

E. E. BEAN.
APPARATUS FOR LIGHTING AND EXTINGUISHING GAS
BY ELECTRICITY.

No. 90,629.

Patented June 1, 1869.

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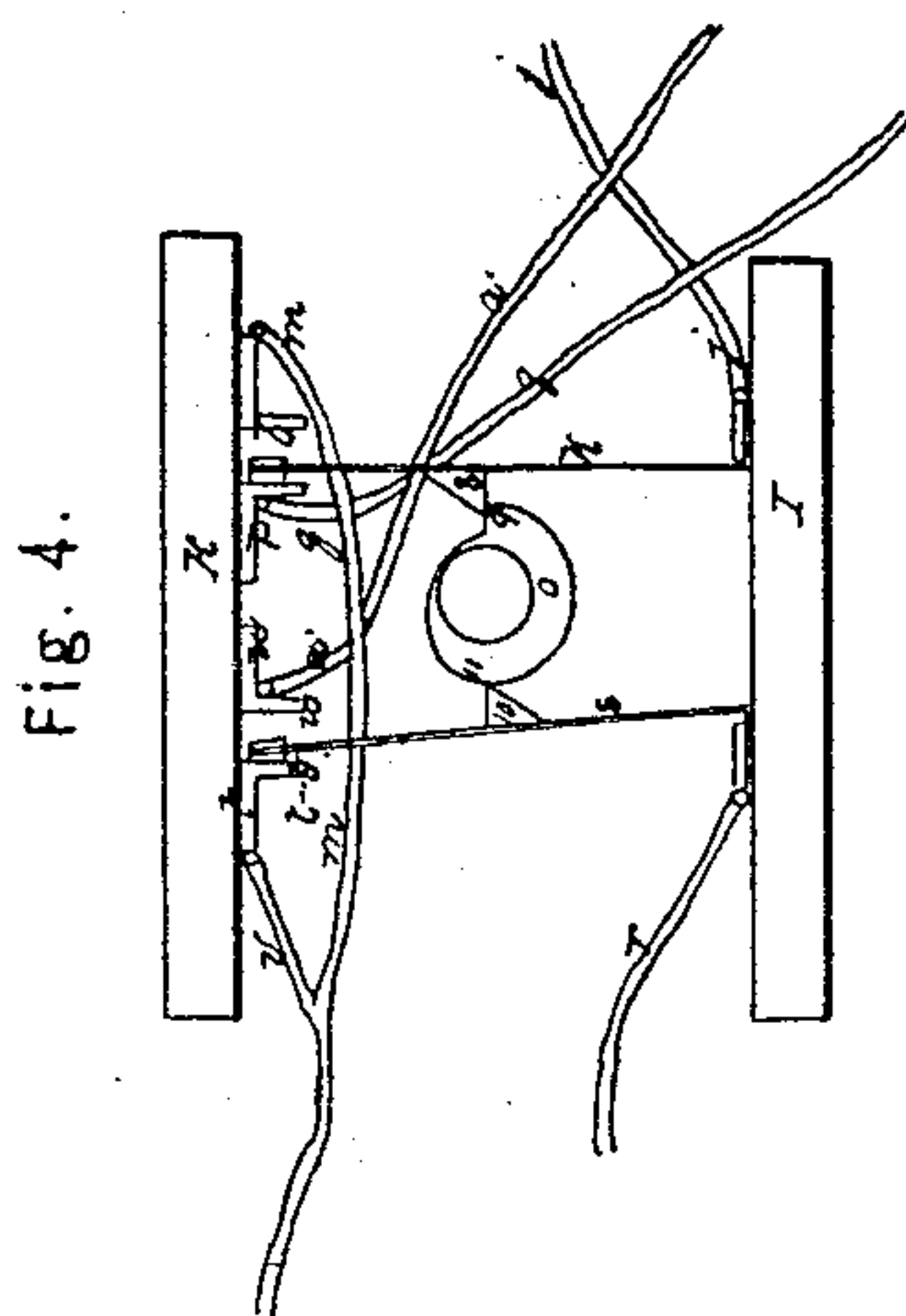
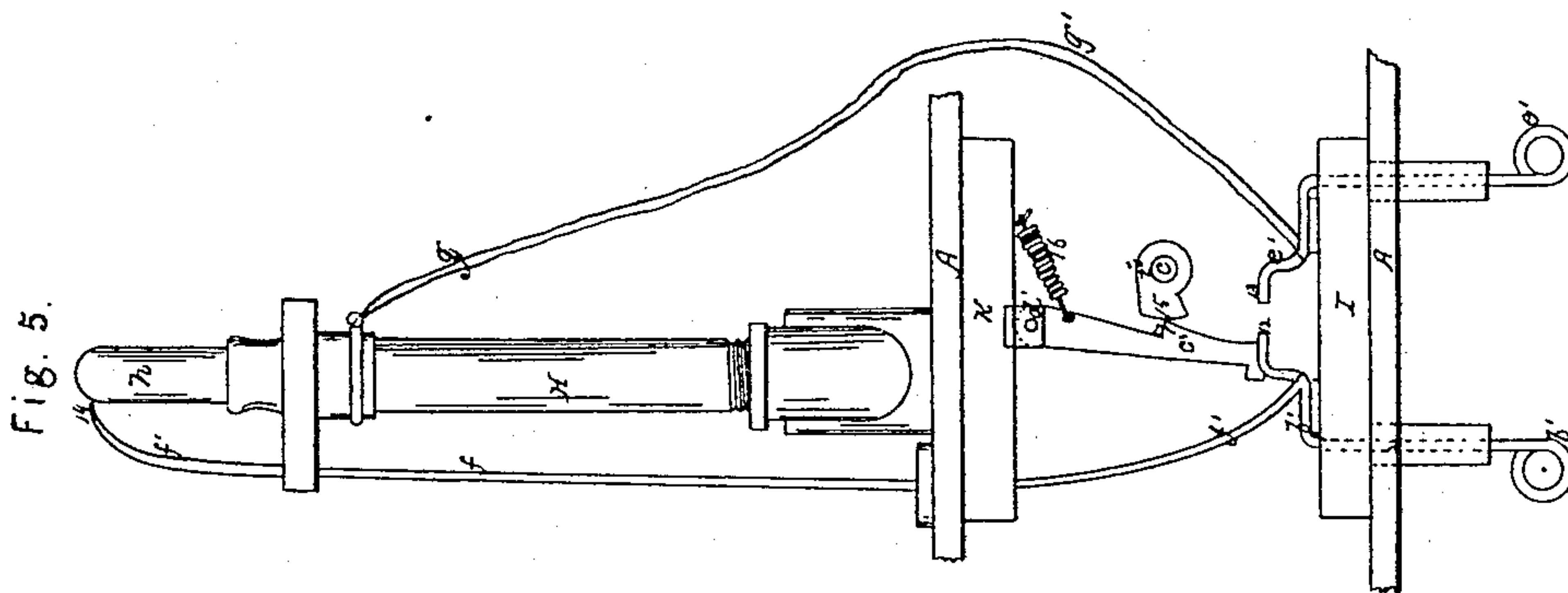
Inventor

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United States Patent Office.

EDWIN E. BEAN, OF BOSTON, MASSACHUSETTS.

Letters Patent No. 90,629, dated June 1, 1869.

APPARATUS FOR LIGHTING AND EXTINGUISHING GAS BY ELECTRICITY.

The Schedule referred to in these Letters Patent and making part of the same.

To all whom it may concern :

Be it known that I, EDWIN E. BEAN, of Boston, in the county of Suffolk, and State of Massachusetts, have invented certain Improvements in Electric Apparatus for Lighting and Extinguishing Gas, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, making part of this specification, in which—

Figure 1 is an elevation of one side of my improved apparatus.

Figure 2 is an elevation of the opposite side of the same.

Figure 3 is an end elevation of the same.

Figures 4 and 5, details to be referred to.

The electric-apparatus, or mechanism heretofore used for lighting and extinguishing gas, in which a ratchet-wheel, connected with the gas-cock, or valve, is rotated by a pawl operated by an electro-magnet, is objectionable, for the following reasons:

Where a number of lamps are placed in a circuit, it has been found impossible to so regulate the mechanism connected with each one as to cause the ratchet-wheels to be moved the same distance at each forward vibration of the pawls, the momentum received from the rapid action of the latter causing some of the ratchet-wheels to be carried beyond the desired point, in consequence of which the gas would in some places be let on, and in others partially or wholly shut off.

Furthermore, where a number of lamps are included in the same circuit, so that the several apparatus will be operated simultaneously, a very powerful current of electricity is required, to convey which necessitates the employment of a wire of large diameter, thus increasing the expense.

The first part of my invention has for its object to overcome the above-mentioned difficulties, and consists in operating one apparatus only at a time, two separate wires being employed, (one to let on, and the other to shut off the gas,) in connection with an automatic circuit-breaker in each apparatus, the current of electricity passing through one wire to the electro-magnet of the first apparatus in the circuit, (returning through the ground,) and as soon as the gas-valve of this apparatus has been opened or closed, as the case may be, the motion of the mechanism connected therewith is instantly arrested by the breaking of the circuit, the current being, by the same movement of the automatic circuit-breaker, connected with a wire leading to the next apparatus, when the operation is repeated, and so on throughout the whole series of lamps, one apparatus only being included in the circuit at a time, and the breaking of the circuit in each apparatus serving to connect the electro-magnet with the other wire, by the current of which the mechanism may be again set in motion, the two wires being used alternately, one to let on and the other to shut off the gas.

The second part of my invention relates to certain improvements in that portion of the apparatus used for igniting the gas by an electric spark.

Where a number of lamps are included in a circuit, and lighted simultaneously, as has heretofore been customary, the electric spark is forced to leap over a corresponding number of breaks, (one at each gas-burner,) and to overcome the aggregate resistance occasioned by these breaks, an exceedingly powerful current of electricity is required, necessitating an expensive covering of great thickness around the conducting-wire, in order to secure the required insulation to prevent the escape of the electricity.

This part of my invention has for its object to prevent this great expenditure of electric power, and also enables me to employ a thinly-coated, and consequently, less expensive conducting-wire, and consists in breaking and closing the electric-lighting circuit at any desired point, for the purpose of producing the sparks to ignite the gas by means of automatic mechanism, as will be hereafter particularly described.

To enable others skilled in the art to understand and use my invention, I will proceed to describe the manner in which I have carried it out.

In the said drawings—

A represents the frame-work of the apparatus, to which is secured the electro-magnet B, the armature C of which is secured to the end of a bent lever, D, which is attached to a horizontal rock-shaft, *a*, and has, pivoted to its upper end, a pawl, *b*, which engages with the teeth of a ratchet-wheel, E, the shaft *c* of which revolves in bearings, *d*, in a bifurcated plate, G, projecting down from the upper plate of the frame-work.

From the hub of the ratchet-wheel E projects a crank-pin, *e*, which is connected, by means of a spring, *f*, to the lower end of the stem *g* of the valve through which the gas is admitted to the pipe H and burner *h*.

The construction of this valve, and the spring-connection between its stem and the crank-pin, however, form no part of the present invention, being the subject of Letters Patent, granted to Frank Bean, on the 28th day of January, 1868, and will not, therefore, be further described.

I will now proceed to describe the manner in which the electric current is caused to pass through the apparatus for the purpose of rotating the ratchet-wheel E, to open and close the gas-valve at the required times.

The parts being in the position seen in fig. 1, (the gas-valve being closed,) the electric current enters the apparatus at *i*, by the wire *j*, through which it passes to the base of a flat spring, *k*, secured to an insulating-block, I.

The upper end of this spring *k* rests against a bent plate, *l*, secured to an insulating-block, K, the current passing through the spring *k* and bent plate *l* to a

wire, *m*, connected with the electro-magnet B, after passing through which the current is conducted by the wire *n* to the ground, or the street gas-pipe, by which it passes to the negative-pole of the battery to complete the circuit, when the armature C may be set in motion, by means of a key at the central station, in a well-known manner, and the pawl *b* vibrated to produce the rotation of the ratchet-wheel E, the motion of which is instantly arrested, as soon as it has completed a half revolution, (which opens the gas-valve to its full extent,) in the following manner:

o is a cam, composed of non-conducting material, and secured to the end of the shaft *c*. This cam bears against a triangular projection, 8, on the spring *k*, and serves to keep its upper end in contact with the bent plate *l*, until its point 9, fig. 4, is carried past the point of the projection 8, (which occurs the instant the ratchet E has completed a half revolution,) when the spring assumes the position seen in fig. 4, with its upper end resting against a bent plate, *p*, secured to the insulating-block K, opposite to the bent plate *l*. This serves to break the circuit through the electro-magnet B, and arrest the motion of the ratchet E, when the electric current will pass through the spring *k* to the bent plate *p*, and thence, by a wire, *q*, to the next apparatus, when the same operation is repeated, and so on throughout the whole series of lamps, one apparatus only being included within the circuit at a time, the electric current passing from one to another in succession, until it has passed through the entire series, and thus, as one armature only, with the mechanism connected therewith, is operated at a time, an electric current of very moderate power only is required, and consequently, a wire of small diameter, and moderate cost, may be employed, while the automatic breaking of the circuit, which arrests the ratchet-wheel, and causes the current to pass on to the next lamp, renders it absolutely certain that the gas-valve will be left in the exact position required.

The gas, having been let on, is ignited by electric sparks, in a manner to be hereafter particularly described.

It is evident that the armature C cannot be again set in motion (when it is desired to extinguish the gas) by a current passing through the wire *j*, on account of the circuit having been broken, as above described.

It, therefore, becomes necessary to employ another wire, *r*, through which the electric current passes to the base of a flat spring, *s*, (on the opposite side of the cam *o*,) the upper end of which rests against a bent plate, *t*, secured to the insulating-block K, when the parts are in the position seen in fig. 4.

This plate is connected with a wire, *v*, through which the current passes to the electro-magnet B, and, by the wire *n*, to the ground, and back to the battery, as before.

The armature C may thus be again set in motion, and the wheel E rotated, for the purpose of closing the valve and extinguishing the gas.

The spring *s* is provided with a projection, 10, (similar to that, 8, of the spring *k*,) which rests against the cam *o*, the latter serving to retain the upper end of the spring in contact with the plate *t*, until the revolution of the ratchet E carries the point 9, of the cam, past the point of the projection 10, when the spring *s* will assume the position seen in fig. 1, with its upper end resting against a bent plate, *w*, secured to the block K, opposite to the plate *t*.

This movement of the spring *s* occurs the instant the gas-valve is entirely closed by the half revolution of the ratchet E, and serves to break the circuit through the electro-magnet B, and thus arrest the motion of the ratchet E, which insures the gas-valve being left closed, as required.

The current now passes, by the spring *s*, to the plate

w, and thence, by a wire, *a'*, to the next apparatus, where the same operation is repeated, the current passing successively from one lamp to another, until the whole are extinguished.

Just previous to the arrival of the point 9 of the cam *o* opposite to the projection 10, the portion 11 of the cam strikes against the projection 8 of the spring *k*, forcing its upper end away from the plate *p*, and bringing it into contact with the plate *l*, as seen in fig. 1, against which it is held by the cam, when its motion is arrested by the breaking of the circuit, caused by the movement of the upper end of the spring *s* from the plate *t* to the plate *w*. The parts are thus left in such a position that the armature C may be again set in motion to open the valve by the current from the wire *j*, as first described. The springs *k* and *s* are thus operated alternately by the cam *o* in such a manner that the breaking of one circuit through the wire *j*, spring *k*, and electro-magnet B, will not only cause the current to pass on to the next apparatus, but will leave the electro-magnet B connected, through the spring *s*, with the other wire *r*, through which a current may be transmitted at the required time, while the breaking of the circuit through the wire *r*, spring *s*, and electro-magnet B, will cause the current to pass on to the next apparatus, and, at the same time, leave the electro-magnet connected, through the spring *k*, with the wire *j*, the wires *j* and *r* being thus used alternately, one to carry the current for opening the gas-valve, and the other the current for closing it, the electro-magnet being at all times connected with one or the other of the wires *j* and *r*.

The electric current which produces the sparks for lighting the gas, passes through the several apparatus, the spark being produced by the electricity passing over a break, or interruption in the circuit, at each burner.

The circuit, however, is broken at one point only at a time, this break being produced at each lamp in succession, throughout the entire series, until they are all lighted, in a manner which will now be described.

Just previous to setting in motion the mechanism which opens the gas-valves, the electric current which produces the sparks is caused to pass continuously through the several apparatus within the circuit, entering each one by the wire *b'*, from the point 12 of which it passes through a lever, *c'* (pivoted at *d'* to the block K) to the point 13 of a wire, *e'*, as seen in fig. 1, by which it leaves the apparatus and passes on to the next one, and when the lever *c'* of each apparatus is in the position seen in fig. 1, the circuit through the several apparatus is unbroken, and no spark is produced.

f' is a wire, one end of which is connected with the wire *b'*, the other extremity, 14, being brought into close proximity with the insulated tip of the gas-burner *h*, to which is secured another wire, *g'*, connected with the wire *e'*, and when it is desired to ignite the gas, it becomes necessary to cause the electric current to follow the wire *f'*, and leap over the break between its point 14 and the tip *h*, so as to produce the electric sparks at this point, and afterwards pass from the burner *h* to the wire *g'*, and thence to the wire *e'*.

This is effected in the following manner:

i' is a cam, of non-conducting material, formed in the same piece with the cam *o*, and, as the ratchet E is revolved into such a position as to partially open the gas-valve, the portion 15 of the cam *i'* is brought into contact with the lever *c'*, when the latter is forced against the resistance of a spring, 16, away from the point 13 of the wire *e'*, as seen in fig. 5, thus breaking the connection between the two wires *b'* and *e'* at this point, and, as the lever *c'* is moved, the instant the distance between its lower end and the point 13 exceeds the space between the point 14 of the wire *f'*

and the tip of the burner *h*, the electric current will pass through the wires *f' g'*, producing a stream of sparks at the point 14, which ignites the gas issuing from the burner *h*, as required.

The production of sparks continues at this point until the gas-cock is nearly wide open, when the portion 15 of the cam is revolved past a shoulder, 17, on the lever *c'*, when the latter is instantly retracted, by the spring 16, into the position seen in fig. 1, with its lower extremity in contact with the points of both wires *b'* and *e'*, which closes the circuit at this point, when the resistance occasioned by the break at the point 14, will cause the current to resume the direct course, first described, through the lever *c'*.

This break in the circuit is produced in succession at each of the several lamps, as soon as the lever *c'* is operated by the cam *i'*, which can only take place when the gas-valve is being opened, and as these gas-valves are opened one at a time in succession, it is evident that but one break can occur at a time in the circuit which produces the sparks, viz, at the particular lamp being lighted; and as the amount of resistance to the electric current occasioned by a single break is very slight, a current of very moderate power may be employed, thus avoiding the necessity of employing a thickly-coated wire to prevent the escape of the electricity, as has heretofore been necessary where a great number of breaks occur in the circuit; and even if a powerful current should be employed, when the resistance to be overcome is occasioned by a single break only, as above described, a conducting-wire, having a very thin coating of insulating-material, may be employed, without any liability of the escape of the electricity, and consequently, a great saving may be effected in the cost of the conducting-wire.

The above-described apparatus is of simple construction, while its action is certain and reliable, and, by its use, much less powerful currents of electricity, and consequently, less expensive conducting-wires, are re-

quired than with any other apparatus of this description heretofore employed.

Instead of providing each apparatus with a lever, *c'*, for the purpose of automatically-breaking the circuit at each gas-burner in succession, the automatic circuit-breakers may be placed at intervals, so that the electric sparks will be produced at more than one burner at a time, say at two or three burners simultaneously, the aggregate resistance of these few breaks thus produced, being easily overcome. I prefer, however, to produce a break at one burner only at a time, as first described.

Claims.

What I claim as my invention, and desire to secure by Letters Patent, is—

The within-described method of operating gas-valves, by means of a current of electricity passing alternately through separate wires, in combination with the springs *k s*, and cam *o*, or equivalent device, for automatically-breaking the circuit through the electro-magnet, and causing the current to pass to the next apparatus, substantially as described.

Also, breaking and closing the electric lighting-circuit, at any desired point, for the purpose of producing the sparks to ignite the gas, by means of the cam *i'*, upon the shaft of the gas-cock, operating the lever *c'*, or their equivalents, substantially as described.

Also, in combination with the mechanism by which the gas-valve is operated, the cam *i'*, and lever *c'*, or equivalent device for breaking the electric lighting-circuit, so arranged that, as the gas-valve is opened, the sparks will be produced at the required point, to ignite the gas, substantially as set forth.

EDWIN E. BEAN.

Witnesses:

P. E. TESCHEMACHER,
W. J. CAMBRIDGE.