(Model.) 2 Sheets—Sheet 1.

W. A. DRYSDALE.

ELECTRICAL GAS LIGHTING APPARATUS.

No. 245,799. Patented Aug. 16, 1881.

FIG. 1.

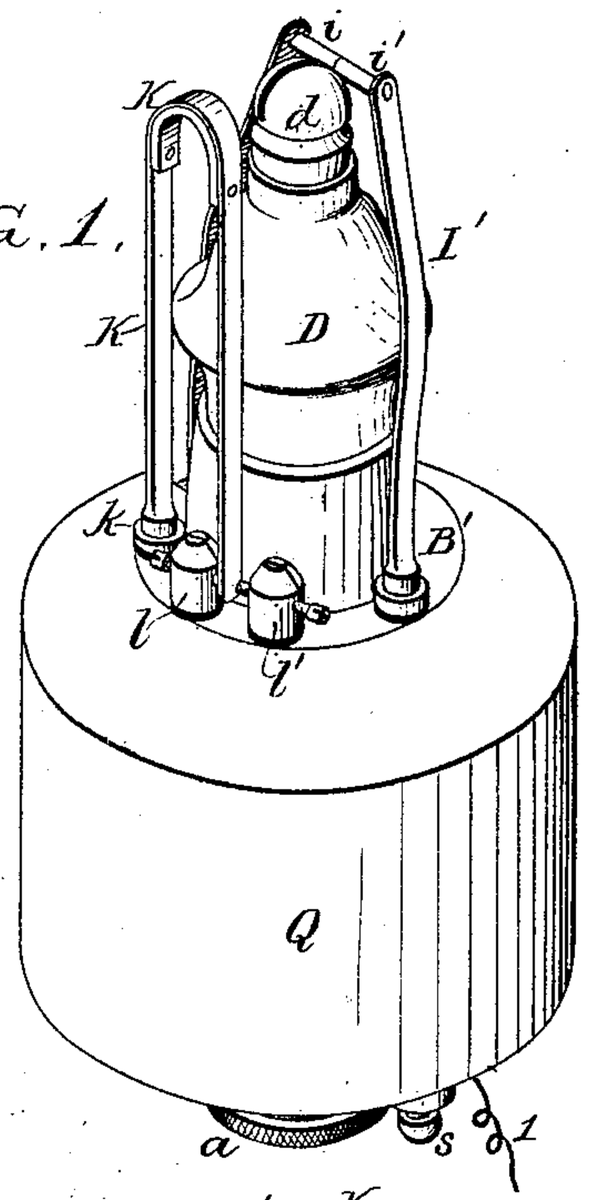


FIG. 3.

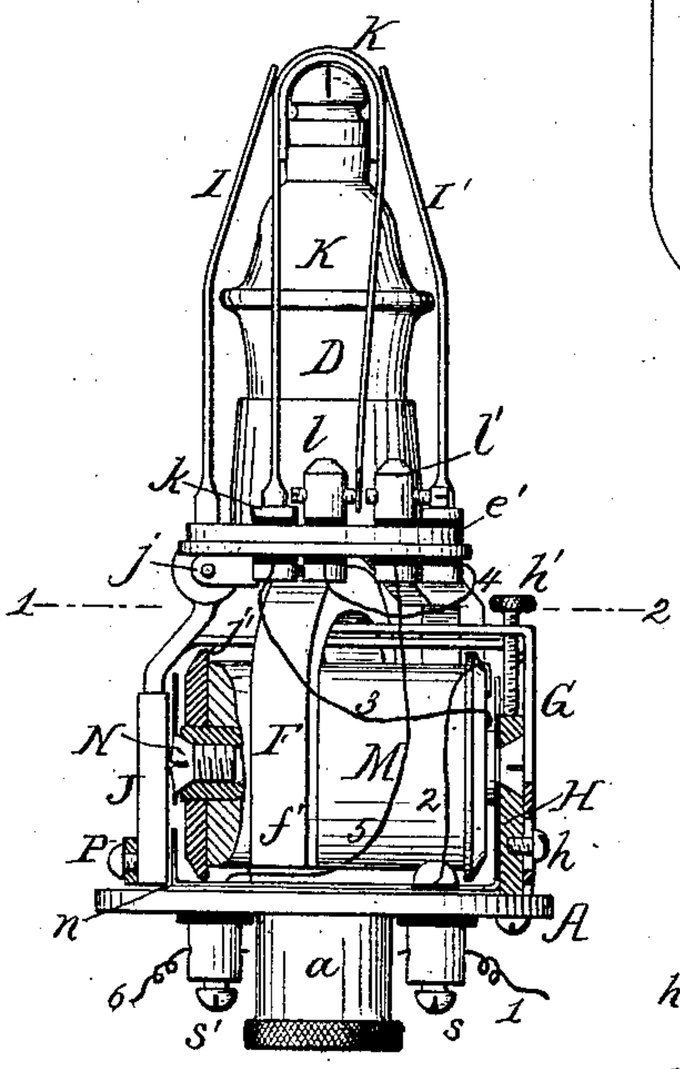


FIG. 2.

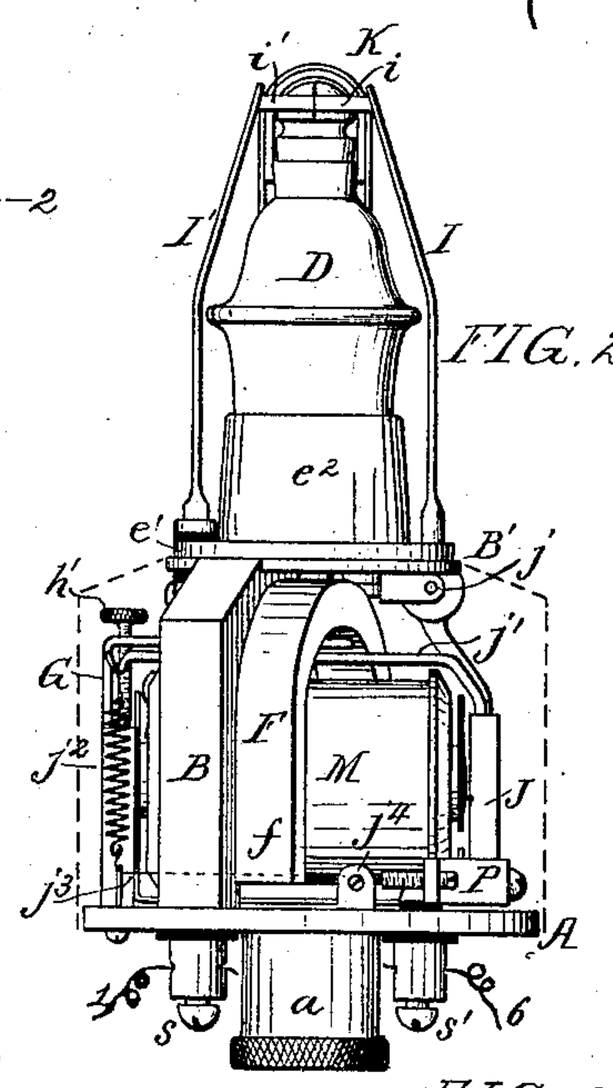


FIG. 4.

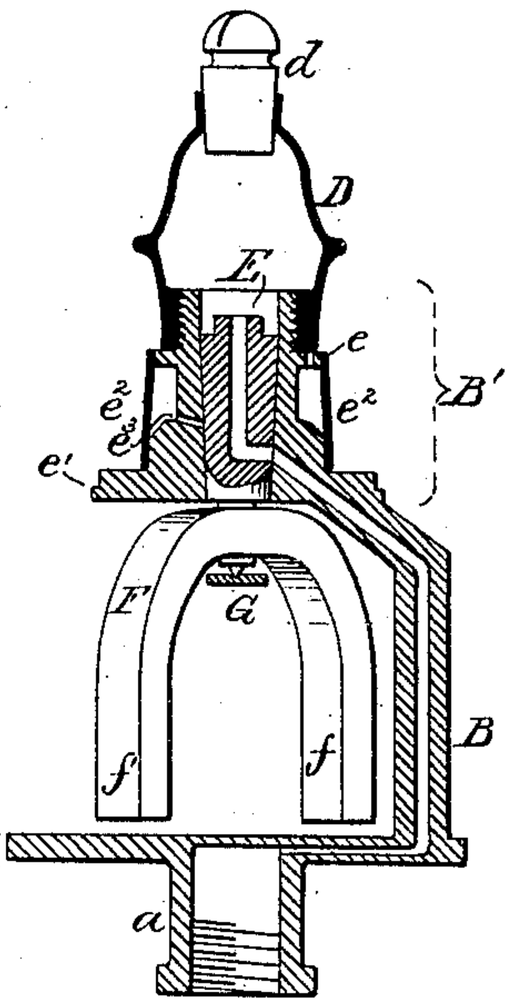


FIG. 5.

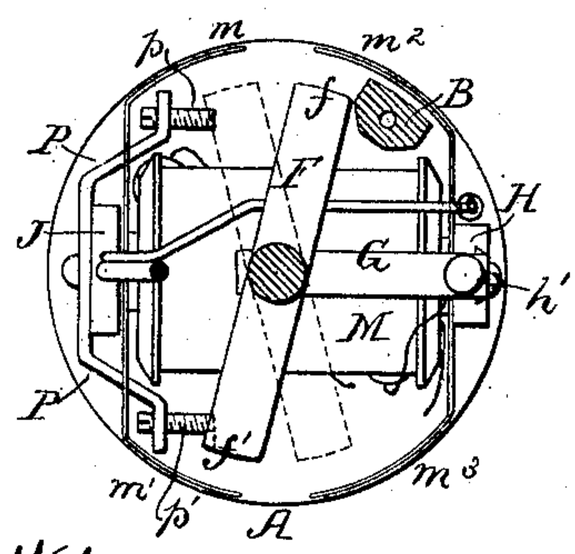


FIG. 6.

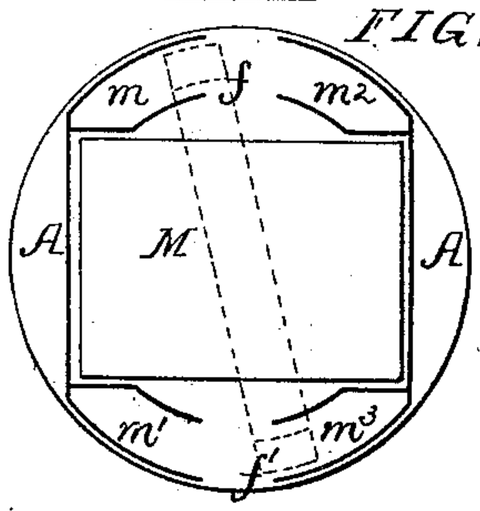
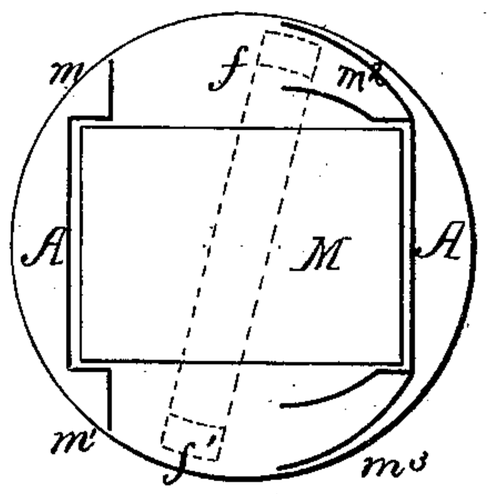


FIG. 7.



Witnesses:
Wm. P. Logan
Harry Smith

Inventor.
Wm A. Drysdale
by his attorneys.
Howson and Sons

(Model.) 2 Sheets—Sheet 2.

W. A. DRYSDALE.

ELECTRICAL GAS LIGHTING APPARATUS.

No. 245,799. Patented Aug. 16, 1881.

FIG. 8.

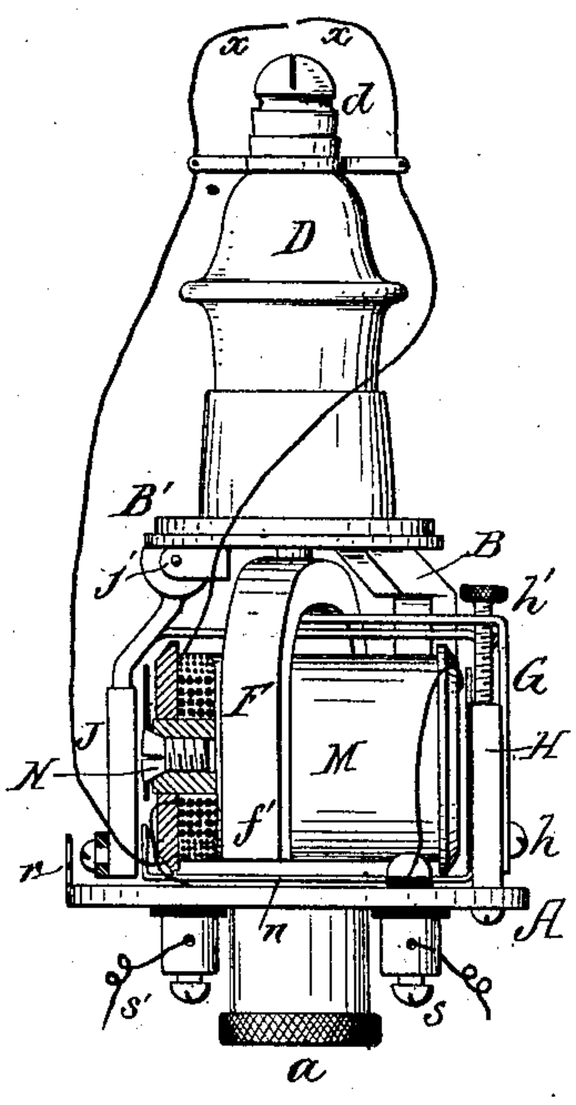
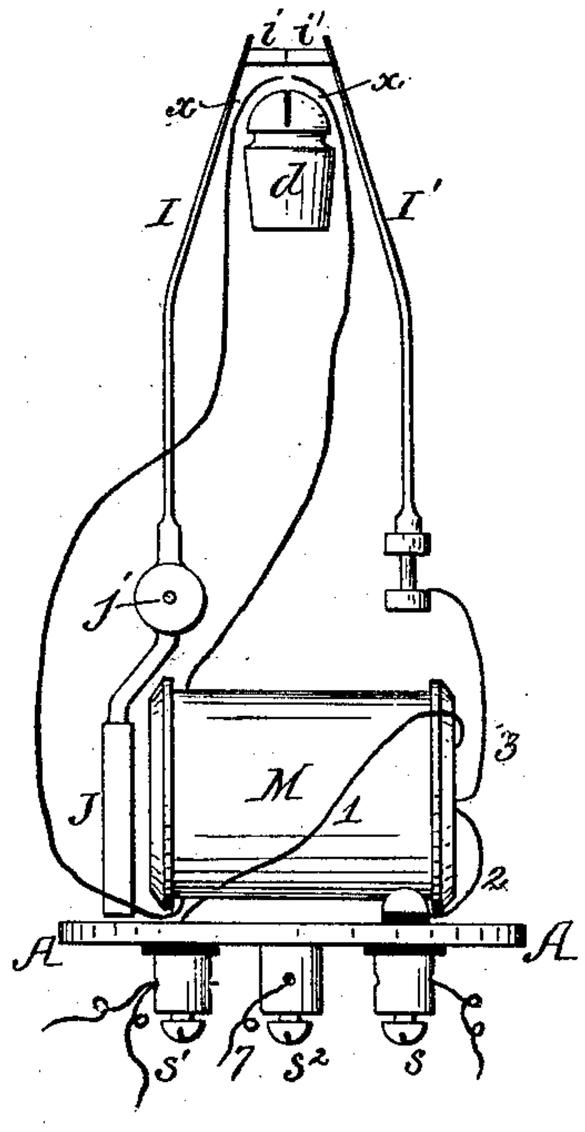


FIG. 9.



Witnesses:
Wm. P. Logan.
Harry Smith

Inventor.
Wm A. Drysdale
by his Attorneys.
Howson and Sons

UNITED STATES PATENT OFFICE.

WILLIAM A. DRYSDALE, OF PHILADELPHIA, PENNSYLVANIA.

ELECTRICAL GAS-LIGHTING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 245,799, dated August 16, 1881.

Application filed May 6, 1881. (Model.)

To all whom it may concern:

Be it known that I, WILLIAM ATLEE DRYSDALE, a citizen of the United States, and a resident of Philadelphia, Pennsylvania, have invented certain Improvements in Electrical Gas-Lighting Apparatus, of which the following is a specification.

My invention relates to certain improvements in that class of electrical gas-lighting apparatus in which the gas is automatically turned on or off and the gas ignited by electrical devices.

The main objects of my invention are to construct the apparatus so as to insure the positive opening and closing of the gas-cock, prevent the clogging of the said cock, and utilize all the power of the electro-magnet, my invention also relating to details of construction, more fully described hereinafter.

In the accompanying drawings, Figure 1 is a perspective view of my apparatus; Fig. 2, a side view of the apparatus with the inclosing-case removed, but its position indicated by dotted lines; Fig. 3, a view from the opposite side, partly in section; Fig. 4, a vertical section of the frame and gas cock and passage, but with the electro-magnetic devices removed; Fig. 5, a sectional plan on the line 1 2, Fig. 3; Figs. 6 and 7, diagram plans showing the modified forms of extension pieces or wings on the electro-magnet; Fig. 8, a view of a modification, and Fig. 9 a diagram illustrating my invention.

Referring to Fig. 4, A is a circular base-plate, having on its under side a nipple, *a*, adapted to be screwed onto the usual threaded tip of a gas-bracket. The plate A carries near its edge a standard, B, having a boss, B′, at its upper end, with a detachable gas-burner, D, and tip *d*, the base-plate, standard, and boss forming the frame. In the center of this boss B′ is a seat for the vertical tapering gas-cock E, the gas from the nipple *a* entering through passages in the base-plate, standard, and cock to the burner when the cock is turned to the position shown in Fig. 4. On the boss B′ are flanges *e e′*, over which is fitted a ferrule, e^2, so as to form a closed chamber for the reception of oil, which can have access to the cock E through the passage e^3. In the upper flange, *e*, is formed an oil-supply opening, which is normally closed by the screwing down of the burner D, so as to prevent the too ready flow of the oil to the cock. The lower end of this cock E projects through the boss B′, and has directly secured to it the pendent horseshoe permanent magnet F, which is so acted on by the electro-magnet described hereinafter as to cause the opening and closing of the cock E at the proper moment. The bottom of the cock is provided with a pivot-point, resting on the horizontal portion of an L-shaped arm, G, the vertical portion of which is adapted to dovetailed guides in a vertical post, H, Figs. 3 and 5. A guiding-screw, *h*, assists in retaining this arm in place, while a vertical adjusting-screw, *h′*, resting on the top of the post H, serves to adjust the arm G, and hence keep the cock E free in its seat, the oil from the reservoir keeping the joint gas-tight.

To the post H is also secured the electro-magnet M, while in front of the opposite end of the latter is the armature J, pivoted at *j* to the frame, and having an arm, I, extending up to the tip *d* of the burner. This arm I is provided with a platinum point, *i*, which, when the armature J is not attracted by the magnet, bears against a similar platinum point, *i′*, carried by the arm I′, secured to the flange *e′* of the boss B′, but insulated therefrom. On the opposite side of the burner, immediately adjacent to the slot in the gas-tip, is the curved portion of an expansion-bar, K, secured at *k* to the flange *e′*, but insulated therefrom, while the opposite free end of the bar K, tipped with platinum, plays between two insulated screw-stops, *l* and *l′*, to change the circuits, as described hereinafter.

To the armature J is secured a horizontal arm, *j′*, passing underneath the permanent magnet and under the control of a vertical spring, j^2, Fig. 2, by which the armature is normally held back from the magnet to the extent permitted by the platinum points *i i′*. This spring may be made adjustable by any of the usual means. In this instance I have shown it connected by a cord, j^3, passing through an eye on the base-plate to a turn-peg, j^4, by which it may be tightened or loosened.

In order to utilize the entire force of the mag-

net, I secure to the back end of the latter, adjacent to the brass post H, a strip of iron, *n*, Fig. 3, which is brought around beneath the magnet, and bent up flush with the front pole of the magnet, so that the magnetism at both ends of the magnet may exert its force on the armature J.

Instead of the usual outside screw-stop to prevent the armature from actually coming into contact with the pole of the magnet, I put a brass screw, N, in the core of the magnet, with its head projecting very slightly beyond the pole.

The legs *f f'* of the magnet F extend to within a short distance of the base-plate A on each side of the electro-magnet M, leaving sufficient space between the said legs and the electro-magnet, however, to allow of the free movement of the permanent magnet to open and close the cock E.

To the lower end of the armature J is secured a bent cross-piece, P, having at its opposite ends screw-stops *p p'*, which limit the movement of the legs *f f'* of the magnet F, so that when the latter is in the position shown by full lines in Fig. 5 the leg *f'* bears against its stop *p'*, while when the magnet is in the position shown by dotted lines the leg *f* bears against the stop *p*.

In order to increase the effect of the magnetic action of the electro-magnet M on the horseshoe F, I attach to the opposite ends of the core of magnet M iron wings *m m' m² m³*, as shown in Fig. 5, the wings *m m'* being cut away at the lower part for the passage of the cross-piece P, and the wing *m²* being cut away for the passage of the cord *j³*. The wings *m² m³* may be formed in one piece with the strip *n*, and the wings *m m'* are secured to the pole by the same screw, N, which serves as a stop for the armature. These wings *m m' m² m³* may be curved around in the path of the legs of the magnet F to within a short distance of each other, or the wings may be made simply in the form of straight projections, as shown at the left-hand side of Fig. 7. When curved, these wings may be on the outside or inside of the legs, or both, as shown in Fig. 6, and in the latter case it is sometimes of advantage to make the two parts of each wing diverge from each other toward their extremities, as shown at the right-hand side of Fig. 7.

The arrangement of circuits is illustrated in Fig. 3. The current enters through the wire 1, secured to the insulated binding-post S, which is connected by the wire 2 with the coils of the magnet, while the wire 3 connects the latter with the expansion-bar K at *k*. The insulated screw-stop *l* is connected by the wire 4 with the arm I', while the stop *l'* is connected through the wire 5 with the insulated binding-post S', the wire 6 from the latter leading to the next burner.

The operation is as follows, the cock E being closed and it being desired to light the gas: When a positive current is sent in through the wire 1, binding-post S, and wire 2, it flows through the coils of the magnet, thence through the wire 3 and expansion-bar K, whose free arm is in contact with screw-stop *l*, the bar being cold. The current thence passes through the wire 4 to the arm I', platinum points, arm I, and the frame, back through the gas-pipe to the ground. This positive current in passing through the coils of the magnet causes its core to become strongly magnetic, with its south pole at the end adjacent to the armature J and its north pole at the opposite end. The wings *m m' m² m³*, being electrically connected with the core of the magnet, become strongly magnetic by induction, *m m'* being of south polarity, and *m² m³* of north polarity, Fig. 5. The leg *f'*, which is the south pole of the permanent magnet, resting against the stop *p'*, as shown in Fig. 5, near the south end of the electro-magnet and of the wing *m'*, there is a repulsion. At the same time the north pole *f* of the permanet magnet is repelled by the north polarity of the wing *m²* and corresponding end of the electro-magnet. The wing *m* at the same time attracts the leg *f*, while the wing *m³* attracts the leg *f'*. As the permanent magnet is secured directly to the gas-cock, the latter must turn with the magnet and allow a flow of gas to the burner-tip. The armature J having at the same time been attracted by the electro-magnet, the platinum points *i i'* are thereby separated, producing a spark, which ignites the gas at the burner. The permanent magnet is secured directly to the plug of the cock, in order to insure its more prompt and certain action than if the cock were acted on through intermediate devices. When the gas is ignited the flame soon causes the bar K to expand and move its free end from contact with the screw-stop *l* into contact with the stop *l'*, when the arms I' and I and the platinum points will be cut out of the circuit, but the electro-magnet left in circuit. The current will then flow through the electro-magnet and bar K, and from the stop *l'*, through the wire 5, to the insulated binding-post S', and thence to the next gas-burner to be lit, and so on to all the burners in succession.

It will be seen that with this arrangement of expansion-bar and circuits the burners can only be lit in their order, so that no one burner can be left unlit, since the expansion-bar of a burner will not switch the current onto the next burner until the gas is ignited. At the moment when the armature is attracted by the magnet that end of the cross-piece P against which rests a leg of the permanent magnet will give the latter an impulse or start in the direction in which it is about to move, and thus prevent accidental sticking of the cock E and its magnet. The continued vibration of the cross-piece with the armature has no effect on the permanent magnet after it has turned, as it is retained by the residual magnetism in the wings *m m³*. If the last burner in the series to be lit is not in sight, a wire may be led from

the binding-post S′ to a bell near the lighting-switch, so that its ringing will indicate that all the burners are lit, and the current may then be switched off; or, the expansion-bar may be left off the last burner, in which case the wire from the magnet M is connected directly to the arm I′, so that the current flows directly to the ground. Where there is but a single burner to be lit the expansion-bar may be left out, and the wire from the coils of the magnet M directly connected to the arm I′.

When the burners have been lit and it is desired to extinguish the lights, a negative current is caused to enter through the post S, reversing the polarity of the magnet and wings *m m′ m² m³*, and causing the permanent magnet F to move in the opposite direction to its first movement, and turning the cock E so as to shut off the gas. As the expansion-bar cools off its free end returns to contact with the stop *l*, ready for the next lighting operation.

If it is desired to light a large number of burners at the same moment, instead of lighting one after the other by the primary current, they may be lit by means of a secondary or induced current produced in a fine wire wound around the primary wire on the magnet M, Fig. 8, the terminals *x x* of this secondary coil being brought close to each other opposite the slit in the burner-tip to produce the spark, while the ends of the primary wire are connected directly to the binding-posts S S′. If, now, a discharge from a strong battery with a condenser in circuit be sent in at S, an induced current will be produced in the secondary coil, and this current in passing over the space between the points *x x* produces a spark which lights the gas.

The devices for operating the cock are the same as before; but the expansion-bar and arms I and I′ are dispensed with, while the armature, which is retained to assist in operating the permanent magnet F, is limited in its outward movement by the stop *r*. When the secondary coil is used the burner should be insulated from the gas-pipe, preferably at the nipple *a*.

If it be desired to arrange any one burner of a system so that it may be lighted by electricity independently of the others, an additional battery, wires, and switch are used in connection with the coils of the electro-magnet of that burner. If it be desired to apply this additional circuit to one burner in a secondary system, however, a very strong battery would be required on this additional circuit; and in order to avoid the necessity of using such strong battery I apply to the particular burner to be lighted in the secondary system, in addition to the terminals *x x*, the arms I I′, carrying the platinum points, as illustrated in the diagram Fig. 9. In this case there are the usual connections from the binding-posts S S′ with the adjacent burners in the system, and one of the additional wires is connected to the post S′, and a current sent through this post and wire 1 to the primary coil of the magnet M, and thence through the wire 3 to the arm I′, platinum points *i i′*, and arm I back through the frame to the battery. As the frames in the secondary system are insulated from the pipes, an additional binding-post, S², is electrically connected to the frame, and a wire, 7, leading thence back to the battery. In this way a small battery may be used to light this one burner through the primary method and platinum points independently of the other burners, while the entire system may be lighted by the secondary method.

I have shown the burner as having a body of light sheet metal, the object of this being to prevent, as much as possible, the conduction of the heat to the gas-cock and other parts of the apparatus.

The magnets, armature, and corresponding parts are preferably inclosed by a case, Q, Figs. 1 and 2.

I claim as my invention—

1. The combination of the rotary plug of a gas-cock with a permanent magnet, directly secured thereto so as to turn therewith, and an electro-magnet adapted to give a partial rotary motion to said permanent magnet, all substantially as described.

2. The combination of the electro-magnet of an electric gas-lighting apparatus with a gas-cock and a permanent magnet embracing said electro-magnet and secured directly to the plug of said cock so as to turn therewith, substantially as described.

3. The combination of the gas-cock and the pendent permanent magnet directly secured to the plug of said cock with an electro-magnet and an adjustable bearing for the pivot-point of said plug and magnet.

4. The combination of the gas-cock and pendent permanent magnet with an electro-magnet, arm G, post H, and adjusting-screw *h′*.

5. The combination of the cock of an electric gas-lighting apparatus with an oil-chamber for supplying oil to the plug of said cock.

6. The combination of an electro-magnet and a movable horseshoe permanent magnet embracing the coils of the electro-magnet with wings *m m′ m² m³* connected to the core of the electro-magnet and adapted to act on the legs of the permanent magnet, all substantially as described.

7. The combination of an electro-magnet and a permanent horseshoe-magnet embracing the electro-magnet with a vibrating armature having a cross-piece, P, adapted to strike one or other leg of the permanent magnet when attracted by the electro-magnet, as and for the purpose specified.

8. The combination of an armature and an electro-magnet having wings *m m′*, with a brass piece, N, securing said wings to the core of the magnet, and serving at the same time as a stop for the armature.

9. The combination of the gas-burner, electro-magnet, armature, platinum points, and