E. E. BEAN.

ELECTRIC GAS-LIGHTING APPARATUS.

No. 170,221. Patented Nov. 23, 1875.

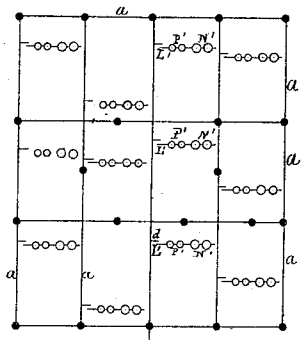

FIG. 4.

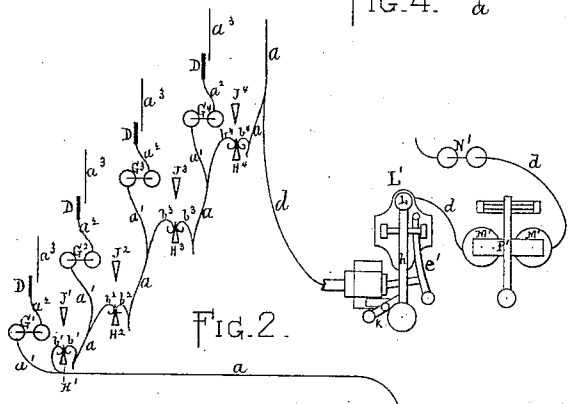

FIG. 2.

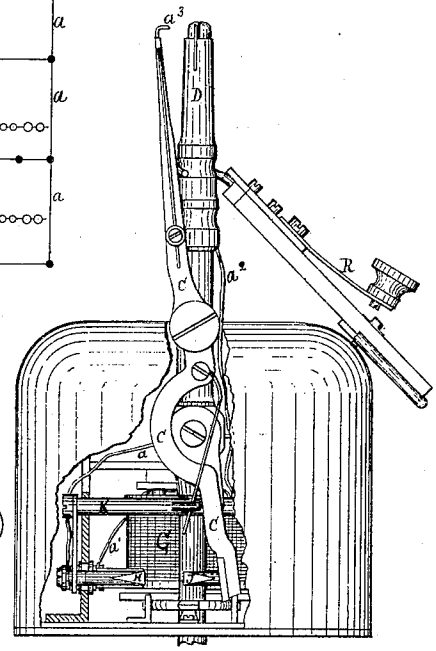

FIG. 3.

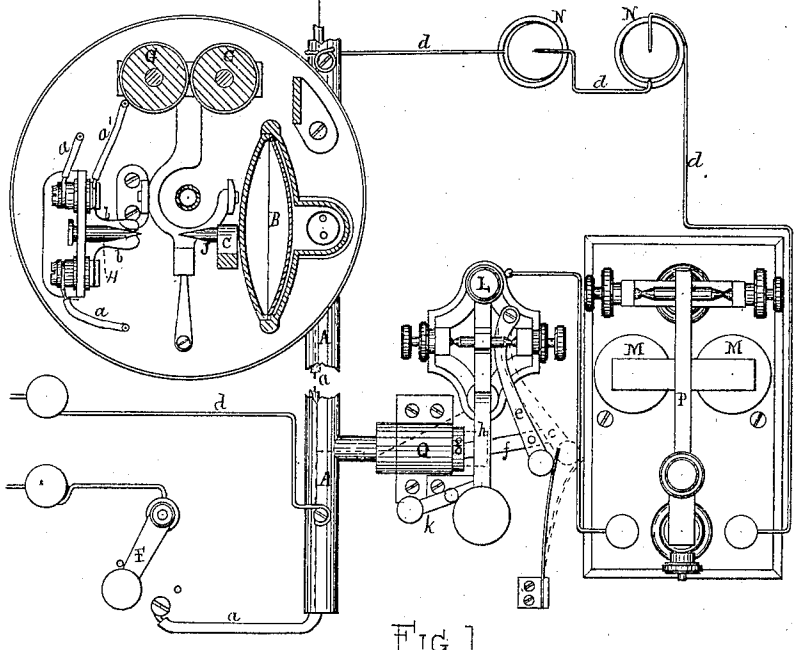

FIG. 1.

G. B. Maynadier
J. E. Maynadier

Edwin E. Bean

UNITED STATES PATENT OFFICE.

EDWIN E. BEAN, OF BOSTON, MASSACHUSETTS.

IMPROVEMENT IN ELECTRIC GAS-LIGHTING APPARATUS.

Specification forming part of Letters Patent No. **170,221**, dated November 23, 1875; application filed October 15, 1875.

To all whom it may concern:

Be it known that I, EDWIN E. BEAN, of the city of Boston, in the county of Suffolk, State of Massachusetts, have invented certain new and useful improvements relating to the adaptation of electrical gas-lighting apparatus for general telegraphic purposes, fully described in the following specification, reference being had to the accompanying drawings.

The object of my invention is to adapt the electric circuits, which are necessary portions of apparatus for lighting street-lamps by electricity, (one of which is fully described in Letters Patent, Nos. 108,434, 149,561, and 158,889,) as a telegraph for police, fire-alarm, military, and other purposes.

Very briefly described, this apparatus for lighting the street-lamps consists of a pipe, A, communicating with a set of diaphragms, B, one on each lamp, into which pipe compressed air is introduced to act upon these diaphragms, and thus open the gas-cocks, to each of which one of the diaphragms is properly connected. The motion of these diaphragms also closes the circuit at the burner by connecting the wire attached to the lever C with the wire attached to the burner D, the burner D being insulated and forming a part of the main wire of the circuit while the lever C is uninsulated, and therefore forms a ground-connection with the battery. The circuit is thus complete at the lamp, and when the switch F is closed the circuit passes through the wires a a^1, magnet G, wire a^2, (which extends from magnet G to burner D,) through burner D and wire a^3, (on lever C,) to the earth. The magnet G attracts its armature when the current passes, and thereby liberates the lever C, the upper end of which flies back and carries the wire a^3 away from the burner, and thus breaks the circuit; but at the same time the wedge I on the lower end of lever C is thrown between the springs b b, and the current again passes through wire a, springs b b, and wedge I, to the next lamp, and its wire a^1, magnet G^1, burner D′, and ground-wire a^3. The circuit is broken at this lamp as before, by separating a^3 from the burner, and a new circuit established by placing the wedge I, between the springs b^1 b^1, and so on through all the lamps.

The wedges H H^1, &c., are not used in the apparatus for lighting, and when the lamps are not lighted the wedges J J^1, &c., occupy the position shown in Figures 1 and 4, and the circuit is broken between the springs b b b^1 b^1, &c.

The first part of my present invention therefore consists in combining with the lighting-wires at each lamp a second circuit-closer, which shall close the circuit as the lamps are extinguished, but without interfering with the proper operation of the lighting attachment; for, if the circuit was not broken at b b b^1 b^1, &c., the current would not pass through the wires a^1 and magnets G G′, &c., and the lamps would not be lit. The essential characteristics, therefore, of this second circuit-closer are that it shall close the circuit as the lamp is put out, but shall open the circuit as soon as the lamp is ready to be relit. The simplest form of it, in view of the present construction of the lighting attachment, is the wedge H, and the readiest point of attachment is to rod K of the diaphragm, as illustrated in Fig. 3. All the diaphragm-rods are withdrawn to close the gas-cocks, and thrown forward to open them, and, consequently, the wedges H H^1, &c., are thrown between the springs b b b^1 b^1, &c., when the lights are put out and removed from between the springs just before the lights are relit. While the lamps are burning the wedges J J^1, &c., make the wires marked a in Figs. 1 and 4 practically one continuous insulated wire, extending from lamp to lamp, (see Fig. 4;) but as the apparatus is now constructed this wire is broken at each lamp, as soon as the lamps are put out, by the withdrawal of the wedges J from between the springs b b; but with the wedges H H^1, &c., the wire a is made continuous again as soon as the lamps are put out, and broken at each lamp (as is essential for the proper operation of the lighting apparatus) as soon as the lamps are ready to be relit.

For police, fire-alarm, or other purposes the wires d are connected to the main wire a of the gas-lighting circuit at any desired point. In Fig. 1 this wire d extends from a wire, a, in the pipe A, then to the key L, then to the magnet M, then to the battery N, and then to the earth. The key L has a switch, e, upon it,

which is kept closed by a spring. Should a policeman desire to transmit a message from any lamp or lamp-post, he will connect the burner D (or any other portion of the main *a*) with the earth by a hand-key, R. (See Fig. 3.) A current will be established (whenever he presses down the knob of hand-key R) from the battery N, through the wire *d*, magnet M, switch *e*, wire *a*, wire a^1, magnet G, wire a^2, burner D, hand-key R, and the earth, back to the battery N, which current will actuate the sounder P, and thus transmit a signal. Simultaneously with this current from battery N a current will also be established from battery N′, Fig. 2, through wire *d*, magnet M′, switch *e′*, wire *a*, springs b^4 b^3 b^2 b^1, and wedges H^4 H^3 H^2 H^1, (or J^4 J^3 J^2 J^1, if the lamps are lit,) wire a^1, magnet G, wire a^2, burner D, hand-key R, and the earth, back to battery N′, and this current will transmit a signal to P′. The same result will follow if the circuit be closed at any of the other lamps by means of hand-key R, and the result is unchanged if the number of wires *d*, batteries N N′, &c., switches *e e′*, &c., and instruments P P′, &c., be increased in number. (See Fig. 4.) For example, in a large city there might be a battery, N, sounder P, switch *e*, and wire *d*, properly connected at one end to the main *a*, and at the other end to the earth, in every police-station and every engine-house, and in such other offices, such as public offices, banks, hotels, &c., as may be desired. If a fire break out, the operator mounts the nearest lamp-post, and with his hand-key R signals one, two, three, (or such other arbitrary signal as may be agreed upon to denote fire,) which signal is given simultaneously in all the engine-houses, police-stations, and other places where there is a sounder, P, and the other appliances. The operator then signals the number of the district, and the number of the lamp-post in that district, showing almost exactly where the fire is; or, should a policeman want aid, he mounts the lamp-post, and with his hand-key R signals to the chief's office and to every station-house in the city.

Should a message require to be sent from any station, the arm *k* of Fig. 1 (supposed to represent the station from which the message is to be sent) is turned so as to bring the post upon its under lever *h;* and, as this arm *k* is in contact with diaphragm Q, its post and lever *h* form a ground-connection key, in function precisely like the key R. This key *h k* may, of course, be a separate key, instead of a part of key L. As often as the lever *h* is brought in contact with the post of arm *k* signals are transmitted to the sounders P′, &c., throughout the city; and so a message can be sent from any station-house, engine-house, or any other office having key *h k* and appliances, to the other station or engine houses.

When the key *h k* is manipulated a current passes from battery N, through wire *d*, magnet M, switch *e*, key *h k*, and the earth, back to battery N, and signals at sounder P. Simultaneously a current passes from battery N′, through wire *d*, sounder P′, wire *a*, springs b^4 b^3 b^2 b^1 *b*, wedges H^4 H^3 H^2 H^1 H, if lamps are not lit, and wedges J^4 J^3 J^2 J^1 J, if they are lit, key *h k*, and the earth, back to battery N′; and a current passes in like manner from each of the batteries N through each of the sounders P. The message is thus sent from any station to all the others.

Should any policeman desire, while on his beat, not only to signal but to receive a reply, he sends his signal, as before, then keeps the knob of hand-key R pressed down, and the signal is sent him from key L by holding back the switch *e*, and he hears the click of the armature of the magnet in the lamp-post. As soon as the knob of hand-key R is depressed, the circuits from all the batteries, N N′, &c., are complete, as before explained; and, as soon as the message is transmitted by the hand-key R, the policeman depresses the knob, and keeps it depressed until he receives a signal showing that his message is received. This message from one of the stations—the chief office, for example—is sent as follows: When the policeman keeps the knob of the key depressed, each of the magnets M M′, &c., attracts its armature, and holds it until each of the switches *e e*, &c., is moved back, and the magnet G in the lamp at which the policeman is also attracts and holds its armature; but, as soon as the switches *e e′*, &c., are moved back, each circuit is broken, and all the armatures released. The operator at the proper station—the chief office, for example—then sends a reply by means of the hand-key L, which establishes a current from battery N, through wire *d*, magnet M, key L, wire *a*, wire a^1; or, if through one or more lamps, wedges I or H, and springs *b*, magnet G or G′, &c., burner D or D′, &c., hand-key R, and the earth, back to battery N; and the signal is conveyed to the policeman at the lamp-post by the sound of the armature of the magnet in the lantern he is at. In brief, each lamp-post, engine-house, station-house, &c., is, by my invention, made a station for both receiving and transmitting messages.

The hand-key R is the simplest form for making and breaking the circuit at the lamp-post, and, in use, brings the ear of the user near the magnet in the lamp-post; but it is obvious that a lock might be let into the lamp-post, and insulated, and that a proper key might be used which would so operate this lock as to bring a portion of it into electrical contact with the wire a^2; and this lock-key might also be an electrical key for making and breaking contact between that portion of the lock in contact with wire a^2 and the lamp-post or other ground-connection. This is a matter not of the essence of my invention, as are also the kind of batteries or the system of signals used. But the signal-key used at the lamp must bring the wire a^2 into connection with the

ground, if signals are to be both received at, and transmitted from, the lamps. If signals are to be transmitted only, the signal-key need only connect the wire *a* at the lamp with the ground.

It is very desirable that it be made impossible to operate any of the keys L L′, &c., or *h k*; and it is essential that switches *e e′*, &c., shall be opened while the wires are required for the purpose of lighting the gas. To effect this, I connect each of the keys L, L′, and *h k* with the rod *f* of a piston or diaphragm, Q, which is itself operated by the compressed air which operates the gas-cocks, so that when the operator in charge of the gas-lights admits compressed air into the pipe A each switch *e* is thrown back, and held back, and a stop, *g*, on the rod *f* is thrown under, and held under, the lever *h* of each of the keys L L′, &c. As soon as the compressed air is allowed to escape (which is done as soon as the gas is lit) the rod *f* and stop *g* are thrown back again, and the key L is ready for use. Both rod *f* and stop *g* are insulated from lever *h* and switch *e*.

This combination of an insulated wire, *a*, and a series of insulated wires, *d*, connected together at numerous points, as clearly shown in diagram, Fig. 4, with each series of wires *d* provided with its own battery N, and with each using more or less of the wire *a* to complete its circuit, is new with me, and is of very great, if not vital, importance in my method of adapting the gas-lighting wires and magnets for use as general telegraphic circuits and instruments.

In the above description nothing has been said as to the number of lamps and other stations connected with the wire *a*, for the reason that any number may be so connected; but for convenience, and in order to prevent any confusion of signals, which might arise if the number of lamps and other stations were great, by reason of two or more operators attempting simultaneously, or within a few seconds, to send signals, it is desirable to confine the number of stations within reasonable limits, varying, of course, with the number of occasions for use. For example, in a large city there might be, say, twenty sections, each separate and distinct from the other, diagram, Fig. 4, showing one section in that case, instead of the whole city. Each of these sections will be connected with the chief office, and the connecting-wires may be each connected to the other at that office, making all the sections practically one; but each connecting-wire will also be so connected to a proper switch that each can be, by a simple motion, disconnected from the other and connected to its own sounder, thus making each one of the twenty sections separate and distinct, and making confusion impossible even if twenty messages were being sent at the same time, provided no two of them were in the same section.

For example, suppose it so happened that several operators attempted nearly simultaneously to send messages, the signals will be confused at all the receiving-stations, and the operator at the chief office will at once disconnect the sections from each other, and connect each with its own sounder. He will then send an order to repeat, and when this order is obeyed there will then be no confusion, unless two or more operators are signaling in the same section, which is not likely to happen if the sections are not too large. If it should happen, a simple system of rules may be readily framed whereby each operator in a given section will be told from the chief office when to make his signal. For example, suppose three operators signaling at the same time in one section; the operator at the chief office will call "One," and wait an agreed time—say, ten seconds—for a reply; if no reply, he will call "Two," and wait, and so on. The operator desiring to signal a fire, will send his signal at the call "One;" the operator desiring police aid, at the call "Two," and so on. Each operator will break the circuit as soon as a number is signaled not his own, and not make it again for an agreed interval of time—say, thirty seconds.

In the description and drawings a battery, N N′, &c., is shown for each sounder P P′, &c.; but in practice one battery may actuate several sounders. For example, in one hundred stations there might be but ten batteries N N′, &c., for one hundred sounders P P′, &c.; and instead of keys L L′, &c., ninety of the stations would only have a ground-connection key, *h k*. Each of these ninety stations would receive all the signals sent from any other station or lamp, as would also the ten stations provided with keys L L′, &c., and switches *e e′*, &c. There might also be a number of stations, such as banks, hotels, &c., which would be supplied with nothing but a sounder, P, and ground-connection key *h k*, and those stations would not receive any of the messages sent except in answer to a signal sent from them, being in all respects the same as before explained in regard to a message sent to an operator at any lamp.

What I claim as my invention is—

1. The combination, with the gas-lighting wires *a*, of the series of circuit-closers H H^1 H^2, &c., whereby the circuit is closed at each lamp as it is put out, and broken just before it is relit, substantially as described.

2. The combination, with the gas-lighting wires *a*, of batteries N, keys *h k*, instruments P, and wires *d*, as described.

3. The combination, with the gas-lighting wires *a*, of key R, batteries N, instruments P, and wires *d*, as described.

4. The combination, with the gas-lighting wires *a* a^1 and magnet G, of key R, batteries N, keys L, instruments P, and wires *d*, as described.

5. The combination, with the gas-lighting wires *a* a^1 and magnets G, of the key R, bat-

teries N, keys L, keys *h k*, switches *e*, instruments P, and wires *d*, as described.

6. The method above described for adapting the wires necessary for lighting street-lamps by electricity to other telegraphic purposes, consisting essentially in using with them the series of wires *d*, batteries N, and suitable signal-making instruments, as described.

7. The combination of air-pipe A and piston Q with the switch *e* and lever *h* of key L, as described.

8. The combination of wires *a*, series of wires *d*, keys *h k*, (or R,) instruments P, and batteries N, as described.

9. The combination of the key R and lamp or lamp-post with the circuit *a d*, instrument P, and battery N, whereby each lamp-post is made a transmitting-station, as above described.

10. The combination of the key R and lamp or lamp-post with the circuit a^1 *a d*, instrument G, instrument P, and battery N, whereby each lamp or lamp-post is made both a transmitting and receiving station, as above described.

EDWIN E. BEAN.

Witnesses:
J. E. MAYNADIER,
G. B. MAYNADIER.