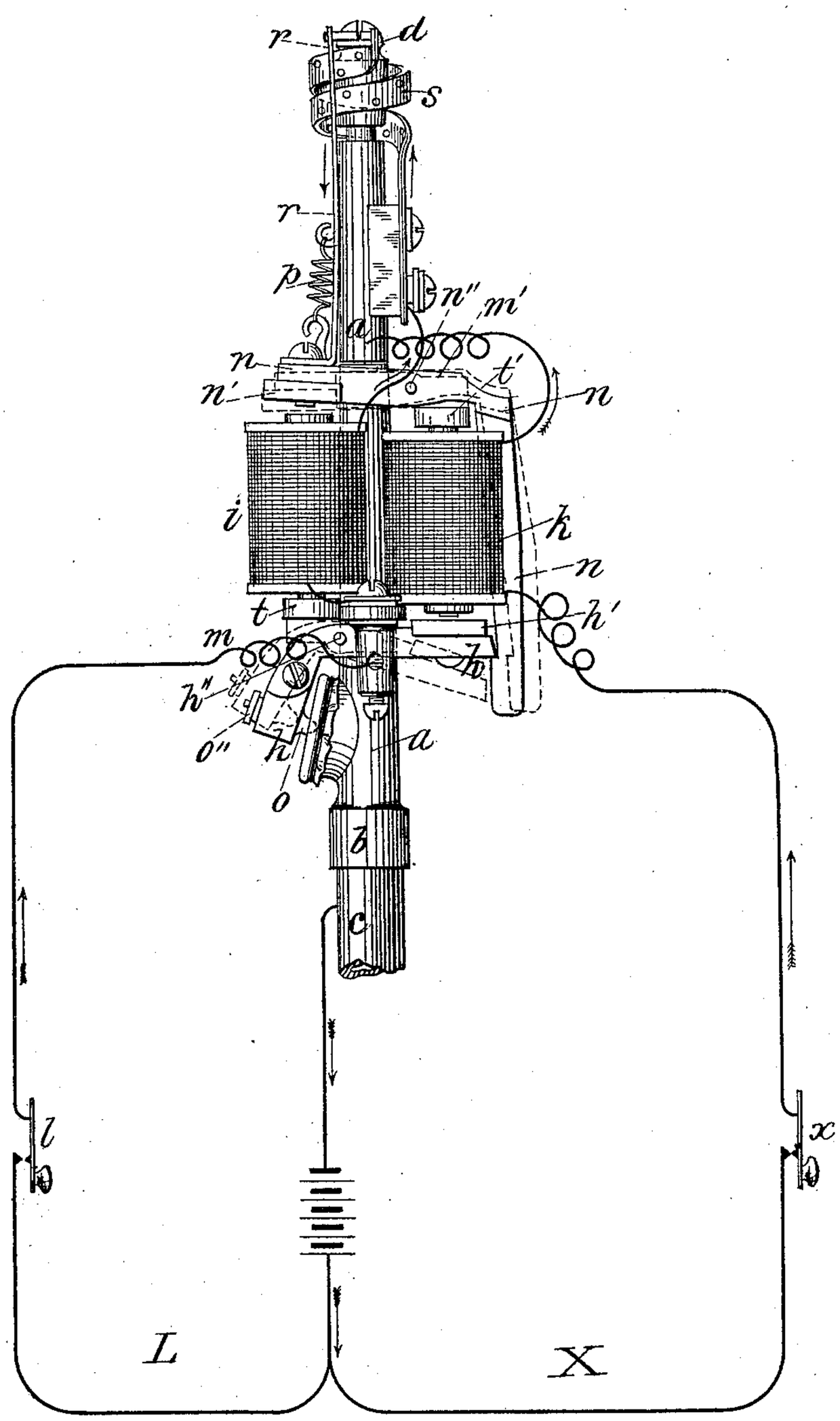
(No Model.) 2 Sheets—Sheet 1.

D. ROUSSEAU.

ELECTRIC LIGHTING GAS BURNER.

No. 248,217. Patented Oct. 11, 1881.

Fig. 1.



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(No Model.) 2 Sheets—Sheet 2.

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Fig. 2.

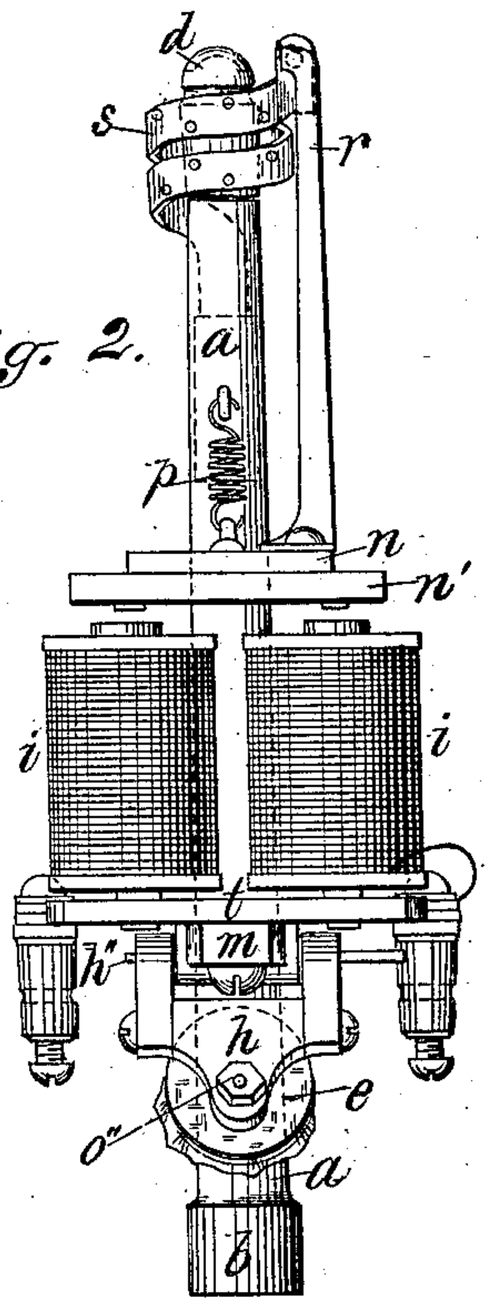


Fig. 3.

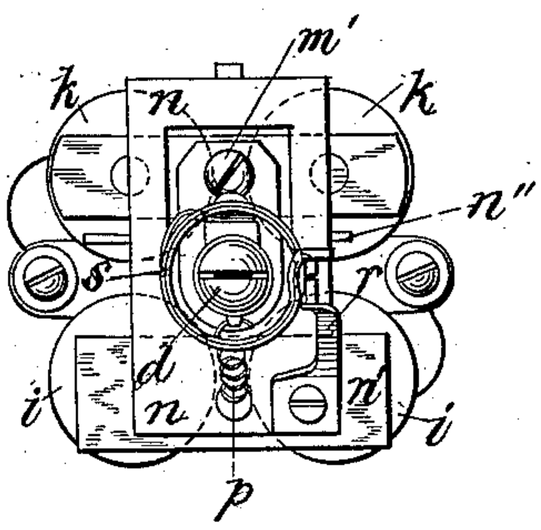


Fig. 5.

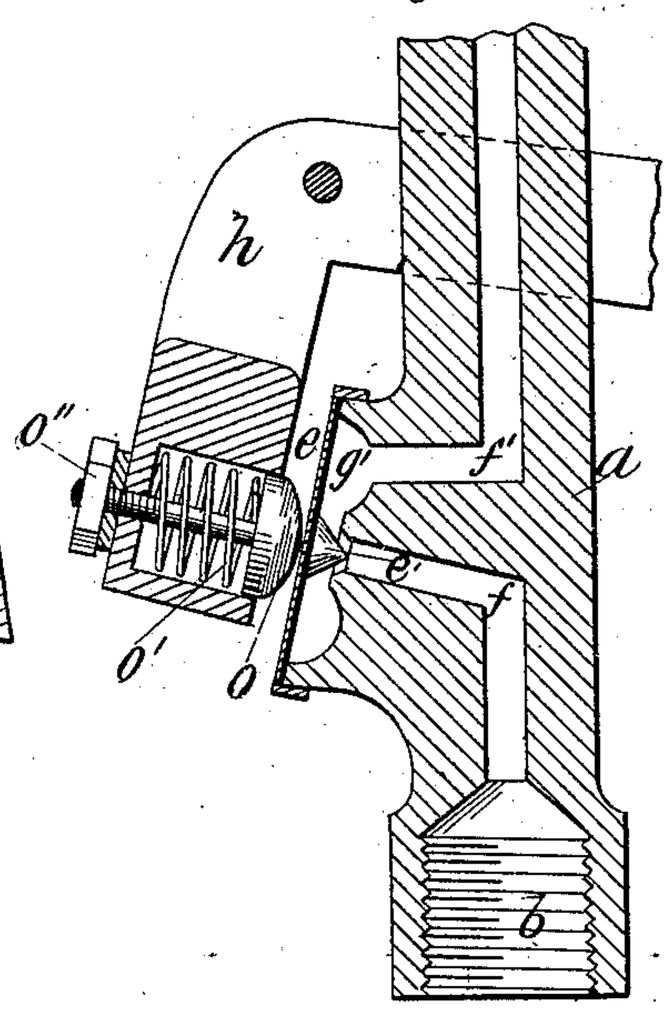
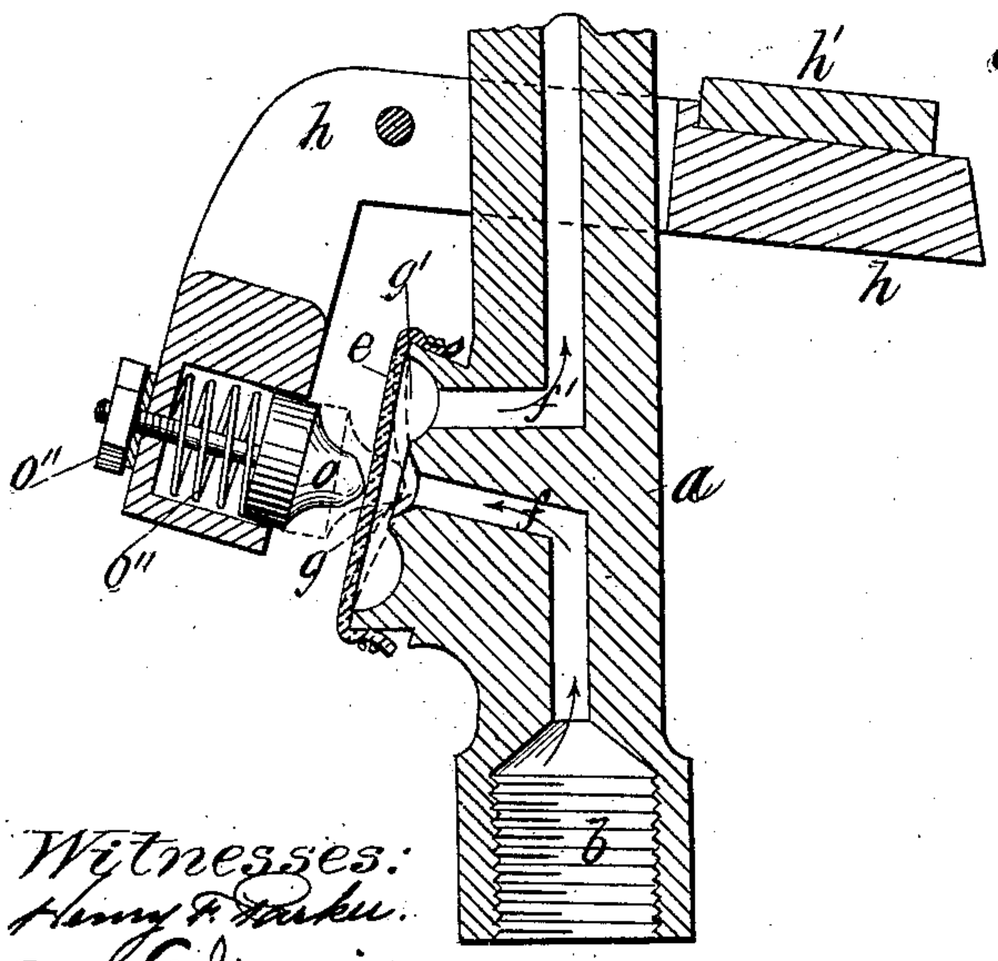


Fig. 4.



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UNITED STATES PATENT OFFICE.

DAVID ROUSSEAU, OF NEW YORK, N. Y.

ELECTRIC-LIGHTING GAS-BURNER.

SPECIFICATION forming part of Letters Patent No. 248,217, dated October 11, 1881.

Application filed August 4, 1881. (No model.)

To all whom it may concern:

Be it known that I, DAVID ROUSSEAU, of New York city, New York, have invented certain new and useful Improvements in Electric-Lighting Gas-Burners, of which the following is a specification.

My present improvement concerns what are usually termed "push-button burners"—that is, burners which are placed at a distance from where the circuit is closed by the operator, and in which the gas is automatically turned on and lighted by the action of magnets on the burner, which become thrown into circuit by the pressure of a push-button or circuit-closing key, from which a wire extends to the distant burner. Such burners, as will be understood, are adapted to be placed in dark cellars or other apartments, so that by depressing a push-button the operator may light the gas in the cellar or other apartment in advance of his entry thereto. These burners are also connected with the burglar-alarms and placed in halls, basements, or any other places about the house, so that in case of a burglarious entrance the gas becomes automatically lighted and the alarms sounded at the same time. Now, in this class of burners the magnets have not only to separate the contact or sparking points to produce the igniting-spark, but also have to operate the gas-valve to turn the gas on or off; and hence it is specially desirable and necessary to construct the burner with an easy-working valve, and to apply the force of the magnets economically and efficiently thereto, this being the chief object of my present improvements. Burners of this kind are usually provided with two distinct magnets, which may be termed respectively the "lighting" and the "extinguishing" magnet, each of which have distinct connections with the battery and with corresponding push-buttons, so that by pressing one button the circuit is closed with one magnet and the gas lighted, and by pressing the other button the other magnet becomes circuited and the gas extinguished thereby. Now, in several former burners of this kind both magnets act on a common armature-lever which plays between them and is connected with both the gas-valve and with the sparking-points so as to separate the points and operate the gas-valve by the impulse of one magnet. In these cases, also, the valve is usually a frictional plug or a lift-valve having a packed stem, the packed or frictional surfaces of which offer comparatively much resistance to the force of the magnets, which is usually weak unless great battery-power be used, and, furthermore, such packed or frictional surface frequently causes the valve to stick and prevent its being opened by the first action of the magnet.

Now, in my present improved burner I employ a distinct armature and armature-lever for each magnet, and the mechanism of my burner is such that the armature of the extinguishing-magnet acts alone or solely to close the gas-valve, while the armature of the lighting-magnet acts to separate the sparking-points, and also serves as a detent or catch to hold the armature of the extinguishing-magnet in its attracted position, in which it acts to close the gas-valve, so that by simply throwing the lighting-magnet into circuit the attraction of its armature acts both to produce the igniting-spark and to release the armature of the extinguishing-magnet, and thus allow the valve to open to turn on the gas. The valve, moreover, is of a peculiar diaphragm form, with the pressure of the armature applied externally thereto and with an internal throttle or seat, so that all packed or frictional surfaces are thus obviated and the pressure of the gas of itself tends to open the valve.

My invention therefore consists, chiefly, in the features here outlined, as hereinafter fully set forth.

Figure 1 of the annexed drawings presents a side elevation of my improved push-button burner with its external circuit-connections represented in diagram. Fig. 2 is a front elevation without the external circuit-connections, and Fig. 3 is a plan view. Fig. 4 is an enlarged fragmentary vertical section of the valve portion of the burner and its operating armature-lever of the extinguishing-magnet. Fig. 5 is a similar view slightly modified.

The main pipe or body of the burner is indicated by *a*, and is of about three times the length of simple gas-burners, having at the base the usual screw-socket, *b*, (see Figs. 1, 2, and 5,) to screw upon the gas-pipes *c*, as seen

in Fig. 1, and provided at the top with the usual slotted jet or lava-tip, *d*. The gas-passage through the burner is not direct, but deflets laterally into and from a circular recess or diaphragm-chamber, *g'*, disposed in inclined position on the side of the burner, near the base, as well shown in Figs. 4 and 5, and also in Figs. 1 and 2. This diaphragm-chamber is covered externally by a flexible diaphragm, *e*, and it will be observed that the induction gas-passage *f* opens under the center of this diaphragm and has a conical mouth or valve-seat, *g*, while the eduction-passage *f'* to the jet opens at one side thereof out of the diaphragm-chamber; hence if the center of the diaphragm be pressed inward it will seat upon and close the mouth of the passage *f* and shut off the flow of gas, and, on the other hand, if pressure on the diaphragm be released, the gas will raise the same and flow freely to the jet. This, hence, constitutes the valve of the burner, and is controlled by the armature-lever *h*, Fig. 4, of the extinguishing-magnet, as will further appear.

Now, the two magnets of the burner are indicated by *i* and *k*, respectively, in Figs. 1, 2, and 3, and are preferably placed on about the middle of the burner, both in upright position, and each on either side thereof, and are of the usual double or horseshoe form, as illustrated. The magnet *i* is the lighting-magnet, and is placed erect—that is, with its poles directed upward—while the extinguishing-magnet *k* is pendent with its poles directed downward. The base or neutral cross-bars *l l'* of each magnet is screwed to respective lugs *m m'*, projecting from the body of the burner, as shown in Figs. 1, 2, and 3, thus securing the magnets rigidly to the burner.

n indicates the armature-lever of the lighting-magnet, and *h* the armature-lever of the extinguishing-magnet, the attracted ends of which are provided with the respective armature-plates *n' h'* of iron. These levers are both of elbow form, as illustrated, and are fulcrumed on the pins *n'' h''*, driven through the supporting-lugs *m m'*, as illustrated. Now, the armature-lever *h*, which controls the valve, is, of course, actuated at its long or horizontal arm by the extinguishing-magnet, while its short or pendent arm carries a small spring-stud or buffer-head, *o*, having a conical center, which rests upon the center of the diaphragm, as seen best in Figs. 1, 2, and 4, and when the long arm of the lever is raised or attracted this conical head presses the center of the diaphragm tightly into the valve-seat *g*, as shown by dotted lines in Fig. 4, thus shutting off the flow of gas to the jet. The pressure of the lever is hence not applied rigidly to the diaphragm-valve, but in an elastic yet forcible manner, which thus renders the action more easy on the magnet and more certain and efficient on the valve than would be the case with a rigid construction.

The buffer-head *o* is arranged, as shown in Fig. 4, in a cavity on the short arm of the lever, which also incloses the spring *o'*, which constantly tends to press out the buffer-head and to bring a nut, *o''*, on its stem in contact with the exterior of the lever-arm, which nut limits the protrusion of the head, and at the same time allows its protrusion and the tension of its spring to be adjusted, as may be desired. Instead, however, of this special construction, any yielding or elastic construction of the lever between the point where the motive power is applied and the point where the pressure is transmitted to the diaphragm-valve may be used.

The diaphragm *e* in Fig. 4 is presumed to be constructed of leather or other soft flexible material, and I would specify that it may be preferred to construct it of an external layer of rubber and an internal layer of leather, as the rubber will be impervious to the gas, while the leather will be best adapted to contact with the valve-seat. Instead of this, however, the diaphragm may be made of a thin flexible plate of metal, as shown in Fig. 5, with an internal conical valve, *e'*, projecting from its center to enter the valve-seat *g*. The diaphragm in Fig. 4 is bound onto the diaphragm-chamber with wire, and in Fig. 5 it is soldered to a metal ring, which is screwed onto the diaphragm-chamber. It may therefore be now seen that the form of valve which I employ is specially adapted for an electrically lighting and extinguishing gas-burner, as its construction is quite simple and inexpensive. Very little motion is required to open it, and the pressure of gas assists this motion, while frictional and packed surfaces are obviated. The magnet has hence great mechanical advantage over the valve, and its opening and closing movements are both very easy and very sure.

In order to have the gas-pressure more strongly assist in opening the valve, the position of the ports, as seen in Figs. 4 and 5, may be reversed—that is, the eduction-port may open under the center of the diaphragm at the valve seat, while the induction-port may open into the diaphragm-chamber, at one side thereof, thus bringing the gas-pressure to bear over the entire surface of the diaphragm when the valve is closed.

The construction and action of the gas-valve being now fully described, it will be understood, on reference to Fig. 1, and to Figs. 4 and 5, that when the valve-lever *h* is attracted, or when it is raised into its attracted position, the valve will be closed and the gas shut off. The lever is shown in this position in Fig. 1, which represents the burner in its quiescent inactive position, with the gas shut off and the circuit-connections open. It will therefore be seen from this figure that the lighting-lever *n* is in its quiescent retracted position, which it constantly tends to assume by the pull of its retracting-spring *p*, and that this lever is formed with a long elbow-arm, *n''*, which projects downward between the coils of the extinguish-

ing-magnet and is formed with a hook or ratchet-shoulder, n''', at its lower end, which catches under the valve-lever h when in its raised or attracted position, thus holding the same up and keeping the valve closed, as illustrated. The burner will now remain in this condition as long as the circuit is not closed at any point; but as soon as the circuit is closed on the lighting-magnet i it will at once attract its armature-lever n, thus releasing the lever h and allowing it to fall by its own weight, thereby causing the valve to open and admit the flow of gas to the jet-tip, and at the same time this motion of the lighting-lever n will separate the sparking-electrodes r s and produce the igniting-spark in the issuing gas-jet, thus turning on the gas and igniting it by the one impulse from the magnet i.

One of the sparking-electrodes, s, is, of course, fixed to the body of the burner, but insulated therefrom, while the other electrode, r, which is a spring-tongue, is fixed to the attracted end of the lever n, as fully shown in Figs. 1, 2, and 3. Both electrodes are terminated by platinum-points, which, when the lever n is retracted, lie in contact, but separate when it is attracted, and thus produce the igniting-spark in the well-known manner. The circuit-connections are therefore as follows, as well shown in Fig. 1: From the battery one wire goes to the gas-pipe, and therefore to the body of the burner, while the other battery-wire expands into two branches, which may be termed the "lighting" and the "extinguishing" branch, as indicated by L and X, each having a circuit-closing key or push-button, l x. The wire from the lighting-branch goes by way of one of the binding-posts of the burner to one end of the lighting-magnet i, the opposite end of which connects to the fixed electrode or sparking-point s, the circuit being thence completed through the opposite electrode, the lever i, and the body of the burner to the battery, which circuit will, of course, not be closed until the key l be depressed. The wire from the extinguishing-branch goes by way of the other binding-post of the burner (insulated) to one end of the extinguishing-magnet k, as seen in Fig. 1, while the opposite end of the magnet connects with the body of the burner; but this branch will not, of course, be in closed circuit until the extinguishing-key x is depressed. It will therefore be now understood that to light the gas it is only necessary to depress the lighting-key l, which will at once throw the magnet i into circuit, which, attracting its armature-lever n, will thereby release the valve-lever h, as shown by dotted lines in Fig. 1 and full lines in Fig. 2, thus turning on the gas, and at the same time separating the contact-points, so as to produce the spark, and thus ignite the issuing gas. It may now be seen that the circuit to the magnet i is established through the sparking-points, so that when they are separated by the attraction of the armature-lever n the circuit is broken, and when the lever is retracted the points contact and the circuit is again closed. The armature-lever will hence continue to vibrate, while the key l remains depressed, thus producing a spark at each break, so as to render the ignition of the gas sure in case the first spark should fail. Now, in this connection, it will be readily understood that it is desirable that the operator at the key x should be able to know that the gas is certainly lighted at the distant burner before he removes his finger from the key; and one feature of my invention not before referred to consists in a very simple and efficient means of indicating this fact. This feature, briefly stated, consists in making one or both sparking-points so as to be thermostatic or expansible by heat, so that as soon as the gas is ignited the heat of its flame expands the points toward each other, bringing them in contact and preventing the play between them, whereby the vibrations and breaks before referred to are stopped, although the circuit may continue closed. Thus, in Figs. 1, 2, and 3, the fixed electrode or sparking-point s is formed, preferably, as an expansible spiral encircling the jet-tip and terminating in a platinum pin, which approaches the electrode r, and this spiral is preferably made of two layers of metals, as illustrated, having different degrees of expansibility, on the well-known principle of thermostatic devices, so that as soon as the heat of the ignited gas is transmitted thereto the spiral expands or uncoils sufficiently to force its terminal point against the opposite point, and thus bring the two in close contact and take up all the play between them, even in the position in which the spring r is drawn out and the armature n n' depressed. Hence by this expansion and contact of the points the vibrations of the current and of the parts operated by it which just previously occurred will be stopped, and the current will flow continuously while the key l remains depressed. Now, it will be readily understood that if the key l is so constructed that vibrations of the current may be readily felt, hence the operator will be led to keep the key depressed while the vibrations are perceptible, but will release it as soon as they are found to cease, which will indicate positively that the gas is lighted.

The electrical vibrations may, of course, be rendered perceptible to the operator at the key l in many ways, as electricians will readily understand. Thus a little electro-magnetic mallet, arranged in the circuit at the key l, may be arranged to tap the key from underneath, thus enabling the vibrations to be felt. Instead of this, a small vibrating electric bell, or a simple form of galvanometer, placed near the key l, will indicate in an audible or visible manner the vibrating or continuous condition of the current, and thus show instantly when the gas is lighted. Hence, when the current is found to be continuous, which will usually occur in one or a few seconds, the operator releases the key l, and thus breaks the circuit,

which will cause the armature *n n'* to assume its retracted position. The burner will now remain in this condition, with the gas lighted, the sparking-points expanded into contact, and the lighting-armature retracted, and also the valve-lever *h*. of course, retracted. When, however, it is desired to extinguish the burner, the extinguishing-key *x* is depressed, which will throw the magnet *k* into circuit, and its attraction will at once raise the valve-lever *h h'*, and thereby close the valve and shut off the gas, and when thus raised the lever will be caught and held by the hooked or ratchet end of the lighting-lever *n*. as before described, and shown in Fig. 1, so that when the circuit is again broken by releasing the key *x* the parts remain in the position shown in Fig. 1, the gas being extinguished and the burner quiescent.

The several described features of my invention thus combine to produce a greatly improved burner of this class, in which the work is nicely divided between the two magnets, and each acts with ease and power on its corresponding parts, and performs its functions of lighting and extinguishing with quickness and certainty, in which the valve is as simple and inexpensive in its construction as it is easy and sure in its action, and in which the operator is enabled to know positively that the gas is ignited before he leaves the push-button.

What I claim is—

1. An electric lighting and extinguishing gas-burner constructed with a valve to control the flow of gas, and with two motor-magnets and their corresponding armature-bars, one of said armature-bars being arranged to move the valve in one direction by attraction, and in the opposite direction by retraction, while the other armature-bar acts when retracted as a pawl to hold the valve-bar in one of its positions, and when attracted to release the valve-bar and allow it to assume its other position, substantially as herein shown and described.

2. An electrically lighting or extinguishing gas-burner, constructed with two motor-magnets and corresponding armature bars or levers, and with a valve to control the flow of gas, one of said armature-bars being arranged to close the gas-valve when attracted, while the other armature-bar when retracted serves to hold the former in said position and to release the same when itself attracted, substantially as herein set forth.

3. An electric-lighting gas-burner formed with a valve to control the flow of gas, and a bar or lever to operate the same, and with separating electrodes to produce an igniting-spark, in combination with a motor-magnet and a corresponding armature bar or lever arranged when retracted to hold the aforesaid valve-lever in its closed position, and when attracted to release the same, and also separate the sparking-points, substantially as herein set forth.

4. The combination, in an electric lighting or extinguishing gas-burner, of a gas-passage and a flexible diaphragm covering a portion of the gas-passage, with a motor-magnet and a device operated by said magnet to press the diaphragm into or toward the gas-passage, and close the same, substantially as and for the purpose set forth.

5. An electric lighting or extinguishing gas-burner constructed with a diaphragm-valve to open or close the gas-passage with a motor-magnet and an armature bar or lever to operate said valve, the said bar having an elastic or yielding bearing upon the diaphragm, substantially as and for the purpose set forth.

6. An electric-lighting gas-burner constructed with a thermostatic or expansible sparking point or points placed in circuit with a magnet which separates them, whereby the magnets and points continue to vibrate until the gas is lighted, when the vibrations cease by the thermal expansion of the points into contact, substantially as and for the purpose set forth.

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