D. M. SMYTH.

OPENING AND CLOSING GAS COCKS BY ELECTRO-MAGNETISM.

No. 191,012, Patented May 22, 1877.

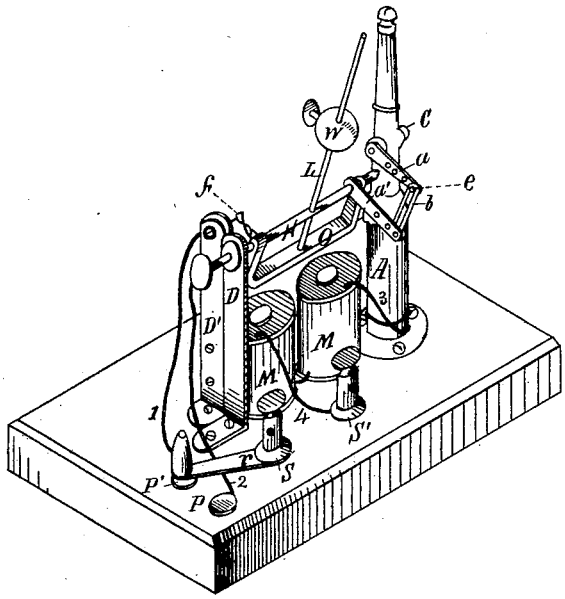

Fig. 1.

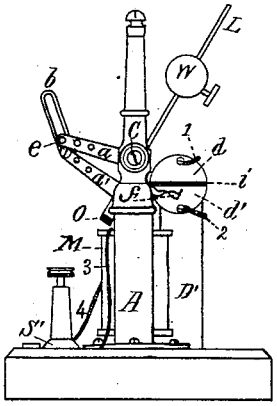

Fig. 2.

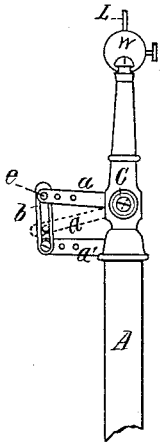

Fig. 3.

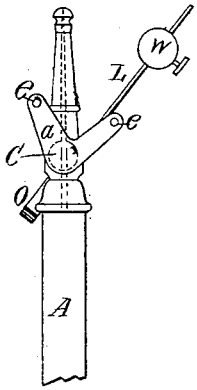

Fig. 4.

Witnesses:

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by his Attorney

Alex. G. Hayes.

UNITED STATES PATENT OFFICE.

DAVID M. SMYTH, OF EAST NORTHWOOD, NEW HAMPSHIRE, ASSIGNOR OF ONE-HALF HIS RIGHT TO GEORGE L. WARD, OF BOSTON, MASSACHUSETTS.

IMPROVEMENT IN OPENING AND CLOSING GAS-COCKS BY ELECTRO-MAGNETISM.

Specification forming part of Letters Patent No. **191,012**, dated May 22, 1877; application filed December 29, 1876.

To all whom it may concern:

Be it known that I, DAVID M. SMYTH, of East Northwood, in the county of Rockingham, State of New Hampshire, have invented a new and useful Improvement in Devices for Opening and Closing Gas-Cocks by Electro-Magnetism, of which the following is a full, clear, and exact description, reference being had to the drawing accompanying and forming part of this specification.

This invention is intended to be used in connection with a system of lighting gas by electricity, and, though applicable to any gas-cock, is especially useful, when used in connection with a system of lighting street gas-lamps by electricity, for opening and closing the gas-cocks of these lamps, as it meets all the requirements that are necessary to be fulfilled in order that any device for opening and closing the gas-cocks of street-lamps by electro-magnetism may be of practical value. These requirements are simplicity of mechanical construction, so that liability to derangement may be avoided, inexpensiveness, instantaneousness and certainty of action, and the production of considerable mechanical force with a minimum of battery-power; and these requirements are more perfectly attained by my device than by any other devices for a similar purpose which have heretofore been invented.

It is now well established that the power which can be obtained by the best electro-magnetic arrangements is very inconsiderable, in proportion to the cost of obtaining power in this way, compared with that which can be obtained at the same cost from other sources of power, and that electro-magnetism in mechanical arrangements is therefore used most advantageously for bringing other forces into action at distant points instantaneously and at will. In my invention I have recognized this limitation to the use of electro-magnetism for producing power, and therefore in my device, instead of relying solely upon the electro-magnetic force to operate the gas-cock, which necessitates a powerful battery, even with the best electro-magnetic arrangement, in order to assure certainty of action, and especially so with the gas-cocks of street-lamps, which, owing to their liability to the effects of rust, and for other reasons, require considerable force to operate them, I use electro-magnetism to set a weight in motion, and the force of the momentum which this weight acquires by its movement to effect the opening and closing of the cock. By this means a quick blow of considerable force, like that of a hammer, is given to the cock, and its opening and closing is easily effected.

My invention, therefore, consists in the combination, with a gas-cock, of an electro-magnet and a weight, moved by said magnet, and operating to effect the opening and closing of the gas-cock by the force of the momentum which the weight acquires by its movement, substantially as hereinafter more fully set forth.

In the accompanying drawing, Figure 1 is an isometrical perspective view of my invention, showing the position of the parts when the gas-cock is open. Fig. 2 is an end view, in elevation, showing the position of the parts when the gas-cock is closed. Fig. 3 is another end view, showing the position of the arms *a a'* when the armature is over the poles of the electro-magnet, both when the armature is moved to open the cock and when it is moved to close the same; and Fig. 4 is a modification of the device shown in Figs. 1, 2, and 3 for operating the cock by the weighted arm.

In these several figures the same letters refer to the same parts.

In Figs. 1 and 2 of this drawing, I have represented the gas-pipe and the magnet and its attachments as mounted upon a base-board, upon which I have placed the binding-screws for making connections with the battery, and a switch and contacts for establishing the connections necessary to respectively open and close the cock.

This method of showing the invention is adopted for the purpose of clearly exhibiting its method of operation, as it is obvious that any desirable and convenient arrangement of the magnet, weighted arm, and circuit-changing device, in relation to the gas-cock, could be adopted when the device is used in practice without departing from the principle of the invention; and, also, that the switch would

be located at the point from which the series of lamps included in the circuit is lighted.

Referring to the drawing, A is the gas-pipe, terminating in an ordinary burner. C is the gas-cock in the same, which is of the ordinary construction, except that, as shown in Fig. 4, it shuts off or permits the flow of gas by a smaller movement of rotation than is usual in gas-cocks. M M is an ordinary electro-magnet. H is a shaft over this electro-magnet and parallel with it, supported at one end in the pipe, and in the other in a suitable standard, D. Attached to this shaft, and depending from it, is a bar of soft iron, O, which forms the armature of the electro-magnet. Also attached to this shaft, at right angles to it, is a rod, L, upon which is placed an adjustable weight, W, which can thus be placed on the rod L, so as to overbalance the weight of the armature, and thus, when the magnet is inactive, the armature will swing from above the magnet to one side or the other, as the gas-cock, happens to be open or closed. An arm or lever, *a*, is attached to the stem of the gas-cock, and moves with it, and another arm, *a'*, is attached to the shaft H. These arms are connected together by a link, *b*, having a slot in the same, in which plays a pin, E, in the arm *a*. Upon the standard D' are two metallic segments, insulated from the standard, and separated from each other by a strip of an insulating substance, such as hard rubber or ivory. One of these segments is connected to the contact-knob P' by a wire, 1, and the other to the contact-knob P by a wire, 2. An arm, *f*, is attached to the shaft H and makes contact with these segments as the shaft moves.

S S' are binding-screws, to which the two poles of the battery are respectively connected. From one of these screws S' a wire passes to one pole of the magnet, and the other pole of the magnet is connected by a wire to the metallic gas-pipe A. *r* is a switch, connected to the binding-screw S, and by means of this switch the circuit can be established either through the contact P or P'.

The operation of the device is as follows: Suppose the parts to be in the position shown in Fig. 2, the gas turned off, and the circuit broken by the switch being between the knobs P and P'; then, by making contact with P', the circuit will be completed through the wire 1, segment *d*, arm *f*, shaft H, gas-pipe A, wire 3, electro-magnet, wire 4, and the magnet will become excited. If the attractive force which is then exerted upon the armature is sufficient to raise the weighted arm L, the armature will be drawn to the electro-magnet with a constantly-increasing velocity, owing to the rapid increase in the force exerted upon this armature as it approaches the poles of the magnet, and, consequently, the weighted arm will acquire considerable momentum.

The arm *a'* is also moved with the shaft H, but does not move far enough to cause any movement in the arm or lever attached to the gas-cock, as shown in Fig. 3. When, however, the swinging armature is brought directly over the poles of the magnet, the contact-arm reaches the non-conducting space *l*, and the circuit is broken. The weighted arm continues its motion by the momentum which it has acquired, and the arm *a'* strikes forcibly against the pin on the arm *a*, and throws the gas-cock open, leaving the circuit closed, and arm *f* on the segment *d'*, and the parts in position, (shown in Fig. 2,) for closing the cock by a similar movement in a reverse direction by turning the switch to the point P.

In this device the only work done by the electric current is the attraction of the armature of the magnet and the elevation of the weighted arm, and this work can be effected by a very feeble current compared with that which is necessary to operate the gas-cock, while the force of the momentum which the weighted arm acquires by its rapid movement, being applied to the cock by the forcible impact of the arms *a a'*, will be sufficient to insure the opening and closing of any ordinary gas-cocks used in street-lamps, even if said cock is tight-fitting or rusty. Moreover, if the first action of the arm is insufficient to operate the cock, a succession of blows can be given by the weighted arm until the gas-cock is moved.

It will be obvious to the mechanician that this method of operating a gas-cock by the action of a weight moved by electro-magnetism can be effected by other mechanical devices than those described, as, for instance, as shown in Fig. 4, the link-motion may be dispensed with, and the arm made to strike directly upon a lever attached to the stem of the cock. I, therefore, do not confine myself to the precise devices which I have shown and described for carrying my invention into effect.

It will also be seen that my device is simple in construction and inexpensive, while it is very efficient for accomplishing its intended purpose.

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

1. In combination with a gas-cock, an electro-magnet, and a weight moved by said magnet, and operating to effect the opening and closing of the gas-cock by the force of the momentum which the weight acquires by its movement, substantially as and for the purpose set forth.

2. The combination, with the gas-cock, of the electro-magnet, the swinging armature, having the weighted arm, or its equivalent, attached thereto, and operating to move the cock, as described, and a device for breaking the circuit when the armature is fully attracted, and establishing the connections for giving reverse movement to the mechanism, substantially as and for the purpose set forth.

3. The combination, with the gas-cock, of the weighted arm and a lever attached to the

gas-cock, substantially as and for the purpose set forth.

4. The combination, with the gas-cock, of the arm *a*, link *b*, arm *a'*, shaft H, arm L, adjustable weight W, armature O, electro-magnet M M, contact-arm *f*, circuit breaking and changing device, and the electric connections, substantially as and for the purpose set forth.

In witness whereof I have hereunto set my hand on this 21st day of December, 1876.

DAVID M. SMYTH.

In presence of—
IRA B. HOITT,
LAVINA T. HOITT.