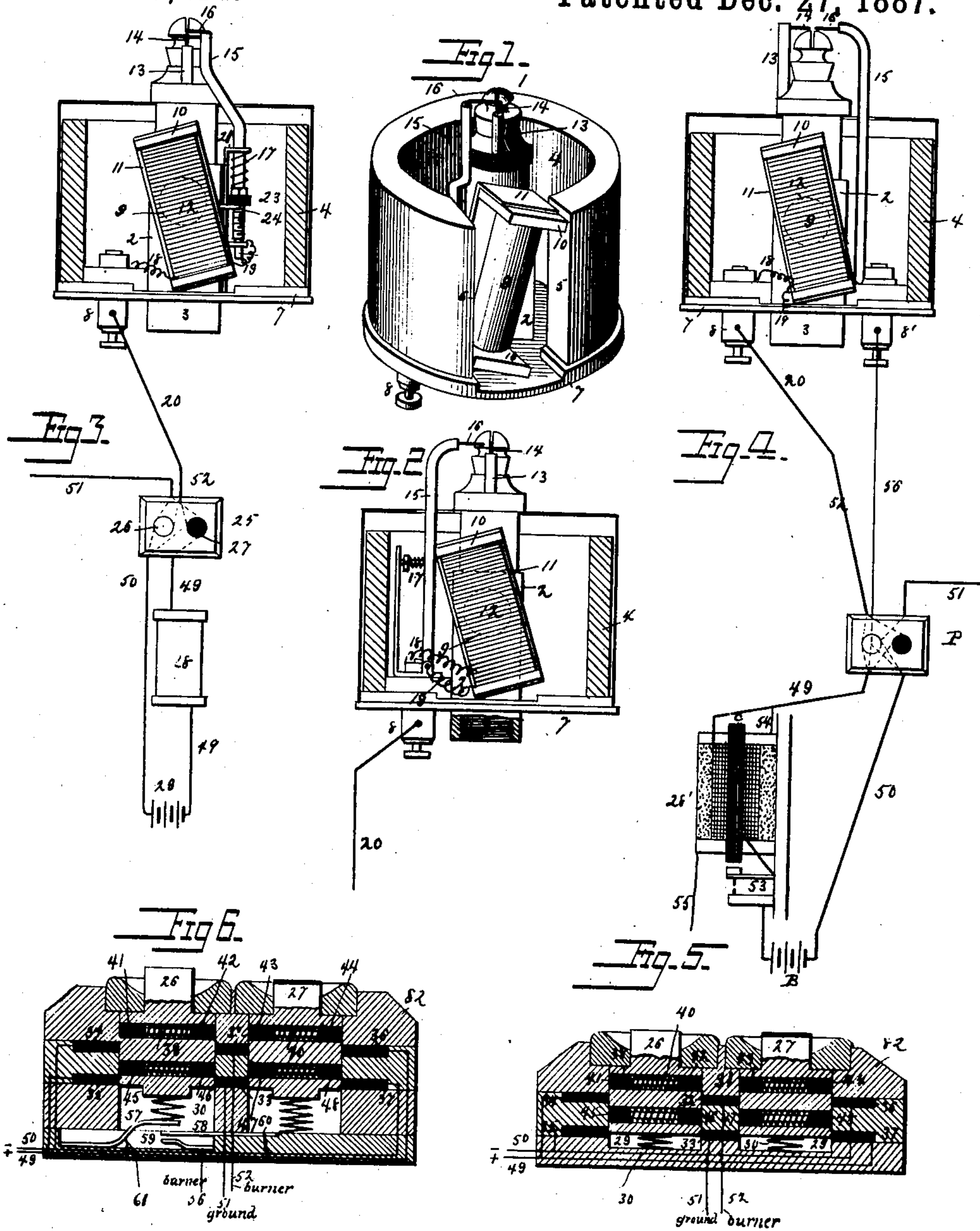
(No Model.)

W. H. DOERING.

SYSTEM OF ELECTRIC GAS LIGHTING.

No. 375,414.

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SYSTEM OF ELECTRIC GAS-LIGHTING.

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To all whom it may concern:

Be it known that I, WILLIAM H. DOERING, a citizen of the United States, residing at Philadelphia, Philadelphia county, Pennsylvania, have invented certain new and useful Improvements in Systems of Electric Gas-Lighting, of which the following is a specification.

The object of my invention is to produce an apparatus for controlling the flow of and igniting the gas employed for illuminating and other purposes by electricity. In accomplishing this object I construct the devices attached to or surrounding an ordinary gas-burner and the key by which the electric current employed is controlled in such a manner as to cause the gas-cock to be opened and closed with the expenditure of a minimum current; and I produce a series of sparks across the path of the escaping gas and continue the production of said sparks at will until the gas has been actually ignited. The reduction of the battery-power required for opening and closing the gas-cock I achieve by a peculiar construction of the magnetic system employed for this purpose. The arrangement is such that the maximum power of a magnet upon a polarized armature is utilized by the action of each pole of the magnet upon a distinctive and opposite pole of the armature, both for opening and closing the cock. A current-reversing key or push-button being necessary for the operation of a gas-lighter of this description, my invention embraces such push-button as specially adapted to the igniter. The continued production of sparks across the escaping gas I have also improved by removing from the circuit the obnoxious resistance of the electro-magnet which actuates the cock, thus obtaining the benefit of the whole current for producing sparks.

The invention will be more fully understood from the following detailed description, with reference to the accompanying drawings, in which—

Figure 1 is a perspective view of one form of my improved gas-lighter; Fig. 2, a sectional elevation of the same slightly modified. Fig. 3 shows a sectional elevation of a modified form of my gas-lighter with the push-button, battery, and spark-coil. Fig. 4 is a similar view of another species of my improvement with its appurtenances, and Figs. 5 and 6 are

sectional views of the push-buttons adapted for the operation of my system.

In Fig. 1 the burner 1 is shown to expand into a square box, 2, and it terminates in a short tube, 3, at its lower end. This tube is screw-threaded internally to be screwed upon a gas supply pipe, as usual. Surrounding the burner and concentric therewith is a tubular permanent magnet, 4, split longitudinally, as shown, and magnetized to have one of its poles at one of its longitudinal edges, 5, and the other pole at the other edge, 6. Both the burner and the magnet are supported by a base-plate, 7, from which a binding-post, 8, insulated therefrom, projects.

An electro-magnet, 9, provided with square pole-pieces 10 10, is placed in front of box 2 and within the slit in the permanent magnet, and a strip, 11, of any desired material—as brass or copper—extends parallel with the electro-magnet and behind the same, and is secured to the pole-pieces, as shown. The strip 11 thus becomes part of the electro-magnet. Its only purpose is to serve as a means for attaching the cock of the burner to the electro-magnet to be actuated by the same. Said cock is attached to and projects from the rear side of strip 11, as indicated at dotted lines at 12. It enters the box 2, and is of ordinary construction. The electro-magnet is thus pivoted at its middle, and when moved to the right or left it will turn the cock to shut or open the passage for the gas to the tip of the burner.

In the position of the electro-magnet shown in Fig. 1 the gas-passage is closed and is held closed by the attraction of the permanent magnet upon the pole-pieces of the electro-magnet, one of these pole-pieces being attracted by one pole, 5, of the permanent magnet, and the other pole-piece by the other pole, 6, of the permanent magnet. If, now, the electro-magnet be energized by the passage of a current through its coils to produce at the upper and lower pole-pieces, respectively, poles of the same names as the poles 5 and 6 of the permanent magnet, the upper end of the electro-magnet will be repelled by 5, while the lower end will be repelled by 6 and attracted by 5. The electro-magnet will therefore swing about its pivot—the cock of the burner—until its upper pole-piece comes in contact with 6 and

its lower pole-piece in contact with 5 of the split tubular permanent magnet. The cock is thereby turned to open the gas-passage, which is held open by the continued attraction of the permanent magnet upon the pole-pieces of the electro-magnet, even if the latter be discharged by the interruption of the current. To again turn the cock to close the gas-passage it is only necessary to reverse the current in the coils of the electro-magnet, as will readily be understood by those skilled in the art. It will also be understood that the arrangement of magnets may be reversed without in the least modifying the operation—that is to say, the split tubular magnet may be the electro-magnet and the magnet connected with the cock may be the permanent magnet.

In the circuit of the electro-magnet or in a circuit acted upon inductively by the circuit which includes the electro-magnet is an elastically-mounted and insulated standard, 15, which in Fig. 1 is shown bent twice at right angles, and which is in the path of the electro-magnet when the same swings into position to open the gas-passage. From the upper end of the standard 15 extends a platinum contact, 16, which, when the magnet is in the position shown in Fig. 1, makes contact with a platinum contact, 14, extending from a short standard, 13, fixed to the burner.

When the electro-magnet swings into position to open the gas-passage, the upper pole-piece, 10, shortly before it comes in contact with edge 6 of the permanent magnet, encounters the elastically-mounted or elastic standard 15, and forces the same over behind the edge 6, and thereby carries platinum 16 out of contact with platinum 14. As will be presently shown, the standards 13 and 14 are in an electric circuit, which, when broken at 14 16, produces a spark at this point and ignites the escaping gas. The arrangement may be changed so that the standard 15 is always out of reach of the swinging magnet and that the platinum 14 and 16 are always out of contact, the spark being in that case produced by an inductorium, as will be explained with reference to Figs. 4 and 6.

Fig. 2 shows the interior and circuit connections of a construction substantially like that shown in Fig. 1. The standard 15 is there shown as an insulated rod pivoted at its lower end and pressed forward by a spring, 17, to establish contact at 14 16. The spring is shown carried by a pin projecting from a rod parallel with standard 15; but this is of no importance, for the spring may be mounted in any suitable manner. The current enters at the binding-post 8, which is insulated from the frame, and is also insulated from standard 15. It then proceeds over wire 18 to and through the electro-magnet 9, and by wire 19 to standard 15, crossing at 16 14 to standard 13, and by the body of the burner and the gas-distributing system of pipes to ground. From the binding-post a wire, 20, connects with the push-button and one pole of the battery, the

other pole of which is grounded. The push-button is constructed to operate as a combined circuit-maker and current-reverser, and a spark-coil is included in the circuit, all of which will be clearly explained further on.

The operation of this device will now be easily understood. Supposing the electro-magnet to be in the position shown in Fig. 1, the gas-passage closed, and the circuit open at the distant push-button. If, now, the circuit is closed at the distant push-button to send a current through the magnet that will polarize the same, so as to cause it to swing about its pivot to the position shown in Fig. 2, said magnet before it reaches the end of its stroke will impinge upon standard 15 and break the circuit at 14 16, producing a spark at this point, which may or may not ignite the gas now escaping at the tip of the burner. The circuit being thus interrupted, the electro-magnet becomes inert, and spring 17, reacting upon standard 15, forces the same back to re-establish contact at 14 16. As soon as this contact is re-established magnet 9 is again energized and again impinges upon standard 15 to break the circuit at 14 16, whereby another spark is produced. It will thus be seen that the electro-magnet, in conjunction with standard 15 and platinum contacts 14 16, operates as a rheotome, and that it will continue to operate as such as long as the circuit is closed at the push-button, producing a number of sparks in rapid succession, which operation should be continued until the gas shall have been ignited.

In Fig. 3 the structural element 15 is a standard movable vertically in guides provided in an insulated metal frame, 21. The standard itself is in this case not insulated, but moves in electrical contact with frame 21. The lower part of the standard is screw-threaded, as shown, and an insulating-washer, 23, upon this portion of the standard is engaged by an arm, 24, projecting from the magnet 9 or from the gas-cock. When the magnet is thrown over to the position shown in Fig. 3, arm 24 lifts the standard against the action of spring 17, whereby contact at 14 16 is broken, a spark produced, and the production of sparks continued by the rheotomic action, which now ensues, as has been explained with reference to Fig. 2. A current-reverser of any suitable construction—such as a push-button, 25—a spark-coil, 28, and a battery, 29, are properly connected in the circuit. The push-button herein described is peculiarly constructed with a view to the requirements of my method of actuating the devices so far described, and I prefer to use the same with my igniter, though of course any other suitable circuit-controller may be used.

Fig. 5 shows such push-button in sectional elevation. In the body 82 of the device, which is of wood, hard rubber, or other insulating material, are two recesses, 29 29, for the reception of plungers 26 27, also of insulating material. The faces of the projecting thumb-

pieces of these plungers are preferably painted with different colors—say white and black, respectively. In the drawings the thumb-piece of 26 is shown white and that of 27 black.

5 These plungers are held in an elevated position by springs 30 30, as usual. Between the two recesses there is a web or partition, 31, and metal pieces 32 33 are inserted in said partition parallel to each other and flush with
10 the faces of the partition on both sides. In alignment with these metal pieces are metal pieces 34 35 36 37, inserted in the body of the device, 34 and 35 being flush with the wall of one chamber 29, and 36 and 37 flush with the
15 wall of the other chamber 29. The whole arrangement is such that metal pieces 34, 32, and 36 are in one line, and metal pieces 35, 33, and 37 in another line parallel to the first and at a suitable distance from the same. Parallel to
20 these lines the two plungers are perforated, there being two perforations in each plunger at distances from each other equal to the distances of the lines of the parallel metal piece in the body 82 and in the partition 31. In
25 each of these perforations there is a metallic pin, 38, surrounded by helical spring 40, and a metal cap is placed upon the head of each pin, so as to be capable of sliding with little friction upon the same. These caps are marked
30 in the drawings with the numerals 41, 42, 43, 44, 45, 46, 47, 48, and each pair of caps is pressed outwardly against the walls of the chamber in which the respective plunger is placed. When a plunger is in its elevated po-
35 sition, the outer faces of the caps are in contact with the insulating substance of the body and partition of the device; but when a plunger is depressed by its thumb-piece one cap of each pair comes in contact with a metal piece
40 in the body and the other cap with a metal in the partition.

The electrical connections are as follows: A wire, 49, from the positive pole of the battery is connected with the metal pieces 34 and 37,
45 and from the negative pole of the battery a wire, 50, is connected with metal pieces 35 and 36. Metal piece 33 in the partition is connected with the ground by a wire, 51, and metal piece 32 is connected by a wire, 52, with
50 wire 20, which leads to the binding-post 8 on the gas-lighter proper, as shown in Figs. 2 and 3. As indicated in Fig. 3, there is a spark-coil, 28, inserted in one of the wires, 49, coming from the battery.

55 The whole operation will now be easily understood.

Assuming the gas cock to be closed, and consequently the electro-magnet in the position shown in Fig. 1 and the circuit closed at
60 14 16, if it is now desired to turn on and light the gas, the white thumb-piece of plunger 26 is depressed. This brings caps 41 and 42 in contact with metal pieces 34 and 32, respectively, and caps 45 and 46 with metal
65 pieces 35 and 33, and the circuit of the gas-lighter is thereby completed as follows: from the positive pole of the battery through spark-

coil 28, by wire 49, to metal piece 34, then through caps 41 and 42 (connected by pin 38 and spring 40) to metal piece 32 and wire 52 7c to wire 20 (see Figs. 2 and 3) and binding-post 8, where it enters the gas-lighter proper. The course of the circuit through the gas-lighter has been described above, and it is here only necessary to remember that it passes to ground 75 by the pipes of the distributing system. The current therefore returns to the push-button by ground-wire 51 and continues to metal piece 33, caps 46 and 45 to metal piece 35, and by wire 50 back to the negative pole of the 80 battery. The current which is thus sent through the electro-magnet has such direction in the coils of the same as to cause it to swing over into the position shown in Figs. 2 and 3. The rheotomic action and production of sparks 85 ensues and continues so long as the white thumb-piece remains depressed, and the operator will hold it depressed until the gas shall have been ignited by one of the numerous sparks produced. When the thumb-piece 90 is released, the sparks cease, but the electro-magnet remains in the same position assumed in the preceding action.

If it is desired to turn the gas off, the black thumb-piece 27 is depressed, whereby a cur- 95 rent in a reversed direction is sent through the coils of the electro-magnet, as follows: from the positive pole of the battery through the spark-coil, by wire 49 to metal piece 37, caps 48 and 47, to metal piece 33, and by wire 100 51 to ground. The current now returns through the ground to the distributing system and enters the gas-lighter by the burner, from which it passes, by a standard, 13, platinum contact 14 and 16, to standard 15, and then 105 continues by wire 19 to and through magnet 9, wire 18, and binding-post 8. From this binding-post 8 the current proceeds by wires 20 52 back to the push-button, to metal piece 32, and then by caps 43 44 to metal piece 36, 110 and by wire 50 to the negative pole of the battery. The current being thus reversed, the electro-magnet will again return to the position shown in Fig. 1, whereby the gas is turned off. 115

In the form of apparatus illustrated in Figs. 4 and 6 an inductorium, 28', is substituted for the spark-coil, and the rheotome is transferred from the burner to said inductorium. Stand- 120 ard 15 is in this case fixed, and platinum wires 14 and 16 are out of contact, but within comfortable striking distance of the secondary of the inductorium. Binding-post 8 is again connected with the electro-magnet by wire 18; but wire 19, coming from the magnet, is in this 125 instance directly connected with the body of the burner, and, consequently, through the distributing system with the ground. A second insulated binding-post, 8', is provided, which is connected with standard 15. In the wire 130 49, coming from the positive pole of the battery, are included the primary of the inductorium and the rheotome 53, and one terminal, 54, of the secondary is connected with the wire

49, while the other terminal is grounded by wire 55. The push-button used in connection with this species of my gas-lighter is illustrated in Fig. 6. It is constructed in the main like that shown in Fig. 5, with such differences as are required to adapt the same for operation of the system that involves the use of an inductorium. The two plungers are fitted to move in recesses of greater depth, so that on depressing them the electrical connections described with reference to Fig. 5 will be first established, and then upon continued depression these connections will be again interrupted. This extended stroke is necessary only for the white plunger 26, but may also be given to the black plunger 27 for the sake of uniformity of construction. The recess in which plunger 26 moves is extended at its bottom both axially and laterally, and spring 30, which has the function of returning the plunger to its elevated position, rests with one end upon a leaf-spring, 57, fixed at one end in the lateral extension of the recess. Under the free end of 57, but not in contact with the same, extends the free end of another spring, 58, and a third spring, 59, is placed with its free end under that of spring 58. In consequence of this construction it will be seen that if plunger 26 is depressed to first make and then break contact with the metal pieces 32 33 34 35 and the metal caps the helical spring 30 will thereby be compressed to such a degree that spring 57 will yield and make contact with spring 58, which latter spring will yield in its turn and make contact with spring 59. The electrical connections to the metal pieces and caps are identical with those of push-button shown in Fig. 5; but, in addition thereto, spring 57 is connected to wire 50 by a wire, 61, spring 58 to wire 49 by a conductor, 60, and spring 59 to binding post 8' by a conductor, 56.

The operation of a system employing the inductorium will now be easily understood.

On depressing plunger 26 the contacts 32 33 34 35, with the caps actuated by springs 40 in the plunger, are first established, and the current from the battery reaches the push-button by wire 49 after having passed through the rheotome 53 and primary of the inductorium. This current takes its course through the push-button and gas-lighter, as follows: by wire 49 to metal piece 34, caps 41 and 42 to metal piece 32, and by wires 52 and 20 to the binding-post 8 on the gas-lighter. From this binding-post the current proceeds by wire 18 to and through magnet 9 and by wire 19 to the distributing system and ground. Returning by ground, the current again enters the push-button by wire 51 and continues by metal piece 33, caps 46 and 45, metal piece 35, and wire 50 back to the battery. The effect of this current, which has the required direction through the coils of the electro-magnet, is understood. The gas will be turned on. As the plunger continues to descend the circuit just

described is again interrupted and new circuit-connections established by contact of springs 57, 58, and 59. The battery-current, after having passed through the rheotome and primary of inductorium, again enters the push-button by wire 49, but now proceeds by wire 60 to spring 58, spring 57, connection 61, and wire 50 back to the battery. The electro-magnet being now cut out of the circuit, the current is strong enough to operate the rheotome, and the high-tension currents generated in the secondary coil are discharged, as follows: from terminal 54 of the secondary coil by wire 49 to the push-button, then by connection 60 to springs 58 and 59, and from the latter by wire 56 to binding-post 8' of the gas-lighter. From binding-post 8' the current continues over standards 15 and 13, crossing the space at 16 and 14 in the form of a spark, and then by the burner to the distributing system and ground, returning by the ground to the other terminal, 55, of the secondary coil.

So long as the push-button is held depressed the production of sparks at 14 16 will continue, and the operator will not release the thumb-piece until the gas shall have been ignited. By depressing plunger 27 a current of reversed direction is sent through the coils of the magnet and the gas is turned off, as has been explained with reference to the other figures of the drawings.

From the above it will be seen that my invention is not limited to the precise construction and arrangement of the devices set forth, but that many modifications may be made therein by those skilled in the art without departing from the spirit of my invention, and which need not be specifically set forth.

I claim as my invention—

1. In a gas-lighter, the combination of a slitted tubular magnet surrounding the burner and an actuating-magnet connected to the gas-cock, one of the magnets being an electro-magnet, substantially as described.

2. In a gas-lighter, the combination, with a slitted tubular magnet surrounding the burner, of an actuating-magnet connected to the cock, one of the magnets being an electro-magnet, and a pole-changer connected in the circuit of the electro-magnet, substantially as described.

3. In a gas-lighting apparatus, the combination of a slitted tubular magnet surrounding the burner and having its poles at the edges of the slit, with a bar electro-magnet connected with the cock, extending along the slit and having its poles projecting into the same, and a pole-changer connected with one of the magnets, whereby the gas-cock is operated to turn the gas on or off by the direct force of all the magnetic poles, substantially as described.

4. In a gas-lighting apparatus, the combination of a tubular permanent magnet having a longitudinal slit and its poles along the edges of the slit, with a bar electro-magnet connected with the gas-cock and having its poles extending within the slit, and a circuit closing

and reversing push-button controlling the action of the electro-magnet to open and close the gas-cock, substantially as described.

5. In a gas-lighting apparatus operating by reversed currents to turn the gas on and off, a push-button composed of two independent plungers actuated by suitable thumb-pieces, two pairs of spring-actuated contact pieces or caps, and one pair of fixed contact-pieces for each plunger, a pair of fixed contact-pieces in operative relation to both plungers, and circuit-connections, substantially as described.

6. In a gas-lighting apparatus operating by reversals of current to turn the gas on and off and to light the gas by the inductive action of intermittent currents, a push-button for directing the current to turn the gas on, and spring-contacts for completing the currents for the

intermittent and induced currents located near the end of the stroke of the plunger and actuated by the same, substantially as described. 20

7. In a gas-lighting apparatus, the combination of an electro-magnet for turning the gas on and off and an inductorium for igniting the gas, with a circuit, including the electro-magnet and primary of inductorium, and a push-button for reversing the current in the magnet and for cutting the same out of circuit, substantially as described. 25

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses. 30

WILLIAM H. DOERING.

Witnesses:

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