(No Model.)

H. H. CUTLER.

ELECTRIC GAS LIGHTER.

No. 445,728. Patented Feb. 3, 1891.

Fig. 1.

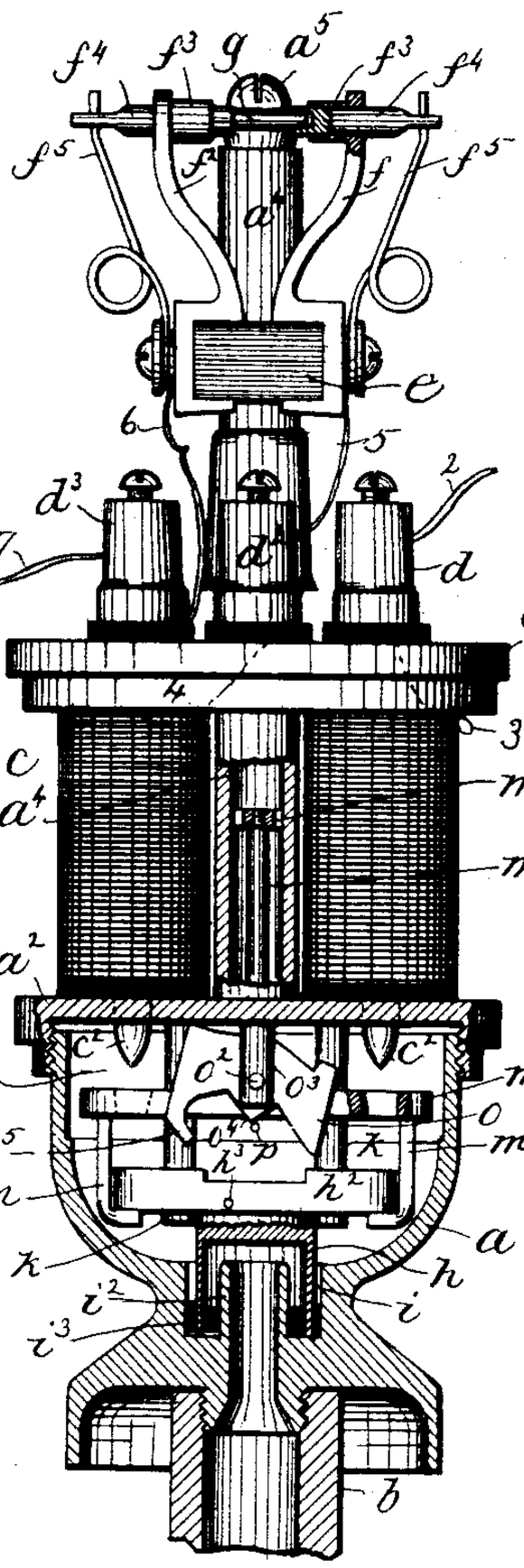


Fig. 2.

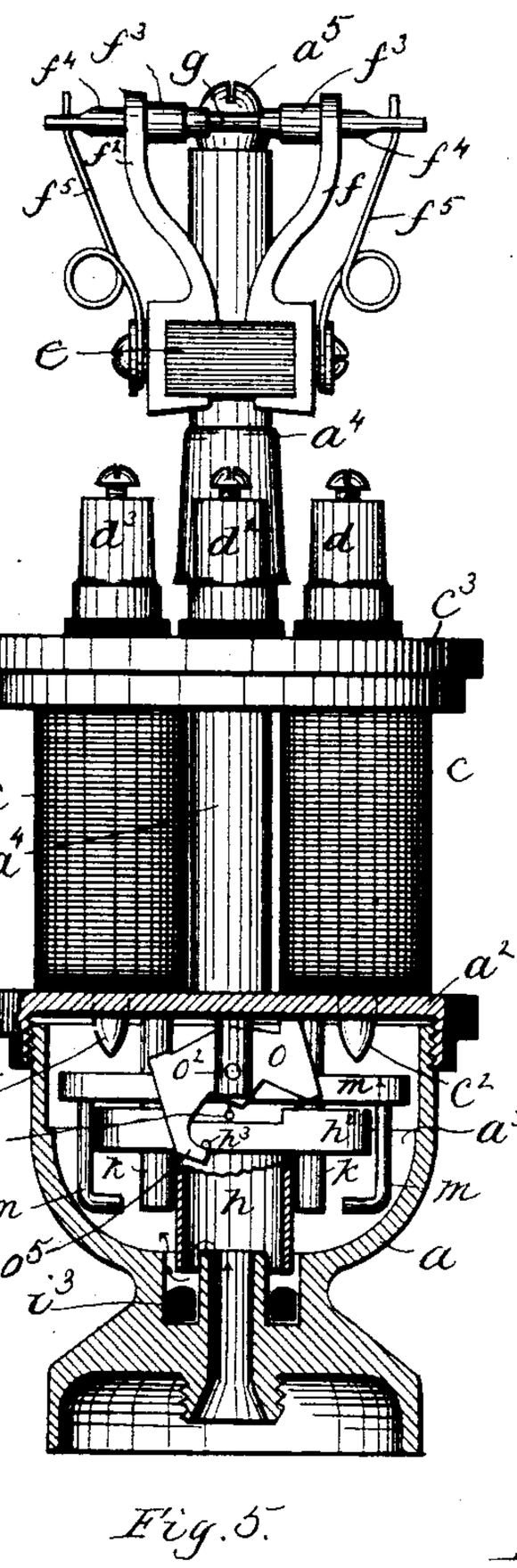


Fig. 3.

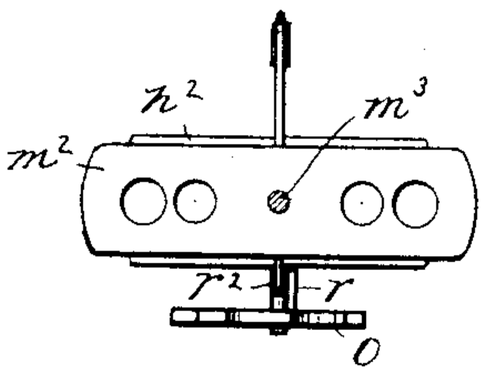


Fig. 4.

Fig. 5.

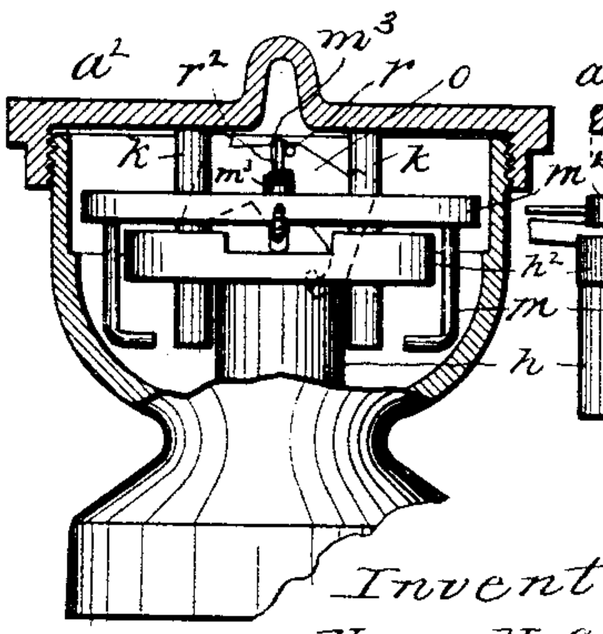
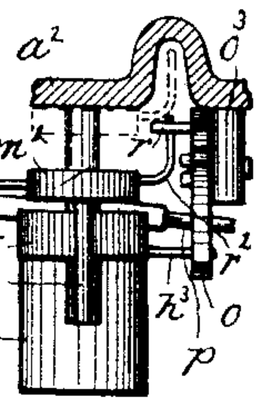


Fig. 6.



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UNITED STATES PATENT OFFICE.

HENRY H. CUTLER, OF NEWTON, MASSACHUSETTS.

ELECTRIC GAS-LIGHTER.

SPECIFICATION forming part of Letters Patent No. 445,728, dated February 3, 1891.

Application filed March 15, 1890. Serial No. 343,991. (No model.)

To all whom it may concern:

Be it known that I, HENRY H. CUTLER, of Newton, county of Middlesex, State of Massachusetts, have invented an Improvement in Gas-Lighting Apparatus, of which the following description, in connection with the accompanying drawings, is a specification, like letters and figures on the drawings representing like parts.

My invention relates to a gas-lighting apparatus especially intended for lighting street-lamps, said apparatus comprising appliances for turning on and igniting the gas and for turning off the gas, so constructed that a large number of said devices can be included in one circuit in series with one another and acted upon by powerful currents, such as employed for electric lighting, it being necessary only to apply said currents for a very short time in order to effect the turning on and lighting of the gas.

The invention is embodied in an apparatus in which the valve-operating mechanism is inclosed in a tight chamber communicating with and forming part of the gasway, the said devices being actuated by an electro-magnet outside of the said chamber, but having its poles extend through the wall of the chamber and into the interior thereof. The valve-operating devices are so constructed that alternate operations of the magnet open and close the valve, which remains in the position in which it was placed by the energizing of the magnet during the time that the magnet subsequently remains demagnetized, and is thrown to the other position the next time that the magnet is energized. The ignition is produced by the incandescence of a stout piece of refractory carbon included in circuit with the magnet and held between spring-pressed clamps that afford a good contact between the said carbon and the more conductive material of which the electrodes are composed.

Figure 1 is a front elevation, partly in section, of a gas-lighting apparatus embodying this invention, shown in the position occupied when the gas-valve is closed; Fig. 2, a similar view showing the parts in the position occupied when the valve is open; Fig. 3, a detail showing the armature in plan view; Fig. 4, a detail of the part that actuates the shifting device by which alternate but similar movements of the armature are caused to open and close the valve; Fig. 5, a rear elevation of the valve-operating mechanism, and Fig. 6 a detail showing a portion of said mechanism in end elevation.

The apparatus comprises a base or casting a, adapted to be connected with the end of the gas-supply pipe, and preferably insulated therefrom by a bushing b of insulating material interposed between the base-piece a and the gas-pipe. The said piece a is cup-shaped, and is provided with a removable cap or bonnet a^2, which, together with the piece a, incloses a chamber a^3, forming part of the gasway, the said chamber being provided with an outlet-pipe a^4, to which the tip or burner proper a^5 is connected in the usual manner. The chamber a^3 contains the moving parts that operate the gas-valve, as will be described, and which are actuated by an electro-magnet c, the poles c^2 of which extend through the bonnet a^2, making, however, a tight joint therewith and projecting down inside the chamber a^3, as shown.

The back strap of the magnet is composed of an iron plate c^3, supported on the gas-tip a^4 at proper height and provided with suitable binding-posts d d^2 d^3 for the circuit connections, which will be hereinafter described, while above the magnet and near the tip is supported a block of insulating material e, which sustains and insulates from one another and from the burner two conducting-brackets f f^2, provided at their upper ends with guides f^3, in which work sliding metallic clamps or slides f^4, which are pressed toward one another by springs f^5, so as to clamp a short stout incandescent bar g between them. The ends of the slides f^4 are socketed to receive a considerable portion of the length of the bar g within them, as shown in Fig. 1, and make an extremely perfect electrical connection between the said slides and said bar, which is of much higher resistance than the other portions of the circuit, so that it becomes heated to incandescence by the current passing through it. A piece of hard graphite or somewhat impure carbon, such as commonly used in hard-lead pencils, is very efficient for the incandescent ignitor g, as its resistance is high, causing it to glow suffi-

ciently to ignite the gas, and it is also very refractory, so that it will last a very long time with the amount of usage required for lighting the gas.

The main circuit may be connected, as shown at 2, with one of the binding-posts, as d, which is connected with one terminal of the magnet c, as shown at 3, the other terminal of said magnet being connected, as shown at 4, with the binding-post d^2, which is connected, as shown at 5, with one of the brackets, as f, while the other bracket f^2 is connected, as shown at 6, with the binding-post d^3, from which the main line extends, as shown at 7, to the next apparatus. Thus a current of sufficient strength in the line 2 7 causes the magnet c to be energized and the igniting-bar g to be heated sufficiently to light the gas if it is at the same time permitted to escape from the burner-tip a^5. The energizing of the magnet c for an instant causes the valve to be shifted from open to closed position, and the reverse, and then retains it in said position until the magnet is again energized by the following means: The valve proper h, as shown in this instance, consists of an inverted cup, the lower edge of which dips into an annular reservoir i, formed in the base of the chamber a^3 around the gas-inlet tube i^2. The said annular chamber i is filled with a suitable liquid, preferably mercury, to a sufficient depth, as indicated at i^3, so that when the cup rests on the bottom of the recess, as shown in Fig. 1, it seals the annular passage i^2 and shuts off the gas from the interior of the chamber a^3, preventing its passage through the outlet-tip a^4 to the burner. When, however, the said cup is raised, as shown in Fig. 2, the gas can pass into the chamber, as shown by the arrows, and pass out through the pipe a^4 to the burner.

The valve h is connected with a yoke or cross-bar h^2, having passages to engage with guide-pins k, projecting down from the bonnet-piece a^2 of the chamber, and said cross-bar is adapted to be engaged by hooks m, connected with an armature m^2 for the magnet c, said armature also having openings and working on the guide-pin k and being provided, as shown, in this instance with a central guide-pin m^3, working in the bore of the outlet-tube a^4, (see Fig. 1,) said pin having a head m^4, which fits loosely within said tube, and is perforated or star-shaped to permit the flow of gas by it through the tube. Thus it will be seen that when the magnet is energized the valve will be lifted by the attractive movement of the armature m^2 to the position shown in Fig. 2, thus opening the gasway, and will remain in this position so long as the magnet remains energized. It is desirable, however, that the magnets should only be energized a very short time, not over a few seconds at a time, and it is therefore necessary to provide means for retaining the valve open after the magnet has been demagnetized and the armature permitted to fall, and as the same movement of the armature is depended upon to both open and close the valve it is necessary that the contrivance should be so arranged that after the valve is opened for the purpose of lighting it shall remain open until the magnet is again acted upon, when the ensuing movement of the armature will again close the valve and leave it closed until the next movement of the armature, and so on. This result is attained by a shifting valve-holder o, pivoted at o^2 upon a stud or projection o^3 from the bonnet a^2, and provided with a cam projection o^4 below the pivot, which is V-shaped, and has its point carried from one to the other side of the line of the pivot as the said shifter is rocked on said pivot. The armature m^2 carries a laterally-yielding arm p, (shown in plan view in Fig. 4,) which normally stands directly under the pivot o^2, and is consequently at one or the other side of the point of the cam o^4, according as the shifter o is in one or the other position. One end of the said shifter is also provided with a supporting projection or hook o^5, which cooperates with a pin h^3, connected with the valve h or its cross-bar h^2. When the armature is raised, the arm p will pass to that side of the cam o^4 which extends to the side of the rocking piece o that is then lowest, and as the armature m^2 continues its upward movement the pin will finally act on the said piece o and rock it to the other position, at the same time shifting its cam with relation to the arm p, so that at the next rise of the said arm from below it will pass to the other side of the cam and rock the shifting plate in the other direction, so that alternate movement of the armature rocks the plate first to one and then to the other side. When the said plate is rocked in one direction to the position shown in Fig. 2, the hook o^5 will engage the pin h^3, and thus sustain the valve until the shifting piece o is rocked to the other position, when the projection h^3 and valve will be no longer supported, but will drop, together with the armature, leaving the valve closed until the next operation of the armature. When the valve is closed, the parts are normally in the position shown in Fig. 1, and a single action of the armature raises the valve and also tilts the shifting piece o from the position in Fig. 1 to that shown in Fig. 2, in which its hook o^5 engages the projection h^3 and retains the valve in open position, although the armature may be immediately afterward released and dropped to its lowest or normal position, as shown in Fig. 1. Then the next movement of the armature will tilt the piece o in the other direction, so that when it descends the valve will no longer be supported and will descend with it and shut off the gas.

In order to insure the proper action of the shifting piece o and to prevent it from becoming accidentally shifted from one to the other position, except when acted upon by the magnet, the said piece is provided with a

locking or retaining projection r (see Figs. 5 and 6) at its rear side when viewed in the position shown in Figs. 1 and 2, the said projection co-operating with an arm r^2, carried by the armature m^2; which when the said armature is in unattracted position lies in the path of the projection r on the shifting piece, preventing it from moving to the other side of the arm r^2; but when the armature is raised the said arm r^2 passes above the projection r, as shown in dotted lines, Fig. 6, thus permitting the said projection to pass to the other side of the arm r^2 in the sudden shifting of the piece o, which is then acted upon by the spring-arm p in the proper direction to shift it and carry its projection r from one to the other side of the arm r^2. The arm r^2 thus constitutes a lock which prevents the piece o from shifting when the armature is retracted, but permits it to shift under the spring action of the arm p when the armature reaches its attracted position, the arm p having been pressed against the shifting piece o in the proper direction to shift it during the attractive movement of the armature. By this means an exceedingly positive operation of the valve is produced, it being practically impossible to get the valve out of time with the alternate actions of the magnet, so that the act of energizing the magnet at any time will reverse the position of the valve, opening it if it has been closed and closing it if it has been standing open.

The apparatus is adapted to work with powerful currents, and is very useful in street-lighting plants in which gas and electric lamps are both used, as the electric current can be thrown onto the gas-lighting circuit for an instant, either to light or extinguish the gas-lamps, as may be required, and may be used the remainder of the time for operating the electric lamps.

I claim—

1. In a gas-lighting apparatus, the combination, with the burner-tip, of insulated brackets adjacent to said burner-tip provided with guides, a spring-pressed sliding clamp working in said guides, and an incandescent conductor working in said clamps, substantially as and for the purpose described.

2. The combination of an electro-magnet and armature with a valve, a shifting valve-holder, and a lock for the latter, all operated by the said armature, the said lock preventing the said support from shifting except when the armature is moved to operate the lock, valve, and valve-support, substantially as described.

3. The combination of an electro-magnet and armature with a valve, a shifting valve-holder provided with a V-shaped cam, and a spring-arm carried by said armature and co-operating with the said valve-holder to shift the same at alternate movements of said armature, substantially as and for the purpose described.

4. The combination of an electro-magnet and armature with a valve, a shifting-valve holder provided with a V-shaped cam, and a spring-arm carried by said armature and co-operating with the said valve-holder to shift the same at alternate movements of the said armature, and co-operating locking projections on said shifting valve-holder and armature, whereby the holder is prevented from shifting except when the armature arrives at or near its attracted position, substantially as described.

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

HENRY H. CUTLER.

Witnesses:
JOS. P. LIVERMORE,
JAS. J. MALONEY.