(No Model.) 2 Sheets—Sheet 1.

C. HEISLER.

INCANDESCENT ELECTRIC LAMP.

No. 327,795. Patented Oct. 6, 1885.

Fig. 1.

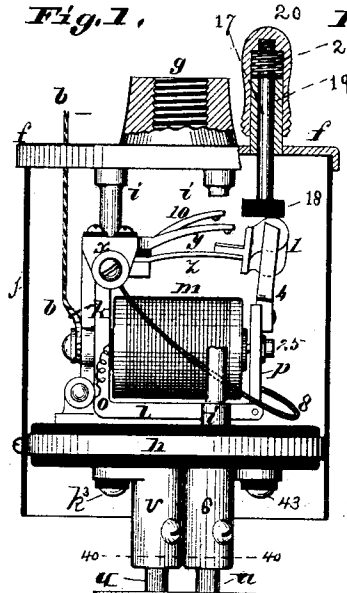


Fig. 2.

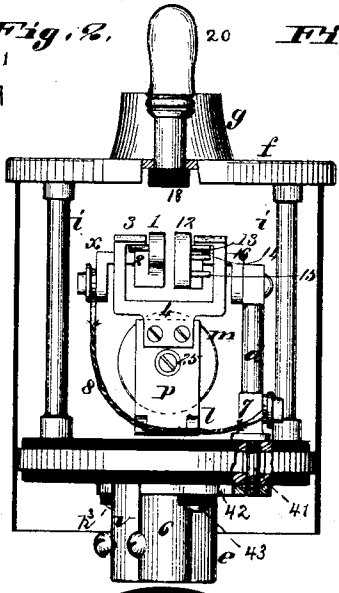


Fig. 3.

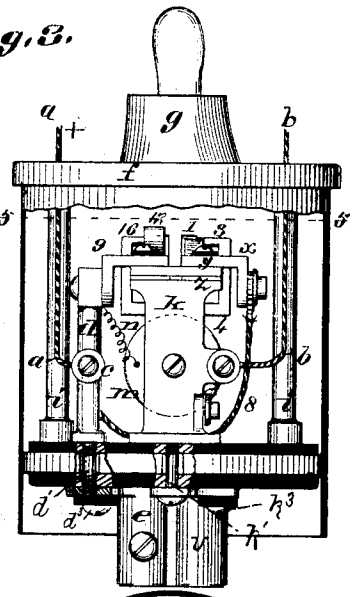


Fig. 4.

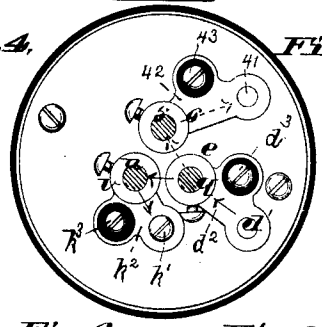


Fig. 5.

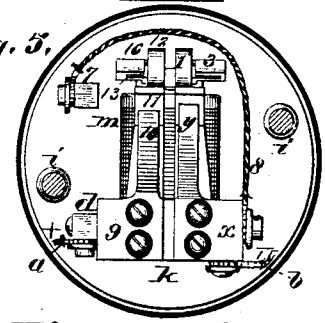


Fig. 6.

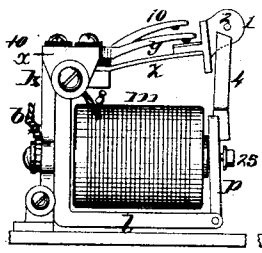


Fig. 7.

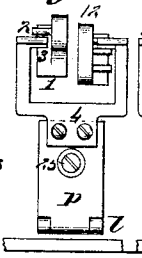


Fig. 8.

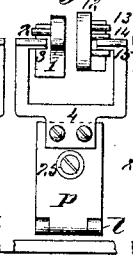


Fig. 9.

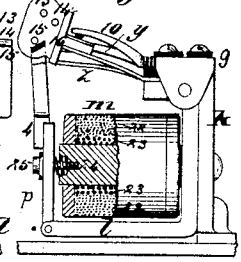


Fig. 10.

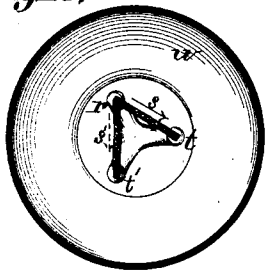


Fig. 11.

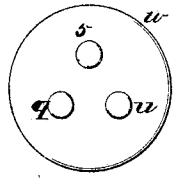
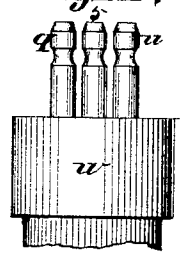


Fig. 12.



Attest;

Benj. A. Knight
Joseph Wahle.

Inventor;

Charles Heisler
By Knight Bros
Attys.

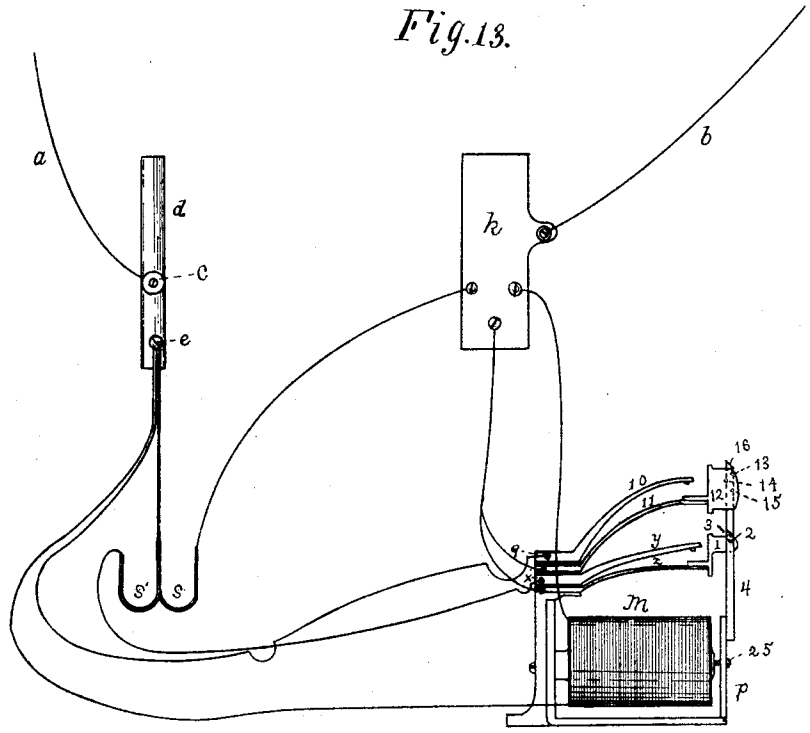
(No Model.) 2 Sheets—Sheet 2.

C. HEISLER.

INCANDESCENT ELECTRIC LAMP.

No. 327,795. Patented Oct. 6, 1885.

Fig. 13.



WITNESSES:
Wm. C. Woodward
E. R. Stockbridge

INVENTOR
Charles Heisler,
BY
George A. Stockbridge
his ATTORNEY

UNITED STATES PATENT OFFICE.

CHARLES HEISLER, OF ST. LOUIS, MISSOURI.

INCANDESCENT ELECTRIC LAMP.

SPECIFICATION forming part of Letters Patent No. 327,795, dated October 6, 1885.

Application filed March 24, 1885. Serial No. 159,959. (No model.)

To all whom it may concern:

Be it known that I, CHARLES HEISLER, of the city of St. Louis, in the State of Missouri, have invented a certain new and useful Improvement in Automatic Cut-Outs for Electric Lamps, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

My invention has for its object to provide means for switching in automatically a new incandescent lamp or filament when an old one is destroyed, and for completing the line-circuit when all the lamps or filaments of a given series are exhausted, so that the operation of other lamps or filaments in the same system shall not be interrupted. I accomplish this result by means of a high-resistance electro-magnet in a shunt around the lamps or filaments, the position of the armature of the said magnet determining whether the circuit shall be complete through one of the lamps or filaments or directly on to line; and my present invention relates more especially to the electro-magnet and its immediate connections. In another application filed at the same time herewith I show different magnet-connections, and in that application I make generic claims covering both forms of cut-out apparatus, confining myself herein to my specific construction.

In the present application I show a two-filament lamp and a cut-out provided for means of switching in the second when the first is destroyed, and for completing the line, as above indicated, when both are incapacitated for service. Instead of a two-filament lamp I might employ two single-filament lamps, and with slight changes I could adapt my cut-out to be used with a greater number of lamps, or with lamps having a greater number of filaments. It will be evident, also, that I could make any other number of lamps or filaments besides one the unit—that is to say, I could switch in two or three or any other desired number of lamps or filaments at a time.

In the drawings which accompany and form a part of this specification, and in which the same letters and numerals refer to the same parts throughout, Figure 1 is an elevation of my cut-out with a two-filament incandescent lamp attached thereto, the casing of the cut-out and the lamp globe or receiver being shown in section. Fig. 2 is an elevation of the cut-out alone taken from the right of Fig. 1, the casing being in section, as before. Fig. 3 is a similar view of the cut-out taken from the left of Fig. 1. Fig. 4 is a section through line 40 40 in Fig. 1, looking upward. Fig. 5 is a section through line 5 5 in Fig. 3, looking downward. Figs. 6 and 7 are details designed especially to illustrate the position of the magnet-armature at the moment when the first filament is destroyed. Fig. 8 illustrates its position after a new circuit has been formed through the second filament. Fig. 9, besides showing other details, illustrates the position of the armature after the destruction of both filaments. Fig. 10 is a horizontal section through 10 10 in Fig. 1. Fig. 11 is a plan of the lamp with the globe removed. Fig. 12 is a detail side elevation of the upper part of the lamp; and Fig. 13 is a diagram of the circuits within the cut-out and the lamp.

Referring to the drawings by letter, *w* is the globe or receiver of an electric incandescent lamp. Within the globe are two incandescent filaments or conductors, *s* and *s'*, both of which are connected, as shown, to a common leading-in wire, *r*, by suitable coupling devices, and each of which is similarly connected to one of the leading-in wires *t* and *t'*. The wire *r* leads to the terminal post *q*, and the wires *t* and *t'* lead, respectively, to the terminal posts *u* and 5. These terminal posts are arranged and shaped to fit, respectively, into the socketed binding-posts *e*, *v*, and 6 on the bottom of the cut-out device, where they are secured in place by screws or other suitable means. It is evident that a current of electricity entering at binding-post *e* may pass through the lamp either by way of the filament *s* or *s'*, according as the return connections are arranged to complete the circuit of one filament or the other. Which filament shall be in circuit at any given time, or whether either shall be, is determined by the condition of my cut-out device, which forms the subject of my present

invention, and which I will now proceed to describe in detail.

The cut-out apparatus is supported between two metallic disks, *f* and *h*, the former of which may be regarded as the cap, and the latter as the bottom or supporting plate of the device. These parts are connected and maintained in position by the bars or posts *i i* in a manner well understood. A cylindrical casing, *j*, incloses the apparatus, fitting into the cap *f* and surrounding the plate or disk *h*, to which it is secured by a screw. Above and below the disk or plate *h* are disks of insulating material, which serve to insulate the parts from the frame of the apparatus. The cap *f* is provided with a screw-socket, *g*, for attaching the device to its support. The post *e* is usually formed in one piece with a bracket or plate, d^2; the post *v* in one piece with a bracket or plate, k^2; and the post 6 in one piece with a bracket or plate, 42. These brackets or plates are secured to the bottom of the cut-out by the screws d^3, k^3, and 43, respectively. Electrical connection is made between the parts outside and inside the casing by the following means. (Best illustrated in Figs. 2, 3. and 4.) The post *e* outside is connected, through the plate or bracket d^2 and a screw, d', with a metallic binding-post, *d*, inside. The post *v* outside is connected, through the plate or bracket k^2 and a screw, k', with a metallic post, *k*, inside, which supports the frame of the shunt-magnet; and the post 6 outside is connected, through the plate or bracket 42 and a screw, 41, with a metallic binding-post, 7, inside. The screws d', k', and 41 are insulated from the disk *h* by the hard-rubber disks above and below the same in a manner well understood.

In the normal condition of the apparatus the circuit enters by wire *a*, and passes by binding-screw *c* to the post *d*, and thence through screw d', plate or bracket d^2, binding-post *e*, terminal post *q*, wire *r*, filament *s*, wire *t*, terminal post *u*, binding-post *v*, to the post *k*, by the way of the plate or bracket k^2 and the screw k'. From *k* the circuit passes by wire *b* back to the generator.

Between the posts *d* and *k*, and having its terminals connected to the said posts, is a high-resistance shunt, including the electro-magnet *m*. This electro-magnet is supported in the frame *l*, as already stated, and its armature is kept normally in a fixed position away from the magnet-core by means of a spring, 24, seated in a recess in the core. This spring presses the armature *p* against the head of the screw 25, which is fixed in the magnet-core, as clearly shown in Fig. 9. The armature has attached to it a metallic head or extension, 4, provided with catches 3 and 16. With the catch 3 normally engages a pin, 2, on a head, 1, which is attached to a metallic spring, *z*, the latter being secured to the top of the post *k*. With the catch 16 normally engages a pin, 13, on a head, 12, attached to a metallic spring, 11, also secured to the post *k*. The springs, when released, as they will be when the catches are moved out of the way of the pins by the attraction of the armature, fly upward; but the spring 11 is caught again by the pin 14 on the head 12, engaging with the catch 16 when the armature moves inward. There is also a pin, 15, on the head 12, which engages the catch 16 when the armature is restored to its original position. A single attraction of the armature liberates the spring *z*. It takes two inward movements to set the spring 11 free. When the spring *z* is released, it carries the head 1 up into contact with an arm, *y*, extending from a metal bracket, *x*, which is attached to but insulated from the post *k*. An arm, 10, extending from a bracket, 9, which is secured to the posts *d* and *k*, but insulated from the latter, is similarly located above the spring 11, which, however, does not make contact with it until after a second attraction of the armature, as has been set forth above. The bracket *x* is connected by a wire, 8, to the post 7, which is connected through the bottom plate with the binding-post 6.

The resistance of the magnet *m* is so great that very little of the current passes through it in the ordinary working of the apparatus. When, however, the filament *s* breaks, or for any other reason that part of the circuit becomes inoperative, the entire current passes through the magnet and causes it to attract its armature. This being understood, the function and operation of the remaining parts above described will now be explained.

When the armature moves inward in obedience to the attraction of the magnet, the pins 2 and 13, together with their respective springs, are released. The spring 11, however, is immediately caught again by the engagement of the pin 14 with the catch 16. The spring *z* on being released makes contact with the arm *y* and completes a new circuit, as follows: through the filament *s'* from post *d*, through binding-post *e*, terminal post *q*, wire *r*, filament *s'*, wire *t'*, terminal post 5, binding-post 6, post 7, wire 8, bracket *x*, arm *y*, head 1, spring *z*, and post *k*, from which point the circuit passes by wire *b* to line. The moment this new circuit is completed the magnet *m* is short-circuited and its armature is restored, releasing the pin 14, but again catching the spring 11, by reason of the pin 15 engaging with the catch 16. A similar operation takes place on the failure of the second filament, the entire current being forced through the magnet, as before. This time, however, the spring 11 is entirely released and closes a short circuit as follows around the whole lamp: from post *d* by way of bracket 9, arm 10, head 12, and spring 11 to the post *k*.

As a means for restoring the spring-heads 1 and 12 after their release, I provide a spring-rod, 17, having at its lower end an insulating-head, 18, that comes in contact with the spring-heads when the rod is pushed down. The rod works in a socket, 19, and its upper end

screws into a cap, 20, which works on the socket 19 as a guide. Between the cap and the upper end of the socket 19 is a spiral spring, 21, surrounding the rod 17, and acting to lift the rod to its upper position when it is released from pressure. The rod 17 is shown in its depressed position in Fig. 1, and in its normal elevated position in Figs. 2 and 3. The tops of the catches 3 and 16 are made sloping or inclined, so that the pins on the spring-heads may push the catches out of their course as they descend.

In practice I wind the electro-magnet *m* with copper wire 23 and fine German-silver wire 22. The latter affords the necessary resistance, and the former serves to increase the power of the magnet without making it too large for use in a compact device.

In Fig. 13 the parts of the apparatus are misplaced and drawn to an independent scale, the design being simply to show the circuits clearly.

Having now described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In an apparatus for switching in a new electric lamp or filament on the failure of the one in use, an electro-magnet, two or more catches or detents on the armature thereof, a series of springs engaging with the said catches, and means actuated by successive operations of the electro-magnet for releasing the springs to form successively the circuits of the unused lamp or filaments, substantially as set forth.

2. In an apparatus for switching in a new electric lamp or filament when the one in use fails, an electro-magnet in a high-resistance shunt around the first lamp or filament, catches or detents on the armature of the electro-magnet, a series of springs provided with pins which engage with the said catches or detents, a series of contact-arms, one in the line of reaction of each spring, each of the latter, with its corresponding contact-arm, forming the terminals of one of the unused lamps or filaments, and means actuated by successive operations of the electro-magnet, whereby the springs are released and make contact successively with their respective contact-arms, substantially as and for the purpose set forth.

3. In an apparatus for switching in a new incandescent lamp or filament on the failure of the one in use, an electro-magnet in a shunt-circuit around the first lamp or filament, the armature *p* thereof, head 4, catches 3 and 16, pins 2, 13, 14, and 15, heads 1 and 12, springs *z* and 11, contact-arms *y* and 10, both the said springs being connected with the same pole of the generator, and each of the said contact-arms being connected with the opposite pole through a different filament, substantially as and for the purpose set forth.

4. The combination, with two or more incandescent lamps or filaments, one of which is in the main circuit of an electric lighting system, of an electro-magnet in a high-resistance shunt-circuit, the said electro-magnet being wound with copper wire and with German-silver wire, for the purpose set forth, and being provided with means for closing the circuit of a succeeding lamp or filament when the one in use is destroyed, substantially as described.

CHARLES HEISLER.

Witnesses:
SAML. KNIGHT,
GEO. H. KNIGHT.