

(No Model.)

H. A. FOSTER.
SYSTEM OF ARC LIGHTING.

No. 472,346.

Patented Apr. 5, 1892.

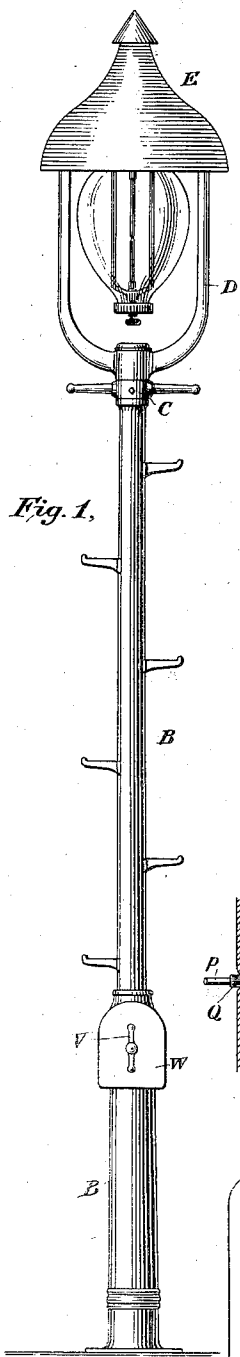


Fig. 1,

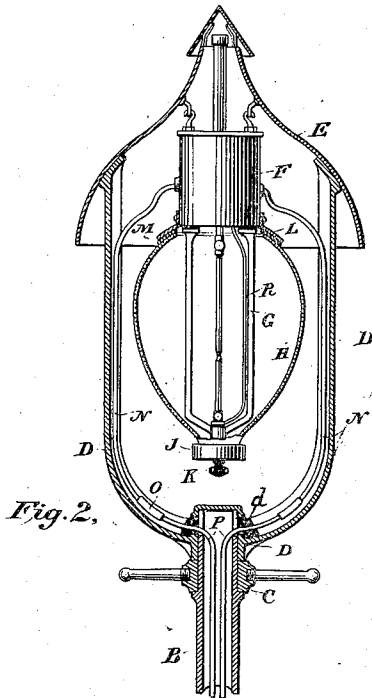


Fig. 2.

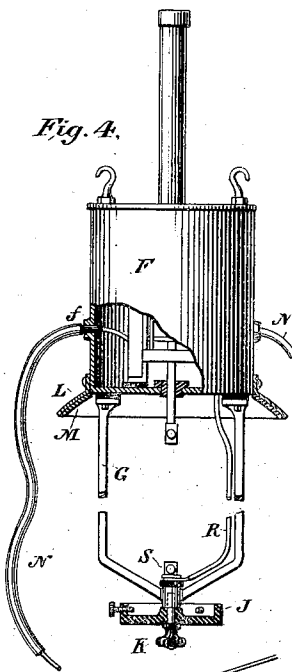


Fig. 4,

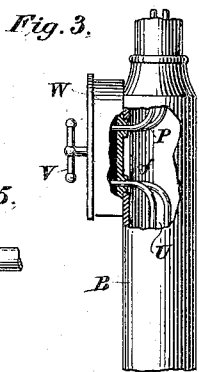


Fig. 3.

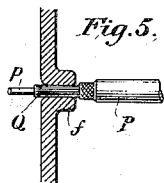


Fig.5.

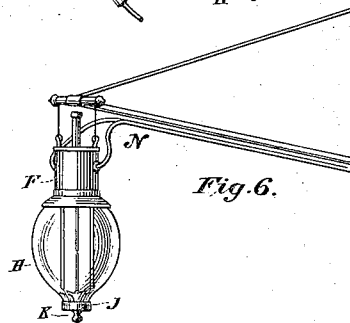


Fig.6.

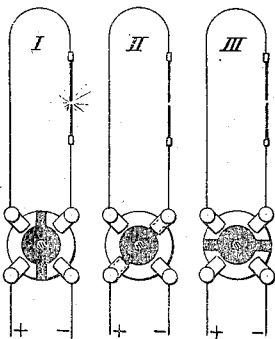


Fig. 7.

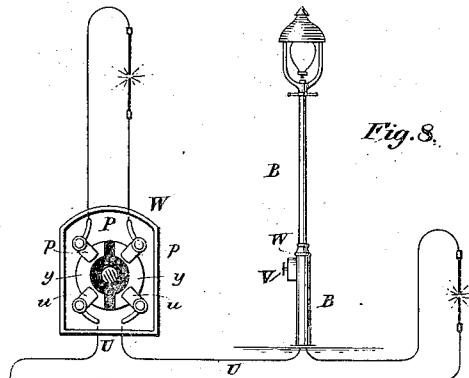


Fig. 8.

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UNITED STATES PATENT OFFICE.

HORATIO A. FOSTER, OF NEW YORK, N. Y.

SYSTEM OF ARC LIGHTING.

SPECIFICATION forming part of Letters Patent No. 472,346, dated April 5, 1892.

Application filed January 29, 1891. Serial No. 379,593. (No model.)

To all whom it may concern:

Be it known that I, HORATIO A. FOSTER, a citizen of the United States, and a resident of New York city, in the county and State of New York, have invented a new and useful Improvement in Arc Lighting, of which the following is a description.

The danger due to electric leakage on high-tension lighting-circuits and the numerous accidents and deaths of careless or disobedient linemen in disregarding the proper precautions against receiving currents from such circuits have of late called for more reliable insulation and protection of high-potential conductors, while the increased danger in case of fire renders ready local control of the various parts of such conductors not only desirable, but essential to the free and fearless operations of a fire department. Recent investigation of the systems now in general use have shown them to be far from reliable, if not, indeed, actually unsafe, in any but the most usual and favorable circumstances. For the purpose, therefore, of supplying this urgent need and of fully obviating the various objections to the systems in use I have invented the system hereinafter set forth, which, by complete insulation and protection against abrasion of the exposed conductors and by the complete isolation of the operating parts by inclosing them in tightly-sealed boxes in almost immediate connection to earth, affords practical security against dangerous leakage and perfect harmlessness of the exposed parts, while by enabling any one to cut off the current from lamps or other parts of the circuit and leave the parts cut out completely disconnected I secure perfect safety in adjusting or handling them. By my construction, also, when any of the operating parts become disordered or make partial connections with their inclosing cases a ground is at once formed on the line at such point, greatly reducing the local danger and indicating to the lighting-station that there is trouble on the line.

To these and similar ends my invention consists in the apparatus constructed, arranged, combined, and operated substantially in the manner hereinafter illustrated, described, and claimed, reference being had to the accompa-

nying drawings, forming part of this specification, wherein—

Figure 1 is an elevation of one type of my invention; Figs. 2, 3, and 4, detail views thereof; Fig. 5, an illustration of my junctions formed by my method; Fig. 6, a view of my lamp as used without lamp-post, and Figs. 7 and 8 diagrammatic views of circuit connections.

In the several views like reference-letters 60 refer to like parts.

In Fig. 8 is shown the general scheme of circuits. The underground or other suitably insulated and isolated mains U are led to my lamps through protected passages, such, in case of lamps used on iron lamp-posts, as the tubular bore of the post B. I place an operating-switch on, in, or near the post and inclosed in a hermetically-sealed moisture-proof box W. The switch, of any desirable double break or dead cut-out type, is operated by a handle V, insulated from the switch and protruding from the box through a moisture-proof orifice.

In Fig. 9 the switch is shown in diagram in the left-hand loop-circuit, the lamp being in circuit. In Fig. 7 the Roman numerals respectively show the switch in position to include the lamp in intermediate position while being turned and in position to cut the lamp out. By these views it will be seen that when the lamp is cut off the two lamp-conductors are completely disconnected from the live circuit and are connected together. The position II shows that the main circuit is closed around the lamp before the lamp-conductors are disconnected, while in cutting in the lamp the lamp-conductors are connected before the shunt around the lamp is broken. Thus a continuous main circuit is assured.

The details of the lamp-post connections are shown in Figs. 2 and 3. The connections from the main circuit are led up inside the lamp-post to a convenient height and there pass into the switch-box W, which I prefer to place on the side of the post covering a hand-hole therein. I omit the details of this switch, as I have already indicated its functions and general type and as any such type may be selected according to the currents and

other requirements of each individual case. The box W is preferably of iron and applied directly to the iron post, thus affording ready passage to earth of any leakage of current at this point. This feature, however, I do not regard as of great importance. The wall of the switch-box covering the opening in the post is provided with nipples *f*, in which are carefully-reamed holes for the several conductors fitting the insulation on the underground conductors U and the post or lamp conductors P leading from the switch to the lamp. The edges of these holes are carefully rounded away to prevent abrasion of the insulation. The conductors may be of the many varieties having an inner rubber or similar insulation Q surrounded by braided or textile insulating protection. In most cases the underground wires are in addition incased in lead sheathing. I form my junction in three or four slightly-modified ways. Some of these are fully set forth in my application filed on the 24th day of October, 1890, and serially numbered 369,196, and in that case my broad-method claim is presented. I first lay bare the rubber or equivalent insulation. By "equivalent" in this connection in this case I mean insulation that may be softened by heat and so secured in my junction. If no such insulation is found upon the conductor, a small piece of rubber tubing may be slipped over the end of the conductor as a substitute. Having prepared my conductor in either of these ways, I insert it in the orifice till the outer partially-removed portions come snugly against the mouth of the orifice. If the rubber or other insulation be sufficiently snug and elastic, its expansion force will retain the parts firmly in position without further assistance. In practice, however, I have found that on gently heating the nipple *f* the insulation firmly cements the parts in position. In this manner I secure perfect insulation and security against abrasion and moisture, while doing away with the expensive insulated stuffing-boxes now in use for such purposes. The junction thus formed is shown in detail in Fig. 5. In the claims, however, except where expressly limited to the method just set forth, I include, when referring to my junctions, the forms and ways of forming set forth in the application above referred to.

It will be understood that the conducting parts inside the switch-box are thoroughly insulated from the box, and, the box being quite moisture-proof, there will be no decrease of insulation in damp weather. From the box my post-conductors lead to the head of the post, whence they are led out to the lamp-supporting frame D through small orifices in the post-head. They are preferably secured at these points by plugging the holes with some moisture-proof material *d*. The side rods of my lamp-supporting frame are preferably of semi-tubular shape, as indicated, since not only are they thereby much stronger for a given weight of material, but they afford

a protecting-channel for the lamp-terminals. These lamp-terminals N are insulated and are preferably incased in lead sheathing. They are introduced into the box F of my lamp, which is supported under and by the hood E, surmounting the frame D, through nipples *f*. With these they make junctions of the kind just described and shown in Fig. 5. My lamp-terminals are about three feet long and form an integral part of my complete lamp. When my lamp is in position, they are laid and suitably secured in the channels of the supporting-frame D and are connected with the ends of my post-conductors by marine or similar insulated and sheathed joints O. The details of my lamp are shown in assembly in Fig. 2 and in detail in Fig. 4. The lamp mechanism is inclosed in and insulated from the iron box F. This box is provided with a flange L, having the cushion M on its underside. Against this cushion is held, when in position, the globe H. To the bottom of the globe is secured by screws or otherwise the insulating globe support or "gallery" J. This is held in position by the hand bolt or screw K, provided with an insulating-head and screwing into or otherwise fitted to the bottom of the yoke G. My lamp-yoke G is secured, either with or without intervening insulation, to the bottom of the lamp-box. The negative carbon clamp or holder S is placed in its usual position on the frame, but is thoroughly insulated therefrom. Its connection with the lamp mechanism is effected by an insulated conductor R, introduced through a snugly-fitting orifice in the bottom of the lamp-box. This I prefer to form as shown in Fig. 5. It is clear that the complete insulation of the box from the negative carbon could be accomplished, with the omission of insulation at S, by providing intervening insulation between the box and the frame G, as above suggested, and carrying the conductor R from the lamp mechanism directly to the upper end of one of the side rods G. My positive or upper carbon holder is insulated from the box by insulating-bushing or by an air-space. Its upper end is kept from contact with the projecting holder-case in any desirable manner. The exposed parts of my box, above and outside of the flange L, are hermetically sealed. The bottom, also, save around the positive-holder rod, is preferably closed in like manner. In this way I obtain a practically-continuous inclosing case about my lamp, consisting of the box sealed on its exposed surface, the globe in moisture-proof continuation thereof, and the insulating globe-support J, with its screw K. Practically the only opening to the air is the restricted space between the globe and its support. The air so admitted is, when the lamp is burning, so increased in temperature that it becomes practically dry, while at all times high insulation is preserved and surface creeping largely prevented.

Fig. 6 illustrates my lamp in use without a

lamp-post. In this and in like uses, as the conductors are exposed to abrasion, the lead casing of the terminals N and of the connections to the switch should not be omitted. This is, however, a matter of choice. With my form of lamp insulation between the lamp and its support is not needed. In use with conducting lamp-posts it is preferably omitted, since any slight deterioration in the insulation is then readily noted in making the routine tests of the line-insulation. Indeed, I hold it one of the many desirable features of my system that when the insulation of any part becomes out of order, deteriorates, or is exposed to moisture the almost direct connection to earth by the outer sheathings, boxes, &c., causes the disturbance to become apparent in the reduced insulation-resistance of the line when this is next determined. It will also be seen that I have devised a system at negligible increase of expense that is in effect a complete system of electric conductors, in which the operating parts are thoroughly insulated and incased in protecting-boxes, the other parts are entirely sheathed in insulating material, and the whole, save the globe of the lamp, is inclosed in a practically-continuous metallic casing in ready connection with earth. I do not, however, in all my claims so limit myself to these many restrictions and limitations, but desire to fully protect myself as well generically as specifically.

The act of cutting out my lamps or other loop-circuit to which my system may be applied is too obvious to need explanation, while the removal of the lamp-globe and the other parts and their restoration are matters that will be readily understood by all familiar with the analogous art. When a lamp is removed or replaced, it is only necessary to make or to break the joints O and replace or remove the lamp with its terminals entire. This renders breaking of the seal and opening of the lamp-box unnecessary. The repairs may be made by responsible parties, thus leaving it almost impossible for the carelessness of the ordinary lineman to result in injury or death either to himself or to others.

The switch-box W is designed to be accessible from the sidewalk, so that the current may be readily shut off in case of need. While I do not in this case show my form of switch-box as embedded in the road-bed, sidewalk, or building-wall, I contemplate using such constructions in certain cases. These features are, however, fully set forth in my application above referred to, and so, having set forth in this case one type of my complete invention, I desire to secure by Letters Patent these several variations and types of the devices covered by the terms of the following claims. By the expression "completely inclosed," referring to the movable lamp mechanism, I do not, of course, mean that the positive-carbon holder does not project downward from out of the lamp-box, nor does the opening through

which it passes necessarily surround it snugly. Such construction would doubtless interfere materially with its free operation and be accordingly faulty. So by the expression "positive-carbon holder" I do not mean that my device is not equally applicable to alternate currents, but merely indicate the upper or movable holder, which is usually the positive in continuous-current lamps.

Having thus set forth my invention, I claim the following:

1. In an arc lamp, the metallic lamp-mechanism box insulated from the current carrying parts of the lamp and provided with a flange for the upper edge of the lamp-globe, the yoke, the negative-carbon holder insulated from the lamp-box walls, a globe inclosing the yoke and holder, and a globe-support J, secured to the yoke by suitable means, and lamp-terminals suitably insulated and inclosed in metallic casings, substantially as set forth.

2. In combination, in an arc lamp, the lamp-operating mechanism, an inclosing metallic box insulated therefrom and hermetically sealed on its exposed sides, the insulated lamp-terminals introduced into the box through snugly-fitting orifices and cemented thereto, metallic casings around the portions of the said lamp-terminals external to the said box, the yoke secured to the lamp-box and bearing the negative-carbon holder, said holder being completely insulated from the lamp-box, the main-circuit connection from the holder to the lamp mechanism, the globe held in position between a flange on the lamp-box and an insulating globe-support J, and insulated means, as K, for securing the support in place, substantially as set forth.

3. A hollow lamp-post for arc lamps, containing insulating and suitably-protected conductors, surmounted by a lamp-supporting frame carrying the hood E, and having tubular or semi-tubular side rods D for protecting the lamp-terminals, substantially as set forth.

4. In combination, a hollow conducting lamp-post surmounted by a lamp-supporting frame and hood, a lamp held therein having its operating mechanism inclosed in and insulated from a conducting-box hermetically sealed on its exposed portions, the yoke secured to the lamp-box and bearing the negative-carbon holder, insulated from the lamp-box, the main-circuit connection from the said holder to the operating mechanism, the globe held in position between a flange on the lamp-box, and an insulating globe-support secured to the yoke by an insulated screw, the insulated and protected lamp-terminals leaving the box through snugly-fitting orifices and cemented therein, leading down the side rods of the supporting-frame to the head of the lamp-post and there connected with insulated and protected post-conductors by means of insulated and protected joints, a hermetically-closed box on or near the post, containing a double-break cut-out switch op-

erated by an insulated handle extending
through the box-wall, the said post-conduct-
ors being led to the switch through moisture-
proof junctions, and the insulated and pro-
5 tected mains led up inside the post and in-
troduced into the switch-box through similar
junctions, substantially as set forth.

In testimony hereof I affix my signature
this 22d day of January, 1891.

HORATIO A. FOSTER.

Witnesses:

J. W. HENRY,
BERNARD LEVEY.