A. G. HOLCOMBE.

Electric-Light Apparatus.

No. 221,918. Patented Nov. 25, 1879.

Fig. 1

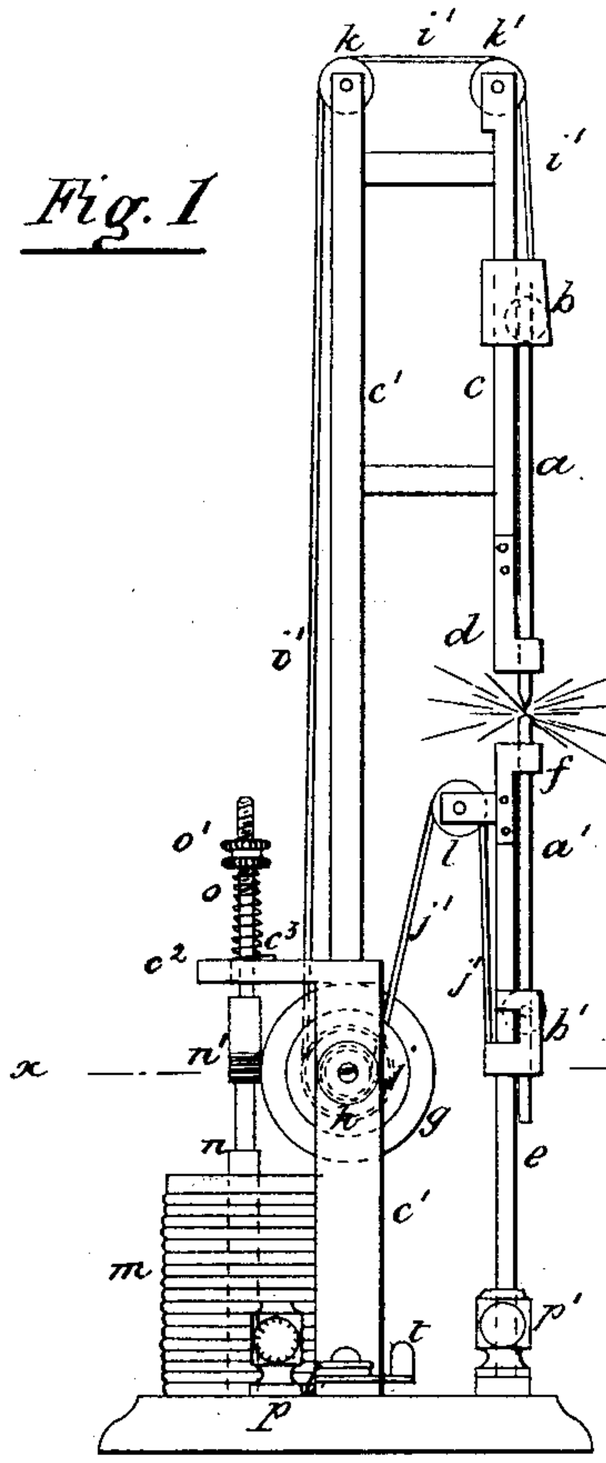


Fig. 2

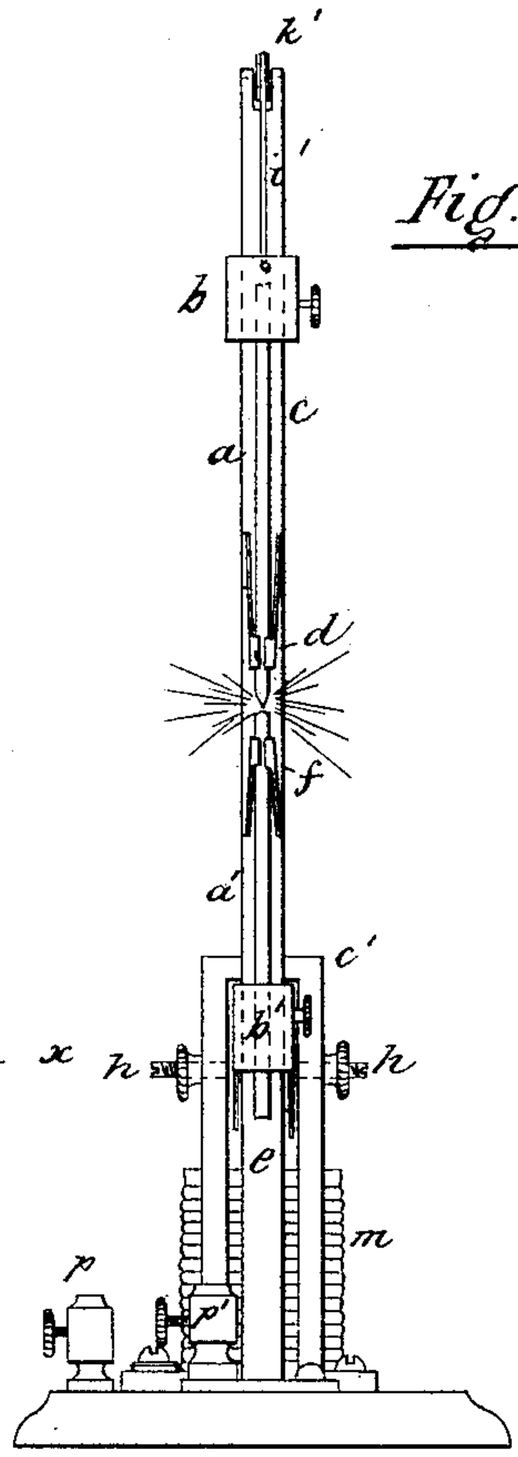


Fig. 3

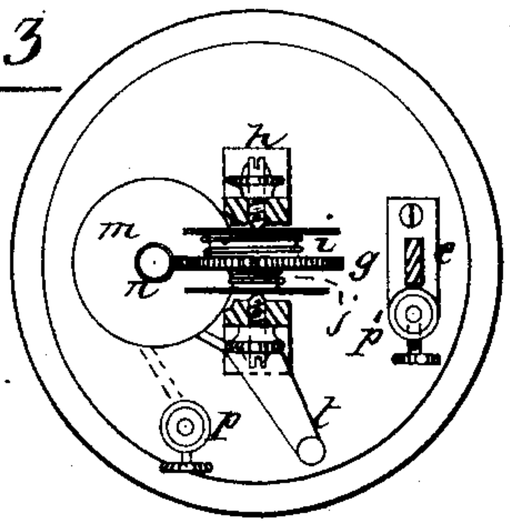
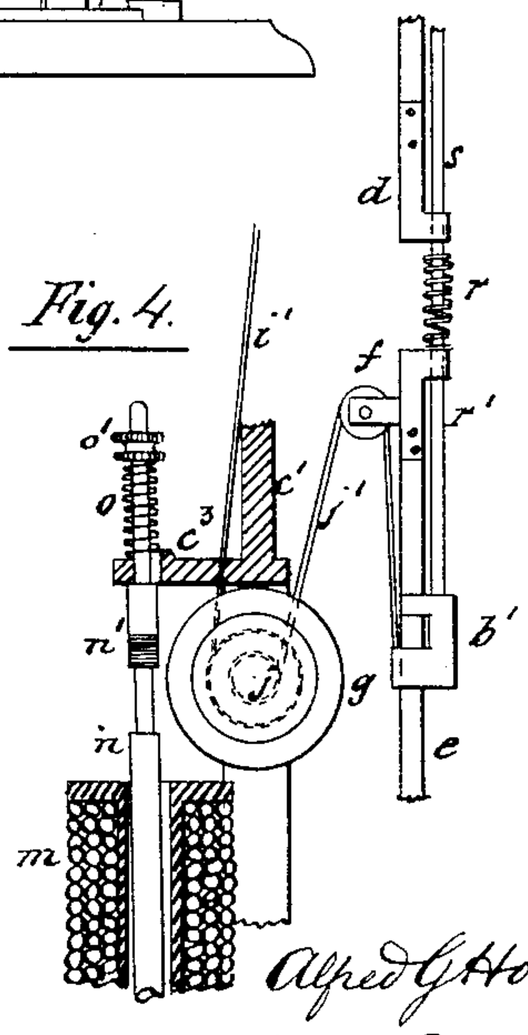


Fig. 4.



Witnesses.

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UNITED STATES PATENT OFFICE.

ALFRED G. HOLCOMBE, OF NEW YORK, N. Y.

IMPROVEMENT IN ELECTRIC-LIGHT APPARATUS.

Specification forming part of Letters Patent No. **221,918,** dated November 25, 1879; application filed May 7, 1879.

To all whom it may concern:

Be it known that I, ALFRED G. HOLCOMBE, of New York, county and State of New York, have invented certain new and useful Improvements in Electric-Light Apparatus, of which the following is a specification, reference being had to the accompanying drawings, forming a part thereof.

This invention relates to electric-lighting apparatus; and it consists of a simple and effective device for regulating the flow of the electric current, either through the carbon pencils of electric lamps when the light produced is by means of the arc, or through continuous metal or other conductors which generate light by incandescence. Said device consists of a disk of iron free to rotate, and provided with means for drawing the carbon pencils apart, and thus altering the resistance of the arc, or for opening the circuit or altering the resistance of the incandescent conductor.

The core of an axial electro-magnet arranged to come in contact with the periphery of the disk is, by magnetic inductive action, attracted to the disk, when the core is magnetized by the current passing through the helix of the magnet, said helix being in circuit with the carbon pencils or incandescent conductor, and as the core is drawn within the helix the disk is caused to partly rotate, and alters the resistance of the arc or incandescent conductor, thereby reducing the quantity of electricity passing through the light and helix, and so regulating the intensity of the light, the magnetic pull of the helix on the core being opposed to an adjustable spring, the strength of which is such that when the current passing through the helix is just a little below what is required to keep the light at the right intensity the core is partly drawn out of the helix and the iron disk freed, so as to allow the carbons to approach one another, or open the circuit of or reduce the resistance of the incandescent conductor, until the current allowed to pass is again sufficient to cause the core to come in contact with the disk and act as a brake thereon.

Figure 1 is a side elevation of my improvements in electric-light apparatus. Fig. 2 is a front elevation. Fig. 3 is a plan view cut through the line *x x;* and Fig. 4 is a part-sectional side view, showing the adaptation of the regulating device to an incandescent conductor.

The carbon pencils *a a′* are secured in the sliding blocks *b b′*. The block *b*, which carries the upper carbon pencil, *a*, is fitted to slide on the bar *c* of the main frame *c′*. The lower end of this bar *c* is provided with the platinum springs *d d*, between which the lower end of the carbon pencil *a* passes, and the block *b′* is fitted to a slide on the bar *e*, which is electrically insulated from the main frame *c′*. The upper end of this bar is provided with springs *f f*, between which the lower carbon pencil, *a′*, which is carried by the block *b′*, passes.

The springs *d* and *f* act as conductors to convey the current to the carbon pencils near their ends, so the length of the carbon pencils included in the circuit remains constant.

The main frame *c′* is forked at its lower end, and in the fork is placed the disk *g*, made of iron or other magnetic material, which rotates on the pointed bearings *h h*, passing through the sides of the forked frames. On the sides of the disk *g* are the drums *i j*, the drum *i* being about twice the diameter of the drum *j*. The cord or chain *i′* is secured to the drum *i*. It passes upward and over the pulleys *k k′*, and down to the blocks *b*, to which its end is secured. The cord or chain *j′* is secured to and passes around the drum *j* in the opposite direction, and passes up and over the pulley *l*, pivoted to and near the upper end of the bar *e*, the other end of this cord or chain being secured to the block *b′*.

It will be observed that when the upper carbon pencil, *a*, falls it causes the cord *j′* to be wound up on the drum *j*, and so causes the lower carbon pencil, *a′*, to move upward, and as the drum *i* is about twice the size of

the drum *j*, the carbon pencil *a* moves about twice as fast as the carbon pencil *a'*, as this is the proportion in which they are consumed, the positive current passing into the upper carbon, *a*.

It is evident that ordinary racks and pinions may be used in place of cords *i'* and *j'*.

The carbons move together automatically as they are consumed, the block *b* being made sufficiently heavy to overcome the friction of the moving parts and the weight of the block *b'* with its carbon pencil.

The axial magnet *m* is placed back of the main frame *c'* in such position that when the core *n* is centrally located in the helix the upper part, *n'*, of it is in contact with the periphery of the iron disk *g*. The core *n* passes up through a slotted hole in the arm c^2 of the main frame *c'*, and around the part of it that projects above the arm c^2 is the spring *o*, which is held in place and raises the core by the nut *o'*. The arm c^2 is provided with a slight projection, c^3, just beneath the forward side of the spring *o*, so that the spring is caused to tilt slightly backward, and moves the core *n* away from the disk *g* and out of the central line of the magnet *m*, as represented in Fig. 4, this being the position of the core when no current is passing through the lamp, and the disk *g* being free, the carbons come together.

The binding-post *p* is connected to one end of the helix *m*, the other end of the helix being connected to the main frame *c'*. The positive end of the conductor is fixed in this post *p*, and the current passes through the helix *m*, the main frame *c'*, and the springs *d d* to the carbon pencil *a*, and from it to the carbon pencil *a'*, through the springs *f f*, down the bar *e* to the binding-post *p'*, to which the other end of the conductor is fixed.

The operation is as follows: As soon as the current passes through the helix *m* the core *n* becomes magnetized, and through induction is attracted to the disk *g*, thereby acting as a brake thereon. It is also caused to move toward the disk by reason of the action of the current in the helix, tending always to make the core assume a perfectly central position thereto, and as the core is drawn down into the helix it draws the disk around with it, and so pulls the ends of the carbon pencils apart, forming an electric arc between them, the extent of which is governed by the strength of the spring *o*, which is regulated by turning the nut *o'*. When the arc increases beyond the point at which it is set to burn, then the resistance to the current increases, and the flow of the current is proportionately decreased, and the spring *o* overcomes the inductive action of it on the core and draws the core out of the helix, which allows the disk to turn and the points of the carbons to approach together until the arc is again of the right resistance. This regulating device is also well adapted for use in electric lamps in which the light is produced by the incandescence of a platinum or other suitable wire by varying the resistance of the wire, by causing more of it to come in circuit, or by breaking contact just before the melting-point is reached.

Fig. 4 shows a spiral of wire, *r*, secured to the rod *r'*, which is held in the sliding block *b'*. The rod *s*, which is secured to the sliding block *b*, (not shown,) fits inside the spiral, but is free to move up and down therein. The spring *o* is so set that when the current passing through the lamp is more than what is necessary to keep the part of the spiral which is in circuit at the proper heat and glow the core *n* is drawn into the helix *m*, and the rod *s* is gradually drawn out of the spiral *r*, thus putting more of the wire in circuit until the resistance of the spiral counterbalances the increase of the current.

The part *n'* of the core *n* is shown provided with fine teeth, which fit into corresponding teeth formed on the periphery of the disk *g*, the object of which is to insure the proper moving of the disk with the core when a weak current is used, and instead of depending on the inductive action of the core on the disk to draw the core to the disk, a light spring may be used for this purpose. When a powerful current is used in the lamp, then the attraction between the core and disk is sufficient to cause the disk to move with the core if they are both smooth.

The ordinary carbon pencils may be made to give a light by incandescence by making the spring *o'* so strong that the helix has not sufficient power to draw the core in contact with the disk, or by switching off the current from the helix and allowing it to pass directly through the frame *c'* by bringing the switch *t* in contact with the post *p*. The carbons would then feed together as they were consumed, as before described, by the preponderance of the weight in the upper block, *b*.

I am enabled with this lamp to maintain a steady light, the equivalent of from one standard candle upward, either by the arc or by incandescence by the use of small carbons, for which small carbons I have found that lamp-black is preferable to the carbon generally used in their manufacture.

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

1. In an electric-light apparatus, the combination of the core of an axial electro-magnet with the iron disk of the feeding device, when said core acts as a brake to the disk by the inductive action of the core thereon, substantially as and for the purpose hereinbefore set forth.

2. The combination of the helix *m*, core *n*, provided with the teeth *n'*, and disk *g*, provided with corresponding teeth on its periphery, substantially as hereinbefore set forth.

3. The core *n* of the axial magnet *m*, in combination with the spring *o*, projection c^3 on arm c^2 of the frame *c'*, and disk *g*, substantially as hereinbefore set forth.

4. The combination of the guiding and conducting springs *d d* and *f f* with the carbons and their carrying-blocks *b* and *b'* and bars *c* and *e*, substantially as hereinbefore set forth.

5. In combination, the disk *g*, provided with the drums *i* and *j*, the cords *i' j'*, with the carbons and their carrying-blocks *b b'*, and springs *d d f f*, substantially as hereinbefore set forth.

6. In an electric-light apparatus, in combination, the magnet *m*, core *n*, disk *g* of the regulating and feeding device, springs *d d f f*, and carbons *a a'*, with the switch *t*, whereby light is produced by the arc or incandescence, substantially as hereinbefore set forth.

In witness whereof I have hereunto set my hand this 5th day of May, 1879.

ALFRED G. HOLCOMBE.

Witnesses:

H. D. WILLIAMS,

ALFRED SHEDLOCK.