(No Model.)

E. B. CUTTEN.

ELECTRIC HEAD LIGHT.

No. 327,143. Patented Sept. 29, 1885.

Fig. 1.

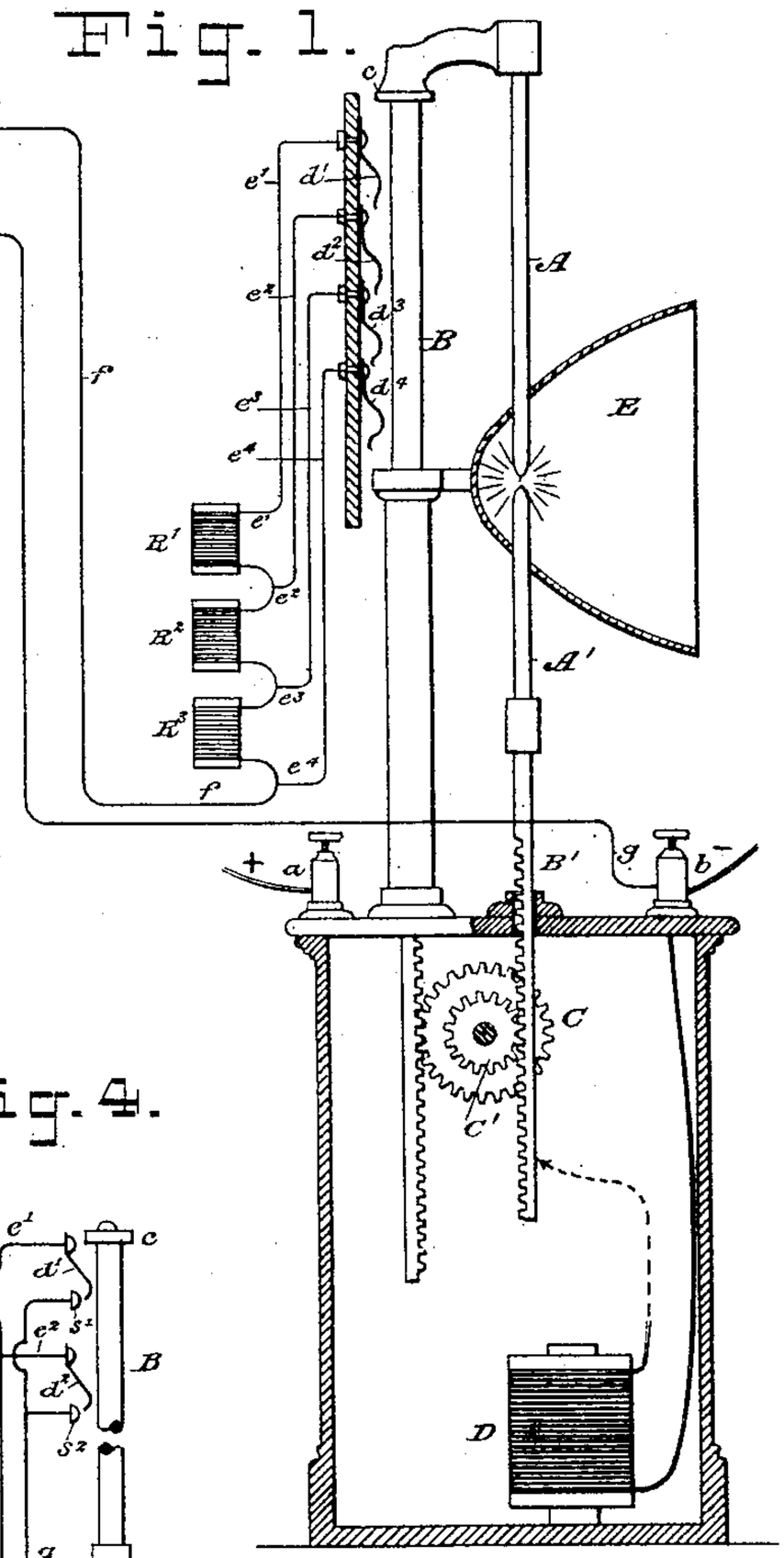


Fig. 2.

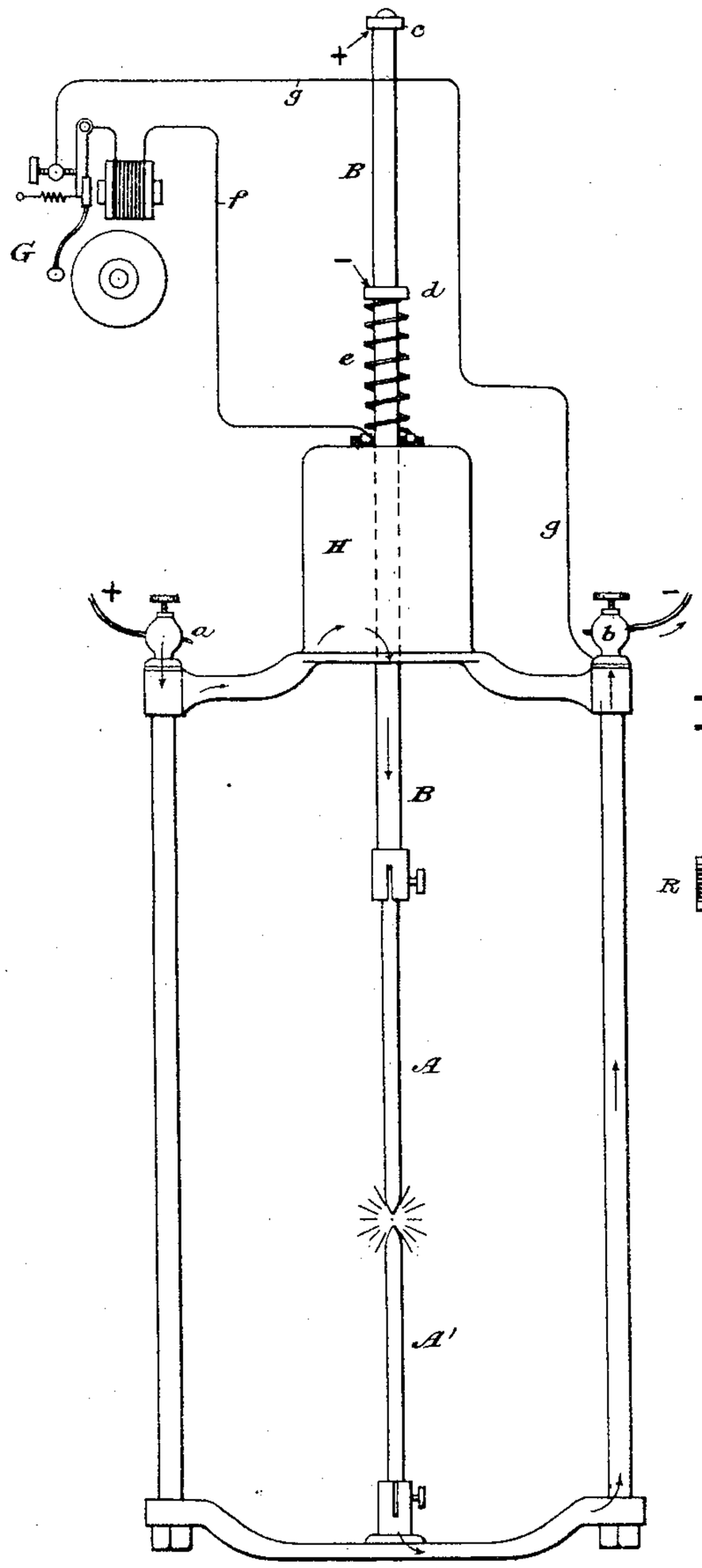


Fig. 4.

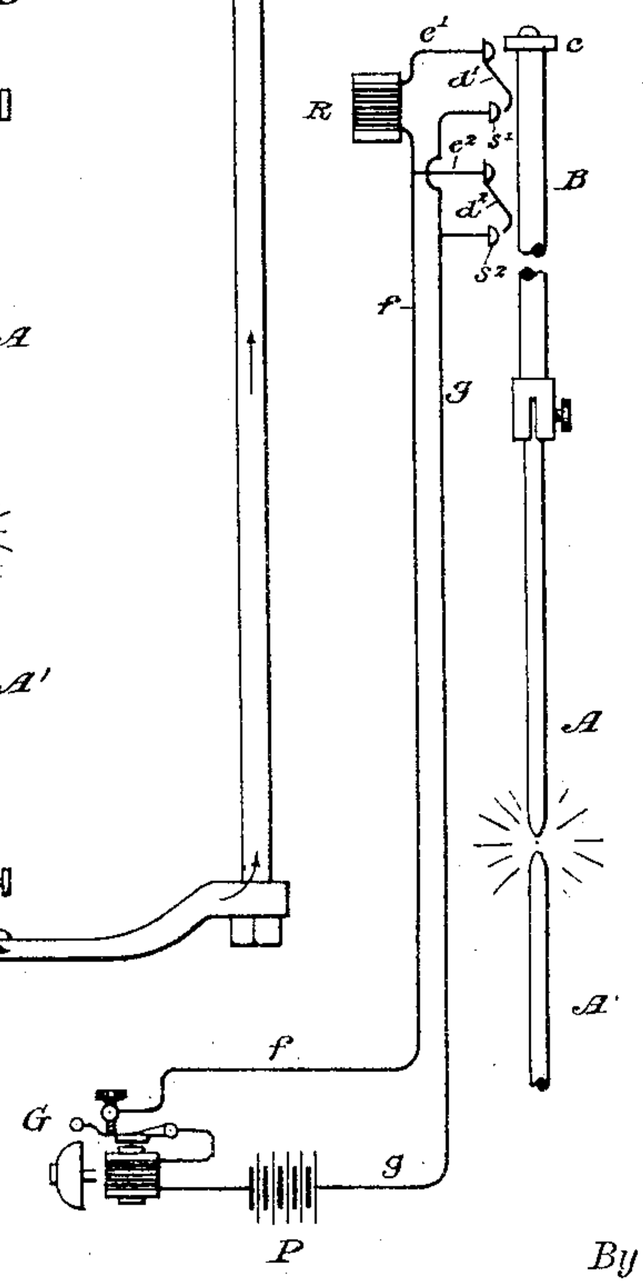
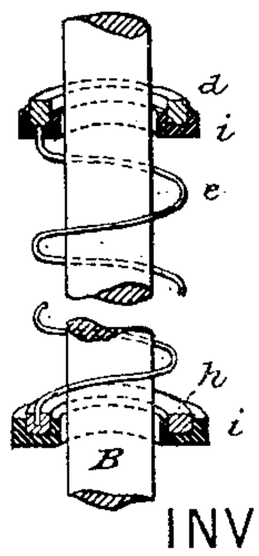


Fig. 3.



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UNITED STATES PATENT OFFICE.

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ELECTRIC HEAD-LIGHT.

SPECIFICATION forming part of Letters Patent No. 327,143, dated September 29, 1885.

Application filed July 3, 1884. (No model.)

To all whom it may concern:

Be it known that I, ELISHA B. CUTTEN, a British subject, residing at Pittsburg, Pennsylvania, have invented certain Improvements in Electric Head-Lights, of which the following is a specification.

My invention is designed most especially for electric head-lights for locomotives; but it is also applicable to head-lights for vessels and to other electric lights.

When an electric light is used for the head-light of a locomotive, it has the important advantage that the light can be increased or diminished at will. For instance, in running over a crooked or dangerous part of the track the engineer can double or treble the illuminating power of his head-light by turning on more steam to the auxiliary engine which drives the dynamo, thus driving the latter faster and augmenting the electric current through the lamp. This variation in the power of the light necessarily involves a like variation in the rate of consumption of the carbons, and consequently an uncertainty as to how long the carbons will last. As the engineer cannot see the carbons he has no means of judging of the rapidity of their consumption, and they are apt at times to burn out and leave him in darkness while he is running between stations, thus necessitating a stoppage to put in new carbons and entailing not only delay but frequently great danger. The same is partly true, but usually to a less extent, of electric lights used for the head-lights of ships, and often also for other purposes.

My invention seeks to obviate this inconvenience and danger by providing an alarm which automatically operates at a certain time before the final burning out of the carbons, thus notifying the engineer or attendant that the carbons are nearly consumed, and that he has approximately so many minutes in which to find opportunity to replace them with new ones. This alarm may be audible, as a bell, or visible, as the dropping of a screen, or it may effect the sense of feeling, as the transmission of an intermittent electric current through some part of the body; but I prefer the use of a bell to ring continuously after it is started until the carbons are renewed, or to ring continuously for a short interval, then pause and ring again, each time more urgently than before.

Figure 1 of the accompanying drawings shows my invention as applied to a lamp of the Foucault type, wherein by feeding both carbons the arc is maintained at a constant position in the focus of a reflector. Fig. 2 shows my invention as applied to a lamp of the Brush type, wherein only one carbon is fed to regulate the arc, and the latter consequently travels downward as the carbons consume. Fig. 3 is a fragmentary detail view of part of Fig. 2, and Fig. 4 is a diagram illustrating a further modification of my invention.

Referring to Fig. 1, let A designate the upper carbon, borne by a bracket on the sliding rod B, and A′ the lower carbon, borne by the rod B′. The rods B and B′ are formed on their lower portions with rack-teeth, which are engaged by compensating gears C C′, forming part of the regulating-train, the remainder of which is not shown because it is well known and forms no part of my invention.

D is the regulating electro-magnet. The current enters at binding-post *a*, traverses rod B, carbons A A′, and rod B′, and passes thence through the magnet D to the binding-post *b*.

E is the usual parabolic reflector.

So far as described this lamp is old and well known, and may be replaced by any other construction of lamp which maintains a fixed arc, so that it can be used with a reflector. Even this may not be essential for some uses.

On the bar B is a projecting flange or tooth, *c*, and in line with this are four (more or less) contact-springs, *d d*. Of these the first or upper spring, d', is in position to be touched by the projection *c* when the lamp is so near to being burned out that it is desirable to notify the engineer. Say, for instance, that it is so placed that contact will be made about twenty minutes before the lamp will burn out. The second spring, d^2, will then be so placed that it will be touched by the projection *c* when the lamp has about fifteen minutes yet to burn, and the third and fourth springs, d^3 and d^4, will be so placed that they will be touched, respectively, about ten and five minutes before the extinguishment of the light.

R′, R², and R³ are three resistance-coils. From spring *d′* a wire, *e′*, leads to the upper coil, and the circuit thence traverses all three coils and extends by a wire, *f*, to the alarm-bell G. From the spring *d²* a wire, *e²*, leads to the second coil, R², thus cutting out the first. From the spring *d³* a wire, *e³*, leads to the third coil, R³, thus cutting out both the first and second coils, and from the spring *d⁴* a wire, *e⁴*, leads beyond the third coil and joins the wire *f*, thus cutting out all the coils. The bell G is simply an ordinary rheotomic bell for continuous ringing, and requires no description. From it a wire, *g*, leads to the binding-post *b*. When the lamp so nearly burns away that the projection *c* touches the first spring, *d′*, a derived current passes from binding-post *a* through rod B, spring *d′*, wire *e′*, coils R′ R² R³, wire *f*, bell G, and wire *g* to the other binding-post, *b*. Owing to the high resistance of the three coils the derived current will be feeble, and will ring the alarm-bell G gently, although sufficiently loud to attract attention. This ringing will continue until the projection *c* passes beyond spring *d′*, or for perhaps a minute or two. Then when the projection touches spring *d²* the derived current will again flow to the bell, and this time it will be stronger because the resistance of coil R′ is cut out, and consequently the bell will ring louder. When spring *d³* is touched, the derived current will be still stronger, the resistance of both coils R′ and R² being cut out, and the bell will consequently ring still louder; and when the spring *d⁴* is touched the derived current will be at its maximum, for all resistance-coils will be cut out and the bell will ring loud and urgently. Thus the bell will ring at intervals of about five minutes, and each time it will ring more urgently than before. The possibility of the engineer failing to hear the first alarm or forgetting that it has sounded is thus provided against.

In the lamp shown in Fig. 2, wherein the lower carbon, A′, is fixed, and the upper carbon, A, is carried by a rod, B, which passes up through the box H, containing the regulating mechanism, a head or flange, *c*, is fixed upon the upper end of the rod B. The usual tube surrounding the portion of this rod above the box H is omitted in this figure to show the parts more clearly. Around the rod B is coiled a very light flexible metallic spring, *e*, which may be wrapped with an insulating-covering to advantage. On the top of this spring is borne a ring, *d*, encircling the rod, but insulated from it, and at the bottom the spring is attached to an insulated metallic ring, *h*, which may rest on the box H, as shown, or on some other part. The preferred construction of the rings *d* and *h* is shown in Fig. 3, each being a plain metallic ring set in a groove or channel in a ring, *i*, of insulating material. The metallic rings are thus insulated on all sides except on top. The ring *d* projects higher than its insulating-ring, so that when the rod B comes down until its head *c* touches this ring there shall be metallic contact between them. The spring *e* is electrically connected at its opposite ends to the two rings *d* and *h*, and a wire, *f*, leads from the ring *h* to the rheotomic bell G, whence another wire, *g*, leads to the binding-post *b*. The spring *e* holds the ring *d* at such a height that it will be touched by the head *c* when the alarm is desired to be given—say, for instance, fifteen minutes before the carbons burn out. When this contact takes place, a derived current flows from binding-post *a* to rod B, up rod B to head *c*, and through ring *d*, spring *e*, ring *h*, wire *f*, rheotomic magnet of bell G, and wire *g* to binding-post *b*. Thus the alarm is rung, and it will continue ringing until the carbons are renewed. The spring *e* is compressed as the rod B descends, and it is so light that its tension does not perceptibly affect the arc.

My invention may be applied in many different ways, of which the two methods illustrated will serve as examples, and I do not wish to confine myself to any precise construction or arrangement of parts to attain the desired result. Among other possible modifications I may mention that, instead of ringing the bell by a derived current diverted from the lamp-circuit, a separate circuit may be provided the current in which is supplied by a battery. Such an arrangement is shown in Fig. 4, where P is the battery, G the rheotomic alarm, R a resistance-coil, *d′ d²* contact-springs, and *s′ s²* contact-stops. The projection *c* on the carbon-holding rod B first depresses spring *d′* into contact with stem *s′*, thus closing the battery-circuit through the coil R. When the projection depresses spring *d²* into contact with stop *s²*, it closes the battery-circuit outside of the coil, thus ringing the alarm more loudly.

I claim as my invention—

1. The combination, with an electric-arc lamp, of an electrically-operated alarm, an electric circuit extending thence to the lamp, and a circuit-manipulating device operated by the carbon-holder of the lamp, whereby the alarm is automatically put in operation at a predetermined time before the consumption of the carbons, substantially as set forth.

2. The combination, with an electric-arc lamp, of a circuit-closer in connection therewith and adapted to be operated by the movement of the carbon-holding rod when the carbons are nearly consumed, an electric circuit in connection therewith, and a rheotomic alarm-bell in said circuit, substantially as set forth.

3. The combination, with an electric-arc light, of a partial circuit connecting with one of the terminals of the lamp and its other end terminating in a circuit-closing contact, and a conducting projection on the carbon-holding rod of the lamp adapted to touch said contact when the rod descends to a predetermined point, and thereby pass a derived current

from the lamp through said circuit, and an electric magnetic alarm-bell in said partial circuit, substantially as set forth.

4. The combination, with an electric-arc lamp, of a derived circuit connecting at one end to one terminal of the lamp and its other end divided into several branches, each terminating in a contact, a conducting projection on the carbon-holding rod adapted to touch said contacts in succession as it descends, a series of resistances in said branches, greatest in that first touched and less in each successive branch, and a rheotomic alarm-bell in said derived circuit, substantially as set forth, whereby said bell is rung at intervals whenever the circuit is closed through any of said branches, and each time its alarm is louder and more urgent than before.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

ELISHA B. CUTTEN.

Witnesses:
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EMMETT E. COTTON.