

No. 651,067.

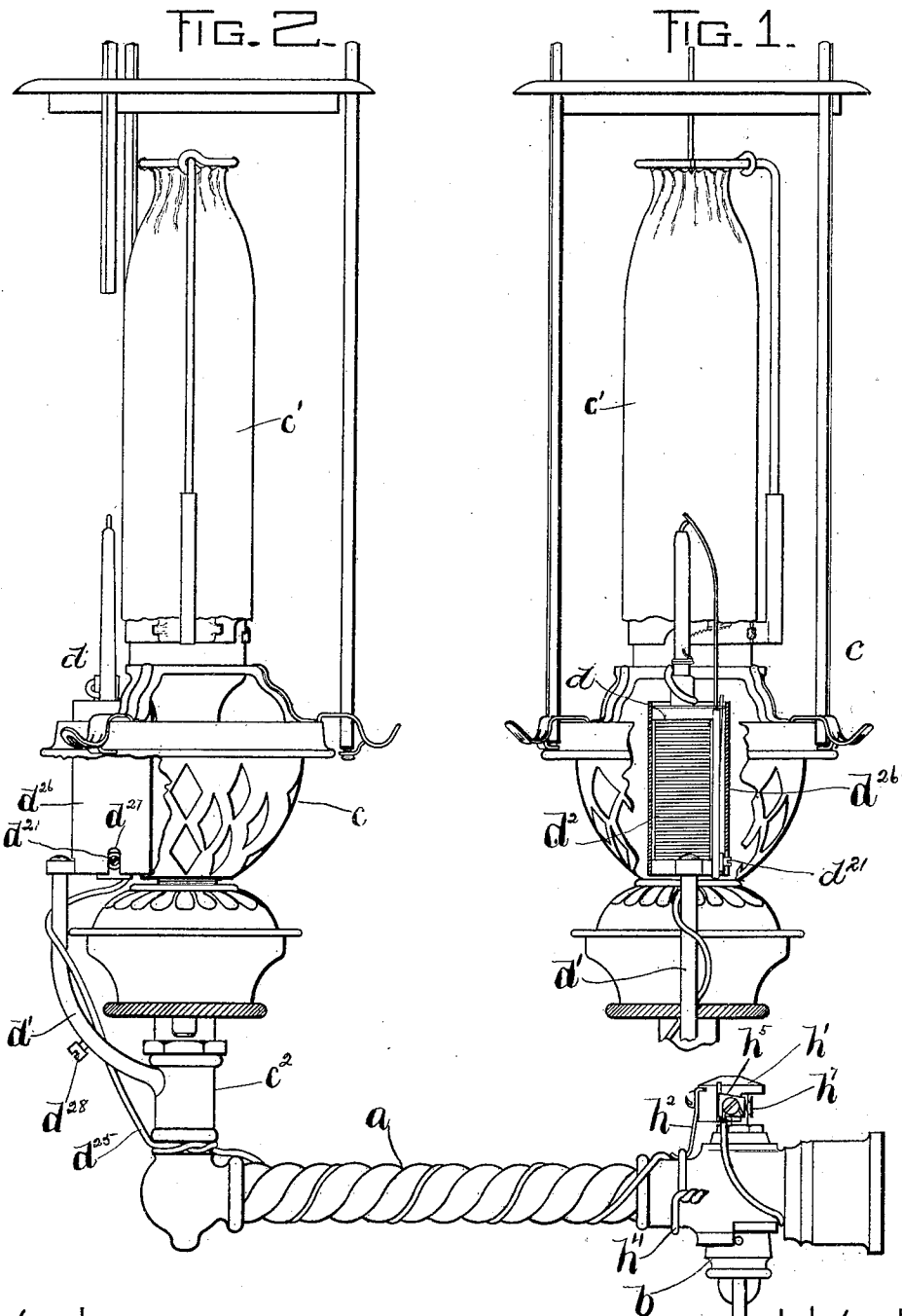
Patented June 5, 1900.

W. E. CRAM.
ELECTRIC GAS LIGHTING APPARATUS.

(Application filed May 5, 1899.)

(No Model.)

2 Sheets—Sheet 1.



WITNESSES:
R. M. Pearson
P. W. Pezzetto

INVENTOR:
Wm. E. Cram
By Wright, Brown & Smith
Attys

UNITED STATES PATENT OFFICE.

WILLIAM E. CRAM, OF BOSTON, MASSACHUSETTS.

ELECTRIC GAS-LIGHTING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 651,067, dated June 5, 1900.

Application filed May 5, 1899. Serial No. 715,639. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM E. CRAM, of Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Electric Gas-Lighting Apparatus, of which the following is a specification.

This invention relates to electric gas-lighting apparatus of the kind described in United States Letters Patent No. 599,121, granted to myself and James H. L. Clegg February 15, 1898. Said patent describes a burner comprising a magnet whose armature operates a vibratile electrode, a coacting electrode constructed as a thermostat, and a switch operated by the turning of the burner plug or valve and included in an igniting-circuit with the two electrodes. The plug upon being operated to turn the gas on closes the switch and starts the armature of the magnet in vibration, thereby causing a series of sparks, which ignite the gas issuing from the orifice of the burner. The heat of the gas-flame thereupon expands the thermostat, breaking the circuit at the point of sparking. The present invention has for its object to simplify and improve the construction of the burner and of the switch in apparatus of the character specified; and to this end it consists in the novel features of construction and arrangement, which I shall now proceed to describe and claim.

Of the accompanying drawings, Figure 1 represents a side elevation, with parts broken away and parts in section, of an incandescent gas-burner provided with a pilot-burner embodying my invention. Fig. 2 represents a side elevation of the burner looking in a direction at right angles to the foregoing view and showing also the gas-bracket, plug, and switch. Fig. 3 represents a diagram and sectional view showing the burner and switch on an enlarged scale, together with their connections. Fig. 4 represents a side elevation of the pilot-burner detached. Fig. 5 represents a longitudinal sectional view through the plug and switch. Fig. 6 represents a view in side elevation, showing my invention applied to an illuminating-burner. Fig. 7 represents a section on line 7 7 of Fig. 3 with parts omitted. Fig. 8 represents a detached view of part of the armature and connected portions.

The same reference characters indicate the same parts in all the figures.

Referring first to the figures, with the exception of Fig. 6, *a* is the arm of a gas-bracket, *b* is the key, plug, or valve thereof, and *c* is a burner of the incandescent type mounted on the end of the arm *a* and having the usual mantle *c'*, adapted to be heated to incandescence by the flame from the Bunsen burner inside of the mantle. Outside of the mantle, in position to ignite the stream of gas issuing through the mantle when the gas is first turned on, is located a pilot-burner *d*, fed through a by-pass pipe *d'*, branching from the main gas pipe or stem *c*² of the incandescent burner. Said by-pass pipe supports a magnet *d*², whose lower pole-piece *d*³ is formed with a lug, into which the upper end of the pipe *d'* is fitted, and the soft-iron core *d*⁴ of said magnet is hollow and constitutes a gas duct or conduit connected with the interior of the pipe *d'* by a short horizontal duct *d*⁵, bored through the pole-piece *d*³.

In the upper end of the hollow core *d*⁴ is fitted the gas-tip *d*⁶, which is hollow and has an outlet-orifice *d*⁷ at its upper end. Said tip is insulated from the core *d*⁴ by an insulation *d*⁸, interposed between the two, and is connected with one end *d*⁹ of the winding of the magnet *d*², as seen in Figs. 3 and 4. The other end *d*²⁵ of the magnet-winding is connected with the switch, as hereinafter explained. At the upper end of the tip *d*⁶, in proximity to the gas-orifice, is an electrode *d*¹², preferably made of platinum to withstand the heat, said electrode coacting with a similar electrode *d*¹³, carried by a vibratile arm *d*¹⁴, in producing a series of gas-igniting sparks when said arm is vibrated. The arm *d*¹⁴ is riveted to the armature *d*¹⁵ of the magnet, which armature extends vertically alongside of the magnet and is arranged to rock on the lower corner 2 of the upper flange or pole-piece *d*¹⁶ of the magnet, said pole-piece being flattened at this point and the pole-piece *d*³ being flattened at a corresponding point to form an abutting face for the lower end of the armature. A thin plate *d*¹⁷ is attached to the magnet above the pole-piece *d*¹⁶ and is formed at one side, above the flattened face of said pole-piece, with an aperture *d*¹⁸, the outer wall of which constitutes

an abutment or bearing for a spring d^{19} , riveted to the armature d^{15} . Said spring exerts a tension which normally moves the lower end of the armature away from the lower pole-piece d^3 and the electrode d^{13} into contact with the electrode d^{12} . The outward movement of the armature due to the spring is limited by the head of a screw d^{21} , passing through a buttonhole-slot d^{22} in the armature and screwing in the pole-piece d^3 . By adjusting this screw the throw of the armature may be varied. There being no pintle in this construction journaling the armature d^{15} , said armature is held from longitudinal displacement by notching the upper end of the spring d^{19} at the points d^{23} , Fig. 8, and also notching the outer edge of the slot d^{18} in the plate d^{17} at the point d^{24} , Fig. 7. The edges of the notch in the plate normally enter the notches in the spring, and thus retain the spring and armature in place. The armature is removed from its normal position by pressing the upper end of the spring d^{19} inwardly and exerting a downward pressure on the armature until the adjusting-screw d^{21} enters the enlarged portion of the buttonhole-slot d^{22} , when the armature can be removed from engagement with said screw and the arm d^{14} withdrawn downwardly through the slot d^{18} . The armature is placed in position by reversing the foregoing operation.

The burner operates by having the terminal d^{25} of its magnet-winding connected with one branch of an igniting-circuit and the gas-pipe connected with the other terminal of said circuit. Said circuit being closed and the gas turned on through the burner, the magnet d^2 will be energized and its lower pole-piece d^3 will attract the lower end of the armature d^{15} , moving the electrode d^{13} at the upper end of the arm d^{14} out of contact with the fixed electrode d^{12} , thus breaking the circuit and causing an igniting-spark above the gas-orifice d^7 . The circuit being broken, the armature is retracted under the influence of the spring d^{19} , and the circuit being again completed through the electrodes d^{12} d^{13} the armature is again attracted, and in this way a succession of igniting-sparks are produced which ignite the gas issuing from the orifice d^7 and cause a flame to be produced thereat. By constructing the arm d^{14} of two strips of metal 3 and 4, having different coefficients of expansion, such as brass and steel, and placing the one having the greater coefficient, as the brass, on the inside I make a thermostat of the said arm. The upper end of the arm is curved over toward the gas-jet, as shown in the drawings, and when it becomes heated by the gas-flame tends to straighten out and separate from the electrode d^{12} . As soon as this expansion takes place the igniting-circuit is broken and the vibration of the arm d^{14} ceases. The sparking-points remain separated as long as the flame exists, and if the flame is extinguished for any reason while the igniting-circuit still remains closed at every point excepting be-

tween the sparking-points the upper end of the arm d^{14} will resume its normal position, and the circuit will again be completed through the electrodes d^{12} d^{13} , and sparking will again ensue, causing the gas to be reignited. The arm d^{14} is made resilient or springy, so as to yield to the action of the spring d^{19} on the armature, and by adjusting the screw d^{21} to vary the throw of the armature one way or the other the length of time during which the sparking action continues before the operation of the thermostat causes it to cease may be varied.

A cylindrical casing d^{26} incloses the body of the magnet d^2 when the device is in use, and said casing is provided with a slot d^{27} at its lower end, through which access may be had to the head of the screw d^{21} , thereby permitting said screw to be adjusted without removing the casing. A screw d^{28} is provided in the by-pass pipe d' for regulating the flow of gas therethrough.

Fig. 3 illustrates the arrangement of the switch and igniting-circuit, by means of which the above-described burner is operated. e and f represent, respectively, the battery and spark-coil usually employed and connected in a branch g in the igniting-circuit which extends from one of the contact members of the switch h to the main gas-pipe, (represented by c^2 in Fig. 3.) The construction of the switch h is as follows: h' is a block of insulating material—such as vulcanized fiber, hard rubber, or the like—mounted above the plug or key d of the gas-bracket, the connection being by means of a metal arm or plate h^2 , attached by a screw h^3 to the block h' and wired to the gas-bracket by a band h^4 , of wire, twisted around the casing b' of the plug or valve and confining the hooked lower end of said arm h^2 . The lower portion of the block is cut away, forming a flat or squared face 5, in the middle of which are a recess 6 and a projecting or overhanging flange 7. h^5 is a metal contact-piece attached by a screw h^6 to one side of the block h' and having a contacting end bent around onto the face 5 of the block. h^7 is a spring-metal contact-arm attached by a screw h^8 to the other side of the block and bent around in front of the contact-piece h^5 . A strip of insulating material h^9 is attached to the inner face of the spring-contact h^7 by means of metal rivets h^{12} h^{13} , the former of which is arranged to make contact with the contact-piece h^5 to close the igniting-circuit. The ends of the contact-pieces h^5 and h^7 and of the attaching-arm h^2 are all turned inwardly into grooves cut in the block h' , thus making their attachment secure. The two contacts h^5 h^7 are connected with the respective branches g and d^{25} of the igniting-circuit, as shown. To operate the spring-arm h^7 of the switch, I provide a cam member which is screwed into the upper end of the plug b in place of the ordinary retaining-screw. i represents the cam member, having a lower screw-threaded portion 8

screwed into the plug and having a lock-nut i' , which screws down onto the washer b^2 of the plug, an intermediate cam portion 9, interposed between the spring-arm h^7 and the block h' and occupying a recess 6 in said block, and an upper stem or journal 10, which has a bearing in a hole in the upper flange 7 of the block. The cam 9 is set on the plug b so that when said plug is turned crosswise of the bracket to turn off the gas the wide portion of the cam presses against the inner face of the spring-arm h^7 and moves the same out of contact with the contact-piece h^5 , as represented in Fig. 3. When the plug is moved to turn the gas on, the cam 9 assumes a position at right angles to that described, as shown in Fig. 5, and allows the spring-arm to move into contact with the piece h^5 and close the igniting-circuit. As soon as this takes place the gas becomes automatically ignited at the burner, as hereinbefore described.

The style of the burner in connection with which my invention is used is immaterial, inasmuch as the invention can be applied equally well to pilot-burners or illuminating-burners. Fig. 6 shows a side elevation of an illuminating-burner having a tip d^{29} of the ordinary form applied to illuminating-burners, the construction being otherwise substantially the same as that which I have described in connection with a pilot-burner.

I claim—

1. A gas-burner having a gas-outlet, a contact member arranged in proximity thereto, a magnet, an armature therefor, and a vibrator arranged to be operated by the movement of said armature and constructed as a thermostat, said vibrator being adapted to coact with the contact member in producing a series of gas-igniting sparks and to be expanded by the heat of the gas-flame, so as to separate the sparking-points and keep them separated during the existence of the flame.

2. A gas-burner having a gas-outlet, co-acting members adapted to produce a series of gas-igniting sparks in the vicinity of said orifice, one of said members being constructed as a thermostat and one being resilient, a magnet having an armature which carries one of the members, a spring arranged to throw the armature away from the magnet, and the sparking member carried thereby into contact with the other sparking member, and an adjusting-screw for regulating the outward throw of the armature, whereby the duration of the sparking action may be varied.

3. A gas-burner having a gas-outlet, a contact member arranged in proximity thereto, a magnet having a pole-piece and a flange, a vibratile arm adapted to coact with the contact member in producing a series of gas-igniting sparks, an armature carrying said arm and fulcrumed on the edge of said flange, said armature having one end arranged in the vicinity of the pole-piece of the magnet and adapted to be attracted thereby when the magnet is energized, a spring attached to the armature and adapted to retract the same, said spring having a notch, a stop for limiting the retractive movement of the armature, and a fixed plate having an abutment or bearing for the spring and a portion entering the notch therein, whereby the armature and connected parts are held in place.

4. In electric gas-lighting apparatus, a switch comprising a block composed of insulating material, an arm attached thereto and adapted to be secured to the gas-bracket in the vicinity of the plug, whereby said block may be positioned over the plug, a fixed contact carried by the block, a spring-contact carried thereby, and a bearing in the block at one side of said contacts, adapted to receive the journal of a cam member connected with the plug for operating said spring-contact.

5. In electric gas-lighting apparatus, a cam member for operating the switch of an igniting-circuit, said member having a threaded portion adapted to be screwed into the plug of a gas-bracket in place of the usual retaining-screw, a nut on said threaded portion, an intermediate cam-shaped portion, and a journal at the other end of said member.

6. In electric gas-lighting apparatus, a gas-bracket having a plug or valve, a block composed of insulating material and attached by an arm to the bracket in the vicinity of said plug and covering the end of said plug, a stationary contact and a spring contact-arm attached to said block, and a cam member screwed into the plug and having a cam portion operating between said spring-arm and the block, and a journal occupying a bearing in the block.

In testimony whereof I have affixed my signature in presence of two witnesses.

WILLIAM E. CRAM.

Witnesses:

P. W. PEZZETTI,
A. D. HARRISON.