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PATENTED JUL 11 1871

Fig. 1.

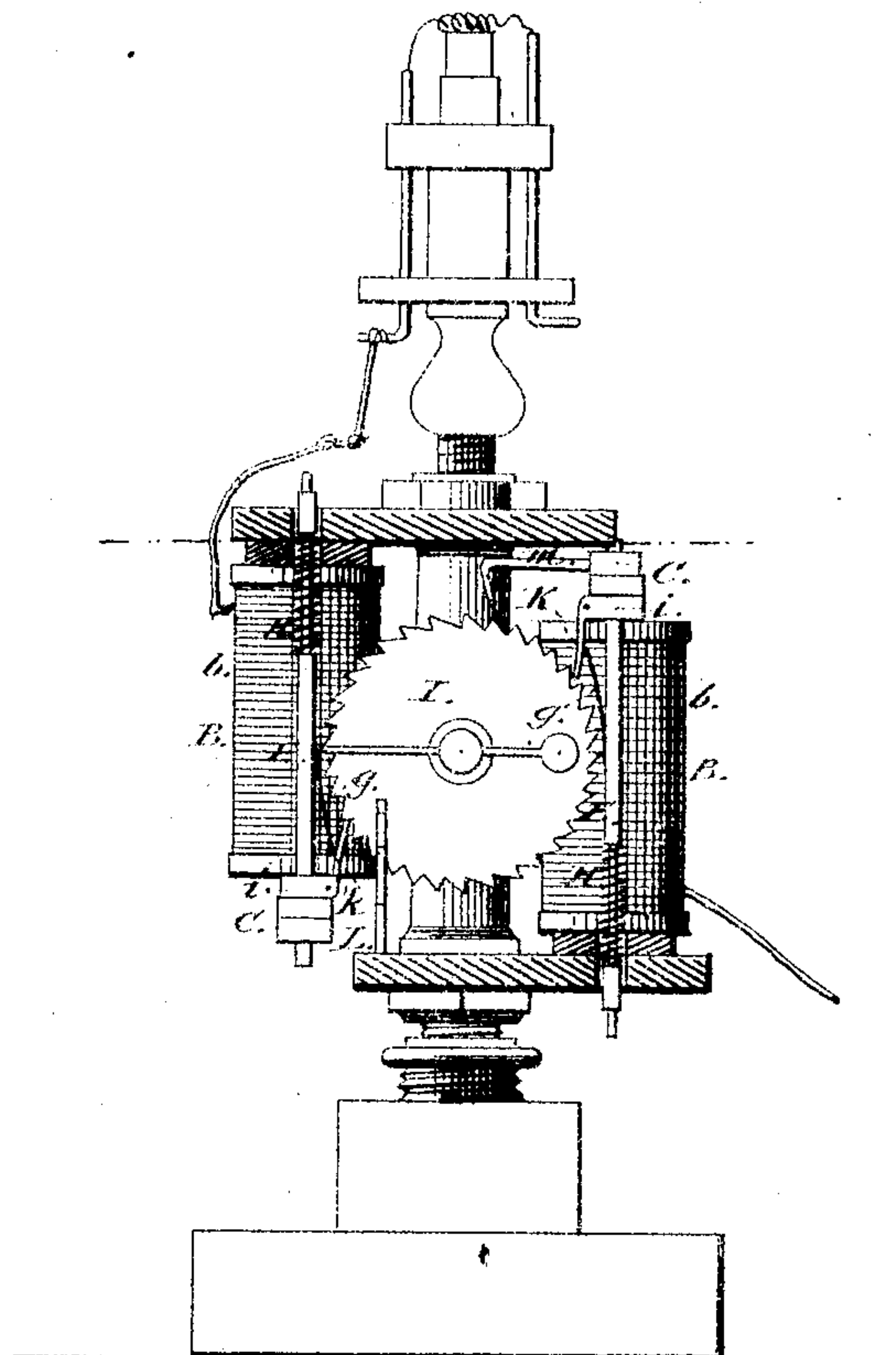
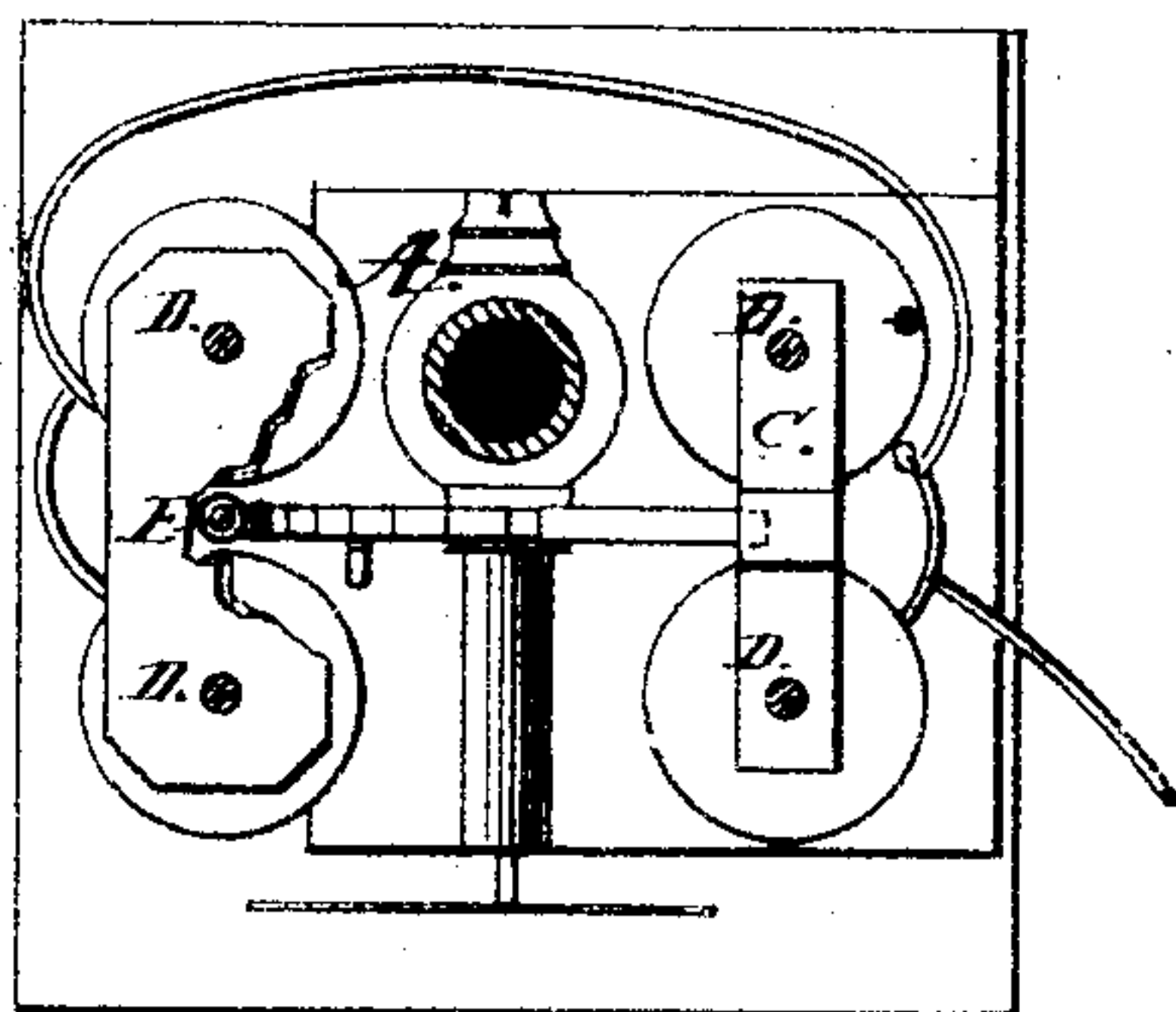


Fig. 2.



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## IMPROVEMENT IN ELECTRO-MAGNETIC APPARATUS.

Specification forming part of Letters Patent No. 116,944, dated July 11, 1871.

*To all whom it may concern:*

Be it known that I, SAMUEL GARDINER, JR., of the city, county, and State of New York, have invented certain Improvements in Electro-Magnetic Apparatus, of which the following is a specification:

My invention relates to an apparatus in which two or more electro-magnets are employed, connected by a wire, to form a continuous circuit to give a motion by which a cock may be turned to regulate the supply of gas for illuminating purposes; and consists of two or more electro-magnets arranged opposite each other in such a manner as to act in reverse of each other to give a certain motion for purposes just mentioned.

Figure 1 is a side elevation with two of the helices removed. Fig. 2 is a horizontal section on line *xx*.

Similar letters of reference refer to corresponding parts in all the figures.

B B are electro-magnets placed opposite each other, one with the head up, which, when operated, gives a downward motion; the other with the head down, which gives an upward motion. These electro-magnets are formed in the usual manner, with their armatures C C' wrapped with copper coils covered with some non-conducting material, forming the helices *b b*. D D are guide-rods at the head of the magnets, which pass through openings in the armatures and form guides to them in their vertical movement. Between the helices, and parallel with their axes, are rods E E attached firmly to the armatures C C at the heads of the magnets, and pass through them at their foot, and are secured with adjustable collar-screws *n* to bring the armatures to their proper places in relation to the ratchet-wheel I. Spiral springs H H encircling the rods E E have their bearings on the shoulders *h h*. These springs serve to return the armatures C C to their proper places when the magnetic current is intercepted. The rods E E have metal heads *i i*, to which are attached the catches *k k*, which work on axles and have their bearings against the flat springs *g g* attached to the rods E E. The springs *g g* press the catches *k k* continuously against the teeth in the ratchet-wheel I, and cause the motion of the wheel in the direction of the arrow when the armatures are acted upon by the influence of the magnets. The hook

is attached to the armature C to limit the mo-

tion of the wheel I when it is released from the catches *k k*. The flat spring L, attached to the rubber plate *e'*, prevents the backward movement of the wheel when the armature is released from the electro-magnet. The axis of the ratchet-wheel forms a spindle, to the end of which is attached a hand or indicator to show the extent of motion made by the wheel. At the back of the ratchet-wheel I is a table running vertically with the cock A at the end of the shaft of the ratchet-wheel, which is turned when the ratchet-wheel is in motion to regulate the flow of gas. To the tube are secured rubber plates, above and below the magnets, to serve as non-conductors. The apparatus is surmounted by a gas-burner with a wire coil passing over it and communicating with the electro-magnets by a continuous copper wire which serves to illustrate the application of the invention.

The operation of the above-described apparatus may be briefly explained. The two magnets are placed on opposite sides of the ratchet-wheel, with the armature of one of the magnets reversed so as to give an upward motion to the rod having the catch, while the other being in reverse gives a downward motion, which allows the catches operating against the wheel to act simultaneously. The two electro-magnets being placed in one continuous circuit, by this arrangement of the magnets I gain a large percentage over the use of a single magnet; as, per experiment, I applied forty cells of battery to move successfully a stop-cock of four inches diameter by six inches in length. By adding another electro-magnet, and placing it on the opposite side of the ratchet-wheel and connecting the two magnets to work in a single circuit, I found that ten cells would work the stop-cock better than forty cells with only one magnet. The two magnets placed and working opposite each other reduced the friction of the cock and very much lessened the expense of battery-power. For street-lighting the magnets may be made very small, and the cost of the extra magnets would rate as two dollars against a battery-power costing (when one magnet was used) fifty dollars. The helices are magnetized and neutralized, or the circuit is formed and suspended in the ordinary manner. When influenced by the magnets, the armatures are drawn against the helices, and the sliding rods E E are advanced in the direc-



tion of the wheel I, which causes the catches to give a partial rotation to the wheel and thereby turn the cock to a corresponding extent. By continuing the motion of the wheel the gas may be turned off or on at pleasure.

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

1. Two or more electro-magnets, placed opposite each other and so connected as to be operated by one circuit, in combination with the ratchet-wheel I, the pawls or catches *m*, spiral springs H, adjustable collar-screws *n*, rods E and

retaining-springs *g*, for turning on and off the gas of street-lamps or other gas-fixtures by electricity, arranged as described, for the purpose set forth.

2. Two or more pairs of electro-magnets arranged in one circuit, and operating simultaneously upon a ratchet-wheel or its equivalent, as and for the purpose set forth.

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Witnesses:

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