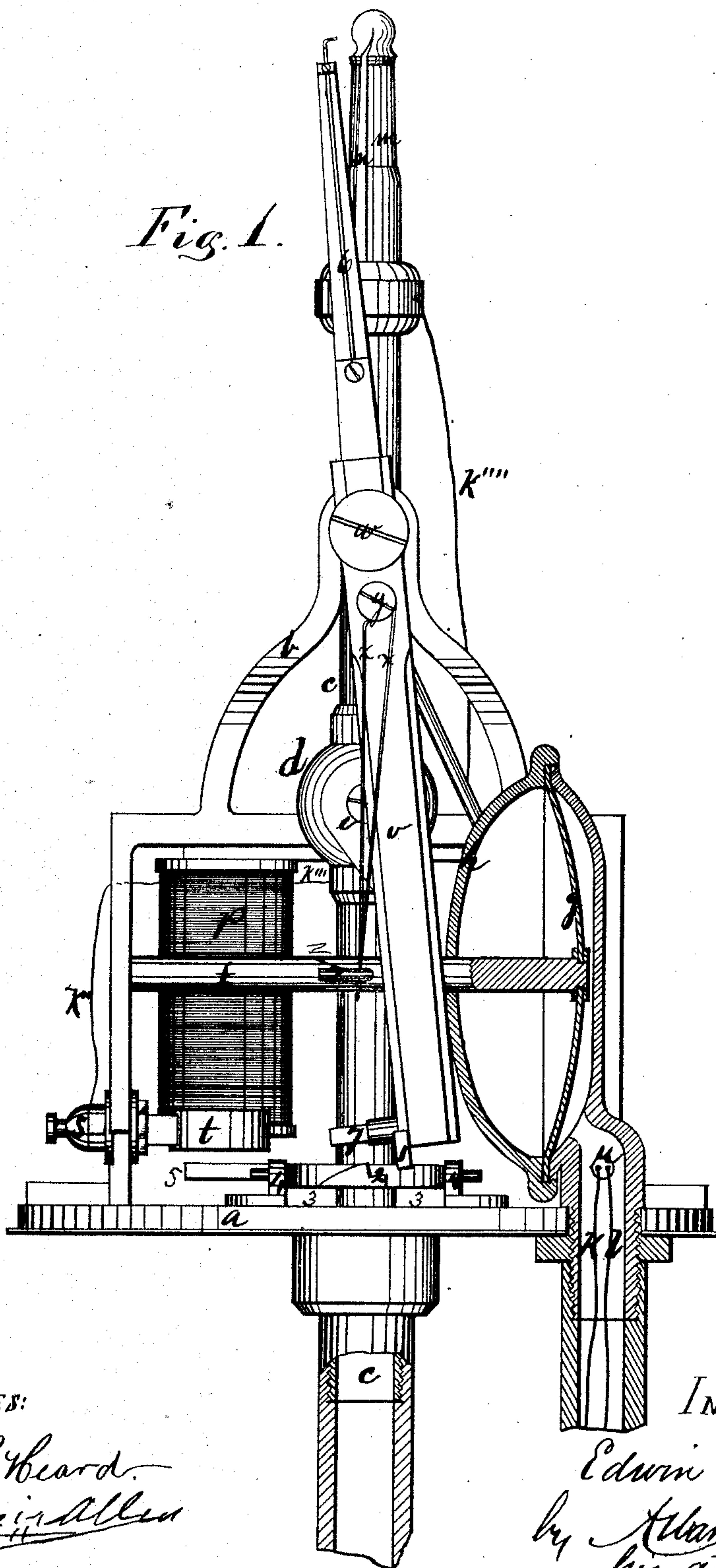


E. E. BEAN.
Electro-Magnetic Gas-Lighting Apparatus.
 No. 158,889. Patented Jan. 19, 1875.

Fig. 1.



WITNESSES:

John R. Heard.
Francis Allen

INVENTOR:

Edwin C. Bean
by Allan Andrew
his attorney

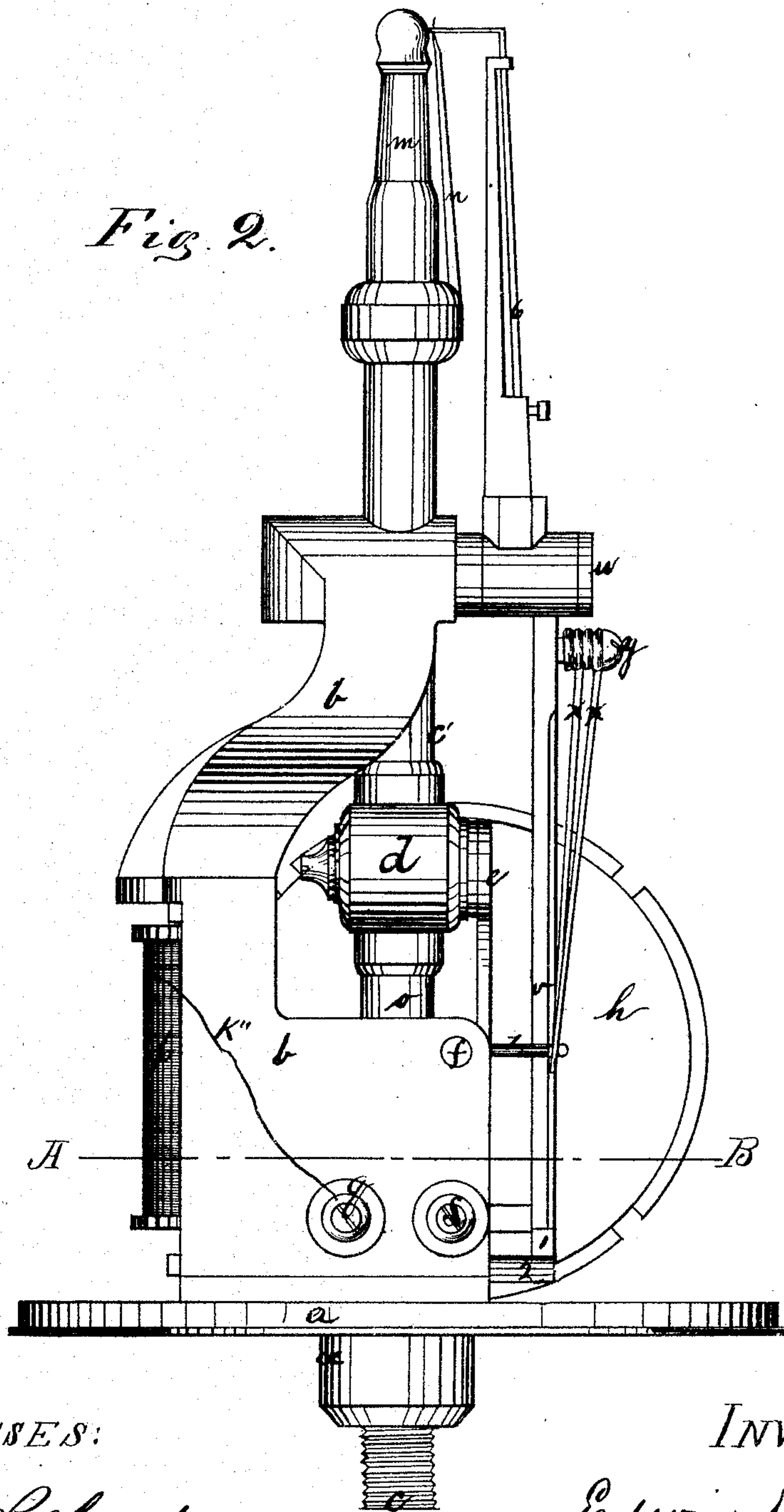
E. E. BEAN.

Electro-Magnetic Gas-Lighting Apparatus.

No. 158,889.

Patented Jan. 19, 1875.

Fig. 2.



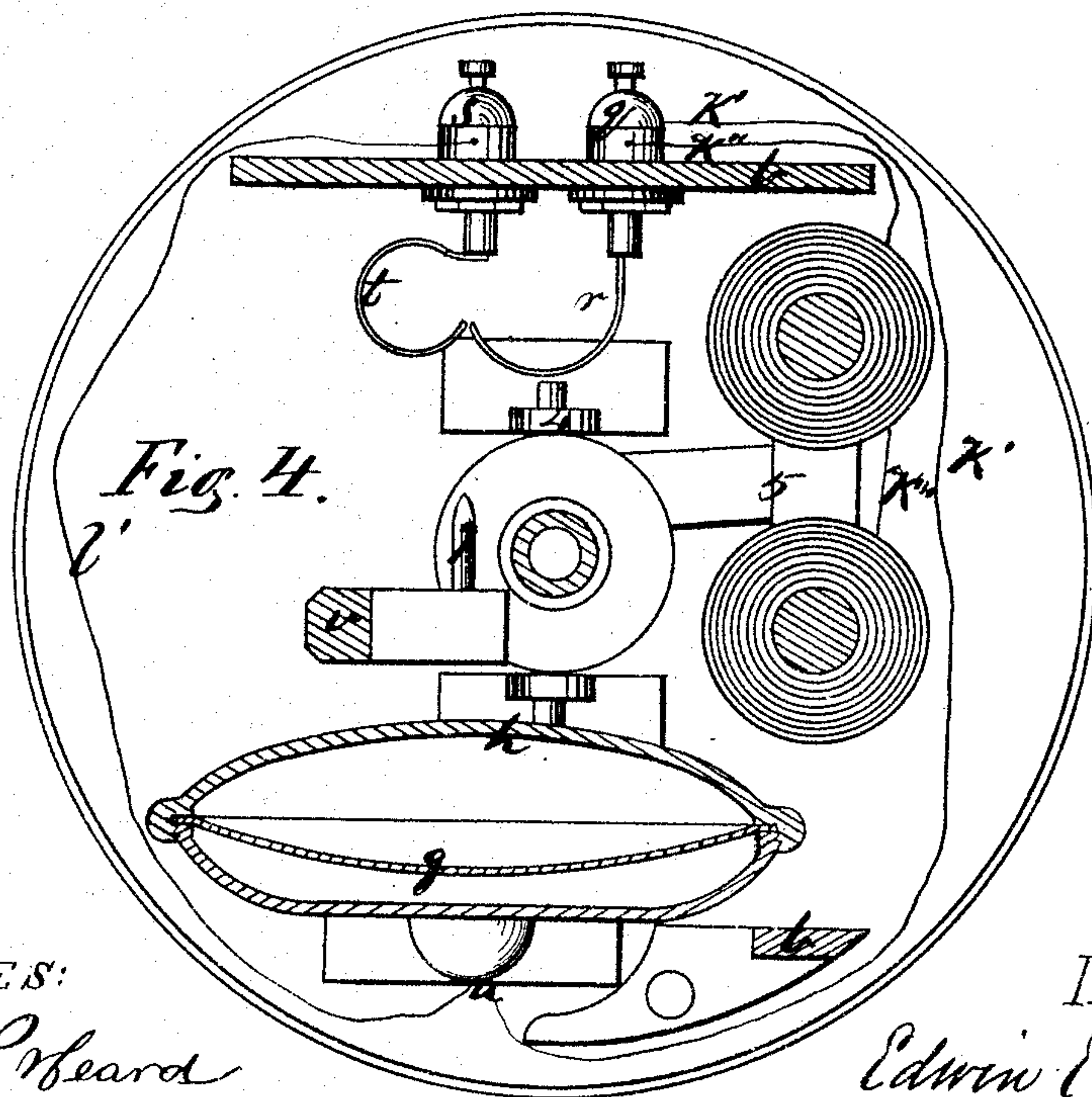
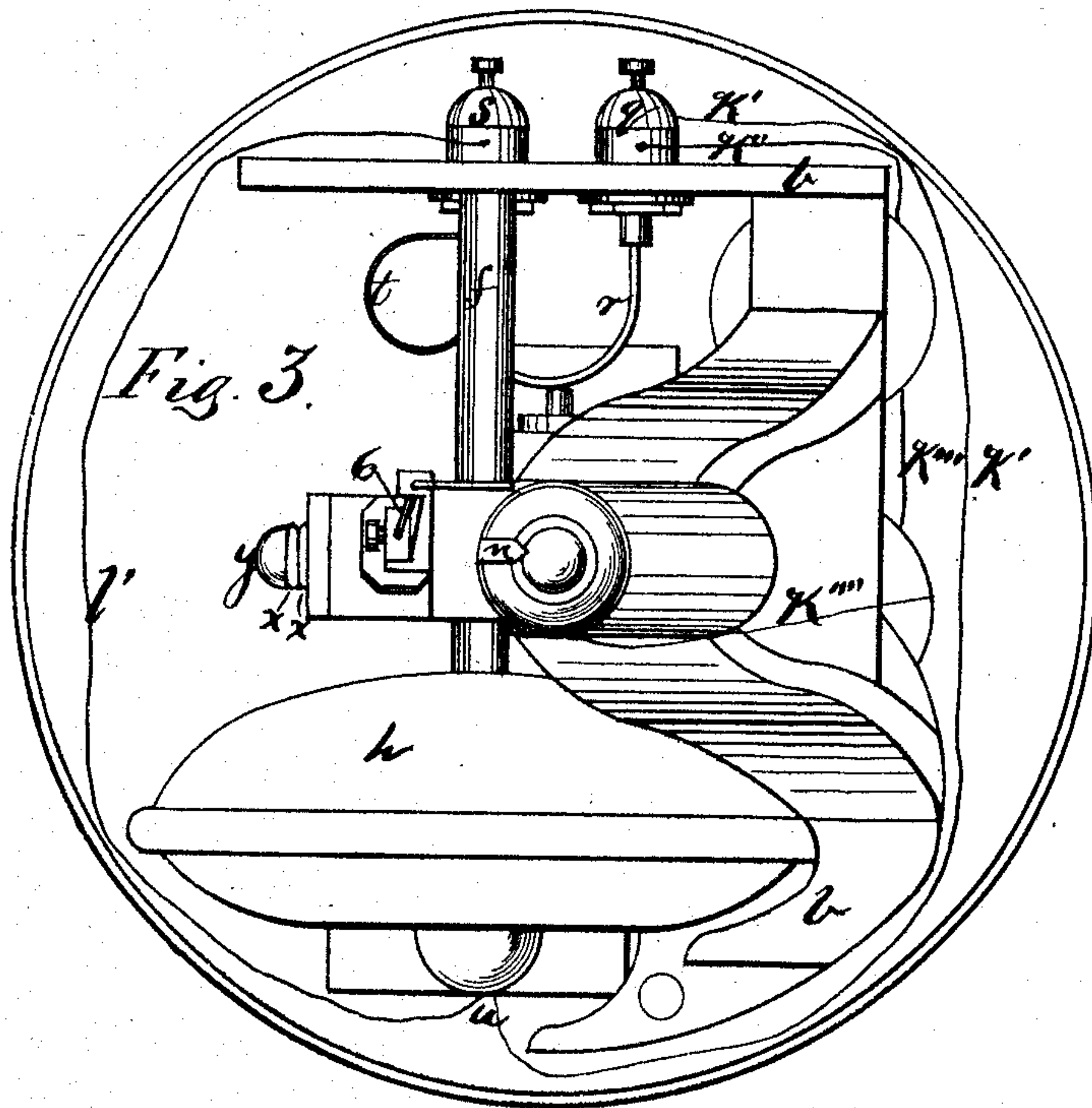
WITNESSES:

John R. Heard.
Francis Allen

INVENTOR:

Edwin C. Bean.
by Alban Andren
his attorney

E. E. BEAN.
Electro-Magnetic Gas-Lighting Apparatus.
 No. 158,889. Patented Jan. 19, 1875.



WITNESSES:

John H. Heard
 Francis Allen

INVENTOR:

Edwin E. Bean.
 by Wm. Andren
 his attorney.

UNITED STATES PATENT OFFICE

EDWIN E. BEAN, OF BOSTON, MASSACHUSETTS.

IMPROVEMENT IN ELECTRO-MAGNETIC GAS-LIGHTING APPARATUS.

Specification forming part of Letters Patent No. **158,889**, dated January 19, 1875; application filed August 5, 1874.

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 new and useful improvements in Pneumatic Electric Gas-Lighting Apparatus; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to which it pertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

My invention relates to improvements on the patent granted to Frank Bean, October 18, 1870, for pneumatic and electric gas-lighting apparatus, and consists in the combination, with a flexible diaphragm and spindle in connection with an ordinary gas-cock, of a rocking lever, operated by a spring-wire, and released by the withdrawing of an oscillated armature that is attracted to a pair of electro-magnets as soon as a current of electricity is conveyed to the apparatus. The spark that ignites the gas at the burner is produced by an elastic bent steel wire, at the upper end of the rocking lever aforesaid, which steel wire, being in contact with an electric pole when the gas is turned on, passes by the said pole, and in breaking the current of electricity produces a spark by which the gas is ignited. The current of electricity is conveyed to the next lamp in succession by means of a metallic wedge secured to and insulated from the lower end of the rocking lever aforesaid, which wedge comes in contact with flexible metallic springs attached to insulated posts carrying the wires to and from the apparatus. The said wires are inclosed in the pipe through which the compressed and rarefied air is conducted to the diaphragm, by which arrangement the breaking of the wires by accident or otherwise is entirely obviated.

On the drawings, Figure 1 represents a front elevation of my invention. Fig. 2 represents a side elevation. Fig. 3 represents a ground plan, and Fig. 4 represents a cross-section on the line A B, shown in Fig. 2.

Similar letters refer to similar parts wherever they occur on the drawings.

a is the base and *b* is the frame, made in

any usual manner. *c* represents the gas-supply pipe, provided with an ordinary two-way cock, *d*, to which is attached the lever *e*, the lower end of which is jointed to the rod *f* in the usual manner. The rod *f* is operated by means of compressed and rarefied air acting upon the diaphragm *g*, the circumference of which is secured to the hollow case *h*. The air acting upon the said diaphragm is conveyed to the case *h* through the pipe *i*, that also serves as a protector for the electric wires *k l*, as shown in Fig. 1. The gas-supply pipe *c* extends above the cock *d*, as the pipe *c'*, and terminates at the top as an insulated burner, *m*, on the side of which is located a metallic rod, *n*, the top of which extends to the slit in the burner *m*. The pole *n* is in connection with the wire *k'''* that leads to an electro-magnet, *o*, from which the wire *k'''* is connected to another similar electro-magnet, *p*, from which the wire *k''* is connected to an insulated post, *q*, that terminates on the inside of the frame *b* as a bent metallic spring, *r*. A second post, *s*, also insulated from the frame *b*, is made in a similar manner to the post *q*, and terminates as a bent metallic spring, *t*, as shown in Fig. 4. From a post, *s*, leads a wire, *u*, through a suitable insulated stuffing-box, *u*, to the wire *l*, by means of which the electric current, after lighting the gas at one apparatus, is conveyed to the next burner in the series of lamps that are to be operated. The wire *k* is connected to the post *q* by means of the wire *k'*, as shown in Fig. 4. A lever *v* is hinged at *w*, as shown in Fig. 1. *w* is a pin or screw, projecting through a circular hole in the lever *v*, and screwed in the frame or standard *v*, by which arrangement the lever *v* may rock around the fulcrum *w*. The lever *v* is operated from the rod *f* by means of a spring-wire, *x x*, attached at *y* to the lever *v*, as shown in Fig. 1. The lower end of the spring-wire *x x* rests against a hook, *z*, on the rod *f*. The lower end of the rocking lever *v* is provided with a projecting tooth, *1*, that is made to fit and rest in the recess *2* on the end of the rocking frame *3*, that is made to rock slightly in the bearings *4 4*. The rear part of the frame *3* projects below the electro-magnets *o p*, as an armature, *5*. The upper end of the lever *v* is pro-

vided with a bent metallic snapping-wire, 6, the extreme upper end of which lies in contact with the rod *n*, as soon as the tooth 1 on the lower part of the lever *v* is forced into the recess 2. A spark is produced when the current is broken between the upper ends of the wire 6 and pole *n*, which is occasioned by the rocking of the lever *v* around its fulcrum *w*. The tooth 1 at the lower end of the lever *v* is released from the recess 2 as soon as the armature 5 is attracted to the electro-magnets *o p*, when the force of the spring-wire *x x* moves the lever in the direction of the arrow shown in Fig. 1, and in so doing places the insulated wedge 7, that is connected to the lower end of the lever *v*, in contact with the two bent springs *r* and *t*, shown in Fig. 4, whereby the electric current conveyed to the apparatus through the wires *k k'* is conducted to the next apparatus in the series through the wires *l' l*.

The operation of my invention is as follows: Before the gas is turned on or ignited, the different parts of the apparatus are in the respective positions, as shown in Fig. 1. When it is desired to open the gas-cocks, I force compressed air from a suitable reservoir through the pipe *i* to the rear of the diaphragm *g*, by which the latter is expanded, and forces the rod *f* and the gas-cock lever *e*, as shown in Fig. 1, toward the left, thereby opening the gas-cocks on all the lamps in the series. The action of the spring-wire *x x* forces the lower end 1 of the lever *v* against the recess 2, at the same time as the snapping-wire 6 is laid in contact with the upper end of the pole *n*. A current of electricity is then conducted through the wire *k* to the electro-magnets *o p*, and to the pole *n*, when the armature 5 is attracted to the under side of the electro-magnets *o p*, and the lower end of the lever *v* is then relieved from the recess 2, and set in motion by the spring-wire *x x* at the same time as the current of electricity is broken between the upper ends of the wire 6 and pole *n*, thereby producing a spark by which the gas is ignited at the burner. The lever *v* being in contact with the metallic frame *b*, which is in contact with the lamp-post, serves

for the purpose of conveying the current through an earth-circuit to the central station as long as the wire 6 is in contact with the upper end of the pole *n*. As soon, however, as the current is broken between the latter parts, a spark passes between them by which the gas is lighted. The force of the spring *x x* then swings the lever *v* around its fulcrum *w'*, so that the insulated metallic wedge 7 comes in contact with both of the springs *t* and *r*, and remains so as long as the gas is burning, whereby the current of electricity that is conveyed to the apparatus through the wires *k k'* and the post *q* is conducted through the spring *r*, wedge 7, spring *t*, and post *s*, to the wires *l' l*, leading to the next apparatus in the series, where the same operation is repeated, and so on through all the lamps that are to be lighted. To extinguish the lights, it is only necessary to connect the air-pipe *i*, leading to each diaphragm *g*, to a vacuum-chamber, or to a reservoir containing rarefied air, when the atmospheric pressure forces the diaphragm *g*, and with it the various operating parts, to their respective positions as shown in Fig. 1.

Having thus fully described the nature, construction, and operation of my invention, I wish to secure by Letters Patent, and claim:

1. The combination, with the diaphragm *g* and rod *f*, of the rocking-lever *v*, spring-wire *x x*, the circuit-breaking wire 6, and the metallic pole *n*, as and for the purpose herein described.

2. The combination, with the electro-magnets *o p*, and the armature 5, of the swinging frame 3, having catch or recess 2, lever *v*, insulated wedge 7, springs *r t*, and their insulated posts *q s*, and the wires *k k' k'' k''' k'''' l l'*, as and for the purpose herein set forth and described.

In testimony that I claim the foregoing as my own invention, I affix my signature in presence of two witnesses.

EDWIN E. BEAN.

Witnesses:

ALBAN ALDRÉN,
JOHN R. HEARD.