(No Model.) 3 Sheets—Sheet 1.

A. CHESTER & J. J. RATHBONE.

ELECTRIC ARC LAMP.

No. 532,531. Patented Jan. 15, 1895.

Fig. 1.

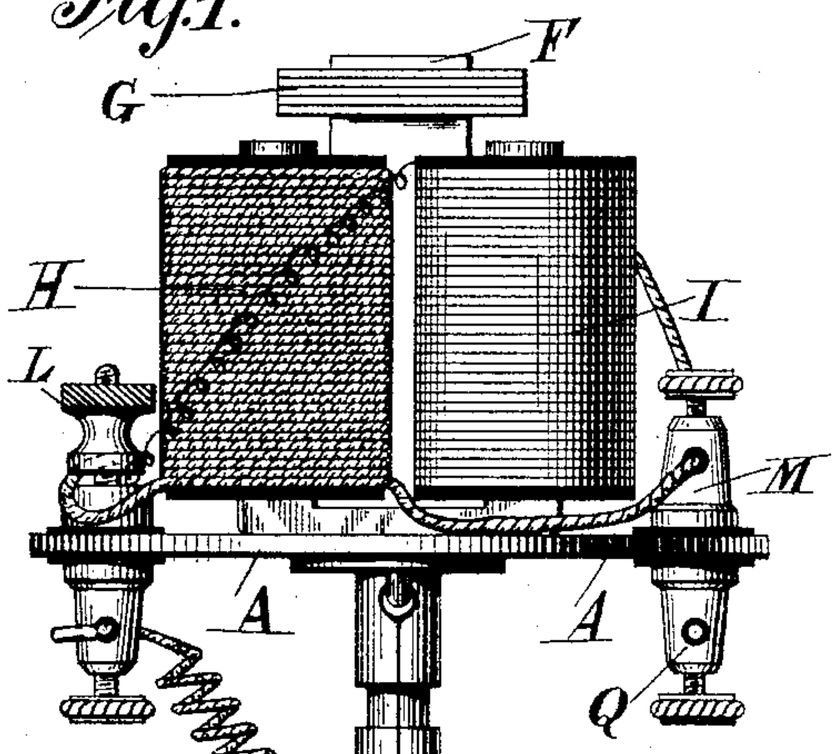


Fig. 2.

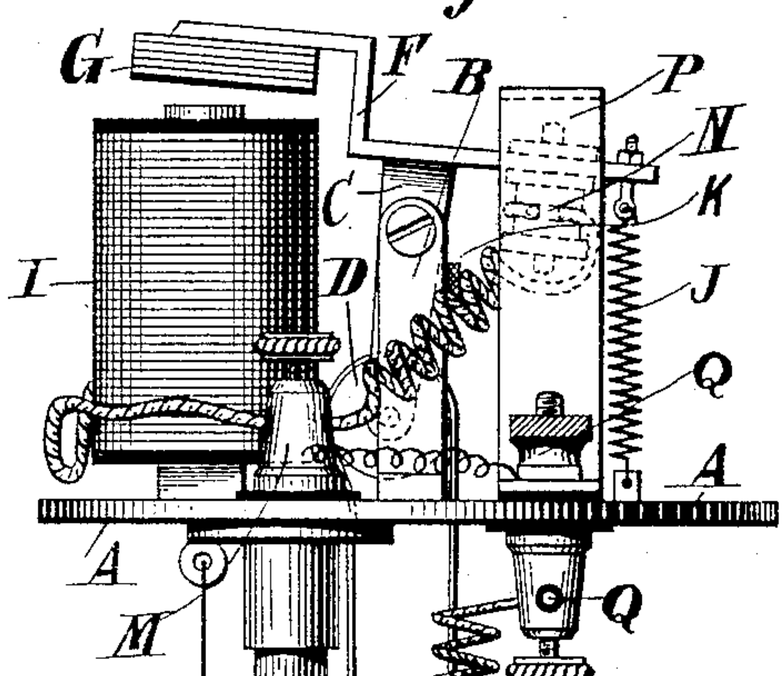


Fig. 3.

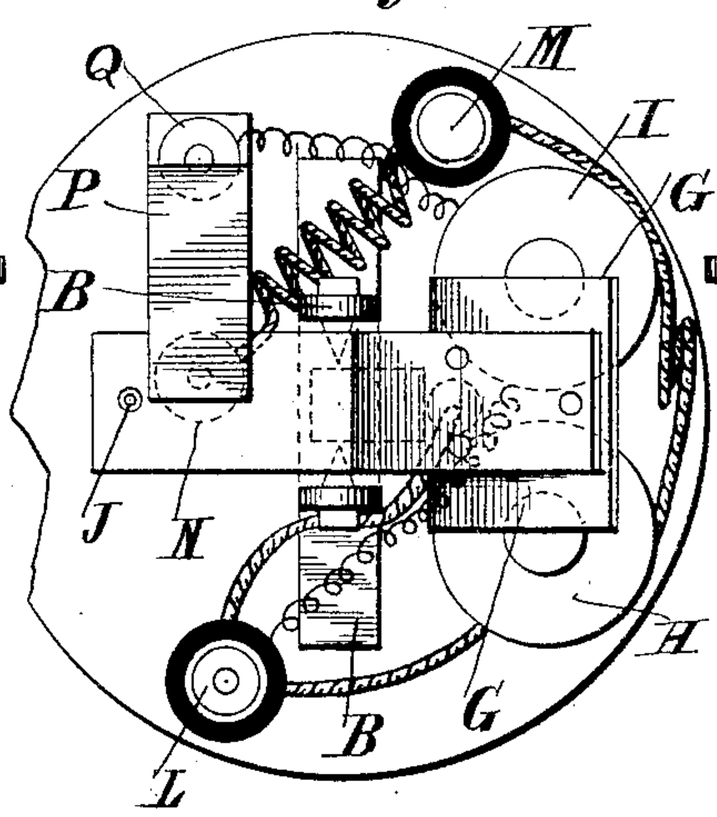
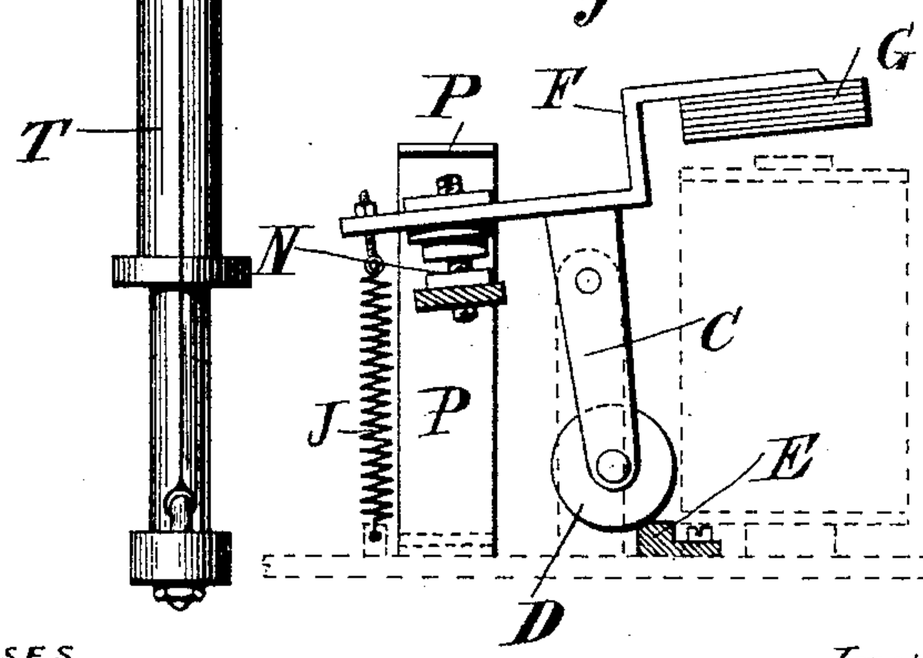
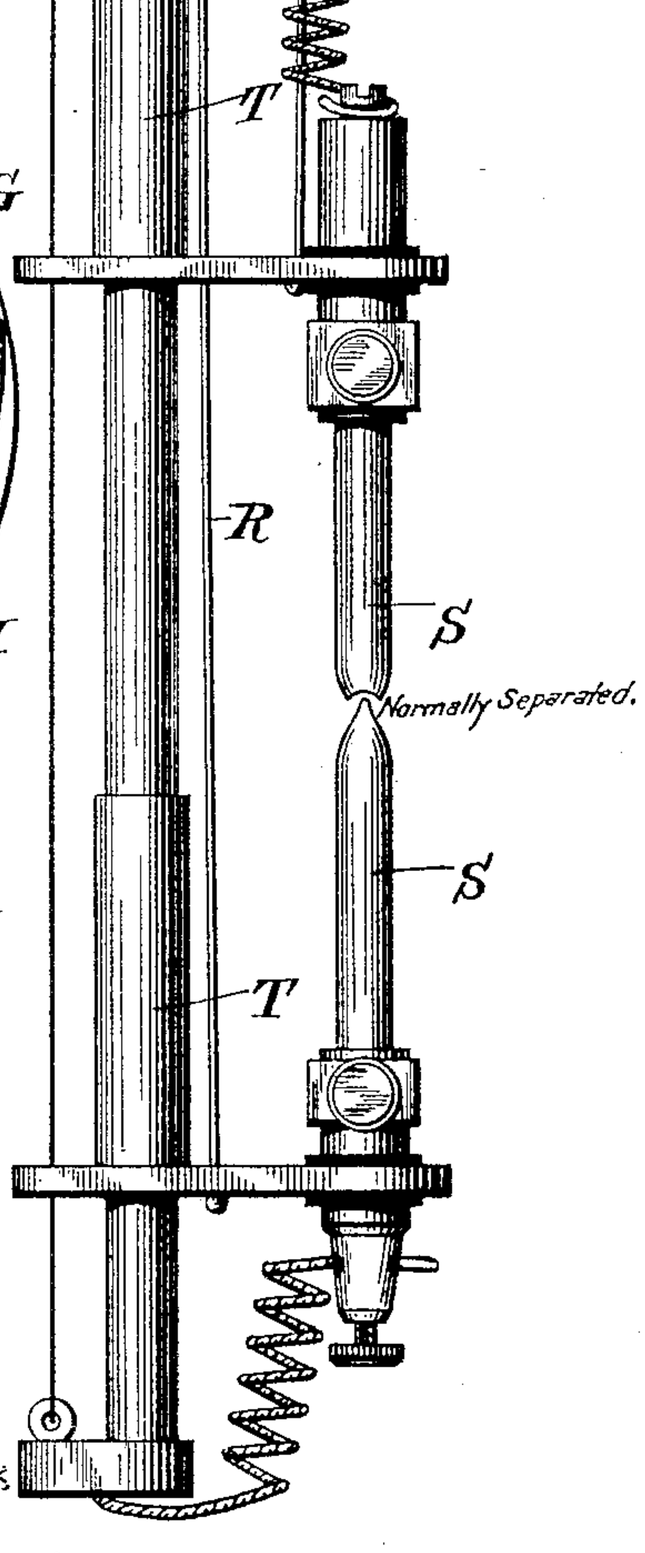


Fig. 4.





WITNESSES
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Charles Alfred Grosvenor

Inventors A. Chester & J. J. Rathbone
per Henry Gardner
Attorney

(No Model.) 3 Sheets—Sheet 2.

A. CHESTER & J. J. RATHBONE.

ELECTRIC ARC LAMP.

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Fig. 5.

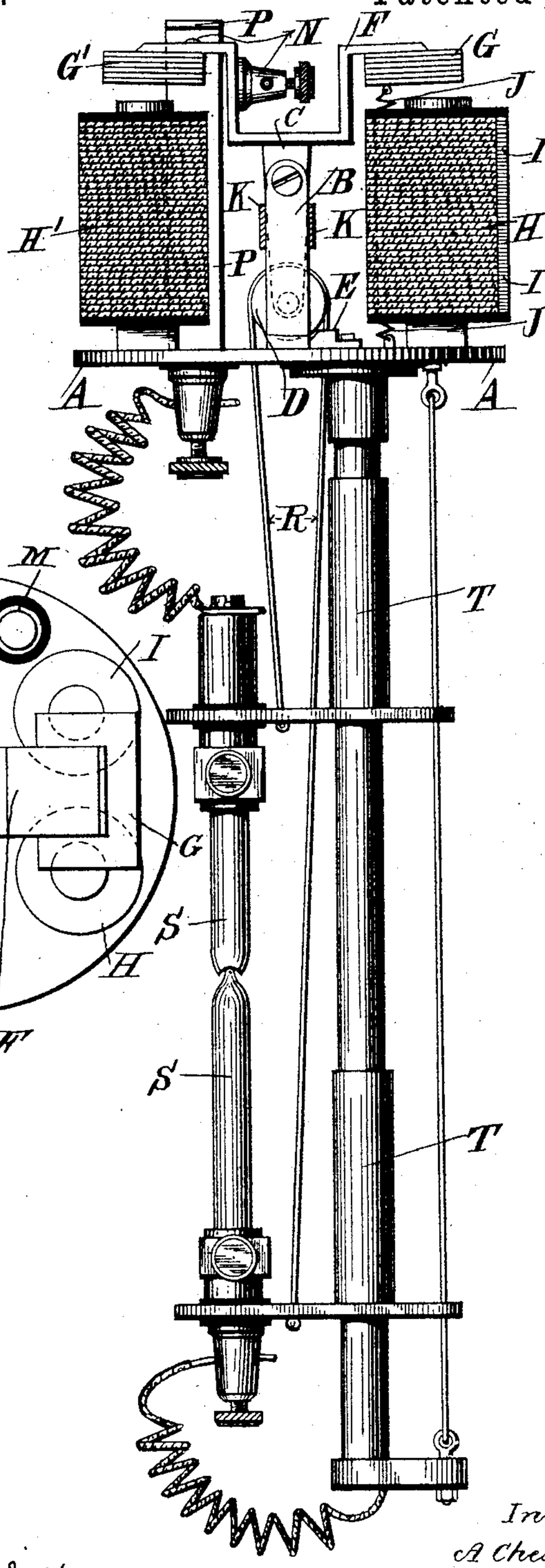
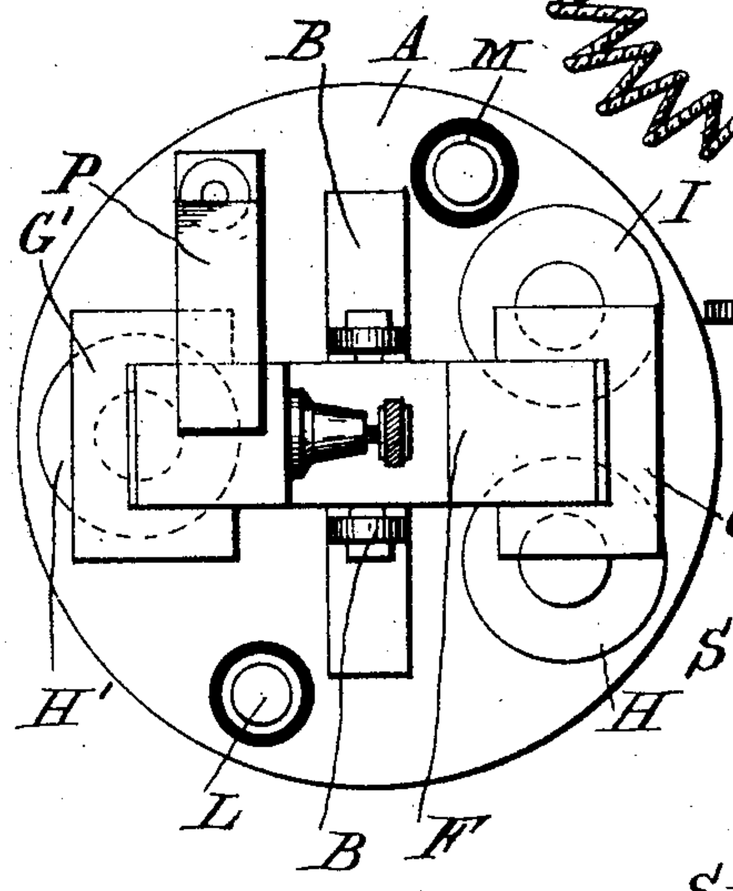


Fig. 6.



WITNESSES.

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attorney

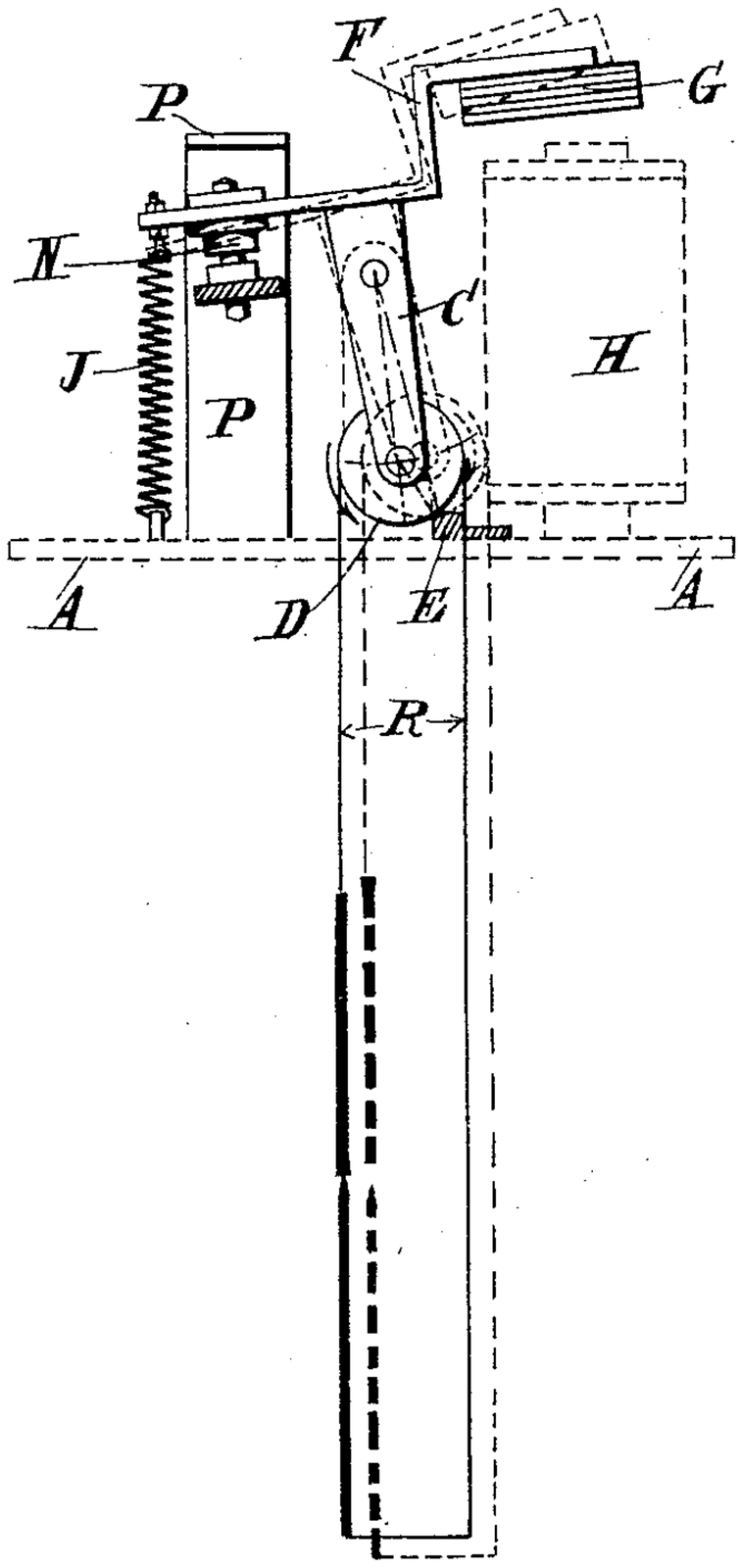
(No Model.) 3 Sheets—Sheet 3.

A. CHESTER & J. J. RATHBONE.

ELECTRIC ARC LAMP.

No. 532,531. Patented Jan. 15, 1895.

Fig. 7.



Witnesses

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Agent

UNITED STATES PATENT OFFICE.

ARTHUR CHESTER AND JOHN JAMES RATHBONE, OF LONDON, ENGLAND.

ELECTRIC-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 532,531, dated January 15, 1895.

Application filed March 26, 1894. Serial No. 505,145. (No model.

To all whom it may concern:

Be it known that we, ARTHUR CHESTER and JOHN JAMES RATHBONE, subjects of the Queen of Great Britain, residing at 4 Kingsley Mansions, West Kensington, London, England, have invented certain new and useful Improvements in and Connected with Arc Lamps, of which the following is a specification.

The object of this invention is to provide an automatic cut out for arc lamps in order that when the feeding mechanism sticks, or the carbons break or if from any other cause the arc resistance becomes unduly great in any particular lamp, no interruption will occur in the working of any of the lamps in the series, as the beforementioned cut out comes into action to put a low resistance coil in series with the main circuit, through which the current can freely pass for feeding the other lamps in the circuit, and magnetizing the core of the said low resistance coil to hold the armature down until the carbons meet.

In carrying our invention into practice, say, to an arc lamp controlled by a high resistance shunt circuit, we arrange a low resistance coil in parallel with the main circuit but operative by its magnetic force upon the same armature as is controlled by the high resistance coil or electro-magnet, the said low resistance coil being put into circuit when the arc resistance increases beyond the normal in the manner hereinafter more fully described in connection with the accompanying sheet of drawings, in which—

Figure 1, is a back elevation of an arc lamp constructed as before mentioned, Figs. 2 and 3 being a side elevation and a plan respectively, and Fig. 4, a detached view of the swinging arm and contact post; Fig. 5, a side elevation of alternative arrangement to accomplish the same result, Fig. 6 being a plan. Fig. 7 is a side view of the swinging carriage to more particularly show the relation of the stop to the carbon carrying roller.

Upon the base plate A of the lamp are fixed standards B, B. Between them the swinging forked carriage C is pivoted at its upper part, the lower end having an india-rubber or other suitable roller D inserted between said forked carriage for pressure against a stop E, against which the roller D is held and partially rotated by the movement of the swinging carriage C. The edge of stop E is preferably inclined so as to prevent a sudden shock when roller D engages and disengages same.

Attached to the top of the forked carriage C is a plate F to one end of which is fixed a laminated or other armature G of sufficient width to serve for both a low resistance coil H and a high resistance coil I. To the other end of the armature plate F is secured a spring J as a counterpoise or check to the too sudden movement of the armature F, G. As a further precaution, we may fix an india rubber strip K between the standards B, B, to act as a buffer to the action of the armature.

As before mentioned the low resistance coil is in parallel with the main circuit, being connected to the terminal L on one side and the terminal M on the other, and thence to a terminal N fixed to the armature plate F, so placed as to make contact with the plate P, which is electrically connected to the main terminal Q. The high resistance coil is connected to the terminals Q and L respectively.

Referring to Figs. 1, 2, 3, and 4 the various parts are brought into operation as follows: The current is switched on, and as the carbons S are, at starting, at arc distance a high resistance to the flow of the current is the result, which consequently is caused to pass through the high resistance coil I to magnetize its core, and attract the armature G down a sufficient distance to rotate the rubber roller D on the edge of the stop E and allow the carbons to meet. The resistance then decreases and the magnetic force of the high resistance coil I is consequently weakened allowing the spring J to overcome it and draw the lever down at that end to swing the carriage C and partially rotate the roller D in the opposite direction and raise the carbons to strike the arc. Should the arc now become abnormally long by the carbons breaking away, or from any other cause, such as sticking of the carbon carriers T, our improved cut out comes into action by reason of the resistance increasing to such an extent that the high resistance coil draws down the armature for the terminal N to make contact with the plate P and put the low resistance coil H in series with the main circuit through which the current can consequently freely pass to feed the other lamps in the cir-

cuit without interruption; also as the current passes the low resistance coil H it magnetizes the core sufficiently to hold the armature to the position the shunt coil has pulled it. The re-action immediately takes place to re-establish the arc in the same manner as previously explained.

From the foregoing it will be seen that the action is automatic and approximately instantaneous.

In some cases it may be necessary that there should be a low resistance or that the carbons S should meet at starting, for which purpose armatures G, G′ may be provided at each end of the plate F as shown in Figs. 5 and 6 and a spring J is preferably placed between the high and low resistance coils H and I to free the roller D from the stop E and cause the carbons to touch each other. The armature G′ is operated by one or two series coils H′ through which the current at starting passes to magnetize their cores and attract the armature G′ and cause the forked swing carriage C to move the roller D against the stop E and partially rotate same to draw the carbons apart by means of the cord R and thus strike the arc. As the resistance increases from any cause the high resistance coil becomes magnetized and draws the armature G down to swing the forked carriage C in the opposite direction to that before mentioned and partially rotate the roller D to feed the carbons together but if the resistance in the arc still increases the armatnre G is drawn down for the terminal N to make contact with the plate P and excite the coil H through which the current may pass to feed the other lamps in the circuit without interruption. When the armature is thus fully down for the terminal N to make contact with the plate P, the roller D suspended in the forked carriage C, is entirely free of the stop E, and, as the roller itself is held closely in position by pivot points screwed through the leg of the carriage C nothing in the lamp feeding mechanism can prevent the carbons again approaching each other.

If the carbons do again meet, they being arranged in series with the main circuit, will lessen the current flowing through the desired circuit (namely the low resistance coil H) sufficiently for the spring J to overcome the magnetic pull of said coil H and thereby draw the armature down at that end and break connection between the terminal N and plate P to cut off the current from the coil H completely. Assuming the foregoing to have taken place, the lamp is thereby automatically placed in the main circuit to be operated by the current exactly as if it had never been switched out of the circuit. If the carbons after sticking, make contact as before described, the magnetic hold by the coil H upon that end of the armature F is weakened and the spring J pulls the opposite end of said armature as before explained. Said spring also by its range of action causes the roller D to make contact with the stop E and it is to be particularly noticed that after actual contact the spring J causes the carriage C to move a slightly farther distance which partially rotates said roller in the direction required to part the carbons asunder and strike the arc.

The stop E is made with a slight incline *a* shown at Fig. 7 in which figure we also show graphically how the roller is rotated to strike the arc, the full lines indicating the position of the roller relatively to the stop E and also relatively to its own axis at the time of actual contact, and the dotted lines show the further travel of the carriage C under the action of the spring J as before explained and shows the changed position of a given point on the circumference of the roller relatively to its axis. The various positions in this figure are purposely exaggerated to more clearly illustrate its action. As the carbons gradually burn away the pull on the armature by the high resistance coil I increases and gradually draws the armature down causing the roller D to rotate back in the opposite direction to that described when operated by the spring J and by so doing the carbons are gradually fed together. As they continue burning the arc resistance increases and by the action of the coil I the roller D is momentarily freed from the stop E to allow it to revolve under the weight of the top carbon and its carrier. The stop E therefore during the normal feeding of the lamp acts as a brake to check the rotation of the wheel D during the feeding of the carbons. It also causes the wheel D to revolve in the direction opposite to that required when feeding the carbons, so that it performs the combined functions of a brake or check to the feed and as it were a ratchet or lever to strike the arc.

We are aware that various brake actions have been adapted and combined with moving or swinging carriages but these various brake mechanisms have in no case performed the functions hereinbefore described.

Automatic cut outs of various forms have also been used in electric lamp circuits and applied to the lamps themselves but these have been cut outs pure and simple which when brought into action cut the lamp permanently out of the circuit until the attendant re-adjusts the mechanism and releases a catch or other device to reinstate the lamp, and in no case so far as we are aware has the switch for cutting out the lamp formed an integral part of its mechanism acting in one capacity to automatically cut the lamp out of the circuit upon any derangement and to automatically cut same into the circuit should the deranged mechanism spontaneously right itself.

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

1. In an electric arc lamp, the combination with rocking armature F, G having a swinging carriage C a roller D pivoted to said carriage C, an inclined stop E fixed to the base of

the lamp in the swinging path of the roller D, a spring J attached to one end of the armature F, G, which in conjunction with the stop E causes the roller D having a cord R fixed to the carbon carriers to partially rotate said roller D to move the carbons apart as described.

2. In an electric arc lamp, the combination with pivoted armature F, G, having a swinging carriage C, roller D and spring J, and a stop E arranged in the swinging path of the roller D of low and high resistance coils H and I respectively both coupled in derivation with the main circuit, a terminal contact N on the armature F, a contact plate P all acting in the manner for the purposes described.

3. The combination in an electric arc lamp with a stop E, of a roller D, pivoted and rocking armature F, G, spring J, low and high resistance coils H, I, respectively, terminal contact N, contact plate P, electrically connected to the coils H and I and to the main circuit said stop E combining the functions of a brake for controlling the feeding of the carbons together under the control of the high resistance coil I and a pawl for causing the roller D to rotate in the opposite direction to move the carbons asunder, the terminal contact N and contact plate P serving to automatically switch the lamp out or into the circuit under the combined action of the coils H and I as described.

In witness whereof we have hereto signed our names this 8th day of February, 1894.

ARTHUR CHESTER.
JOHN JAMES RATHBONE.

Witnesses:
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RICHARD CORE GARDNER,
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