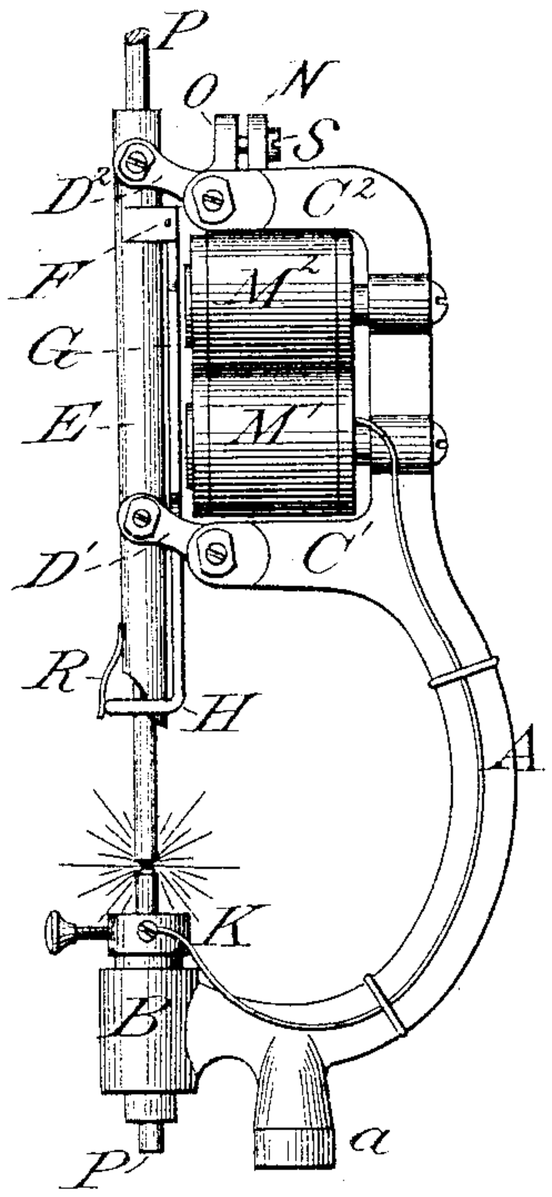
P. DIEHL.

Electric-Light Apparatus.

No. 214,242. Patented April 15, 1879.

Fig. 1.



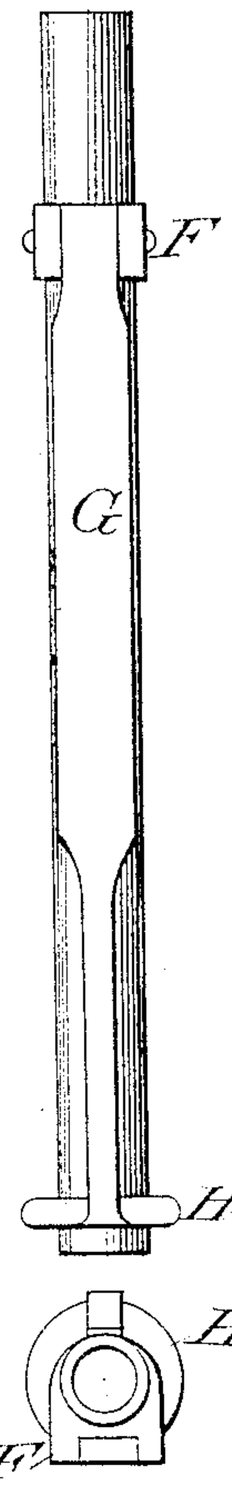




Fig. 2.



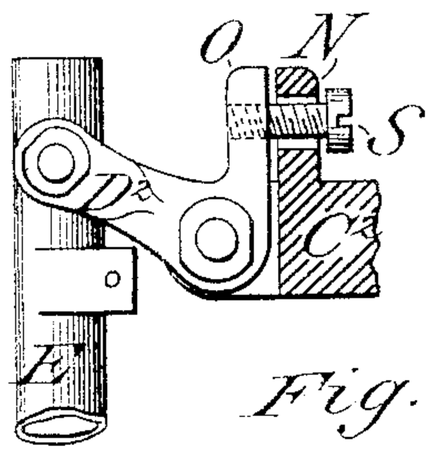
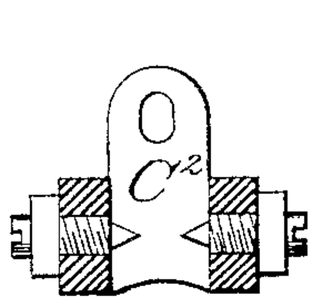




Fig. 4.



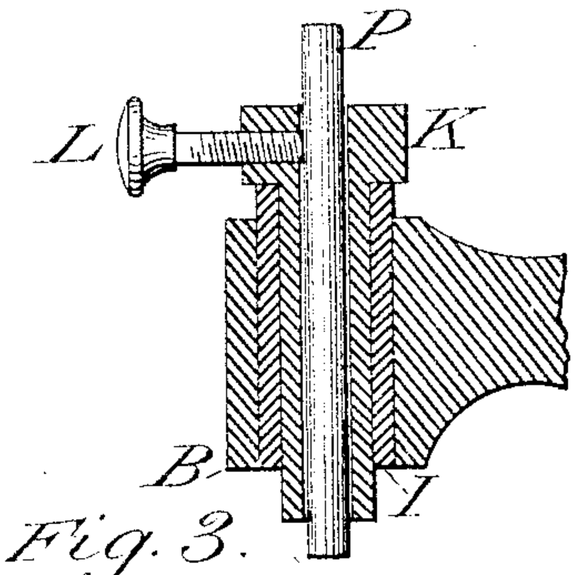




Fig. 3.

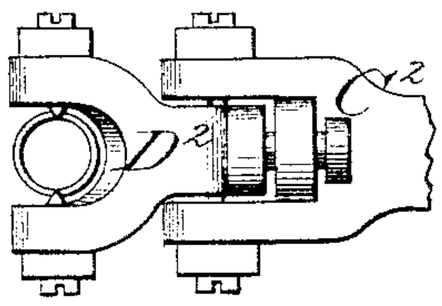
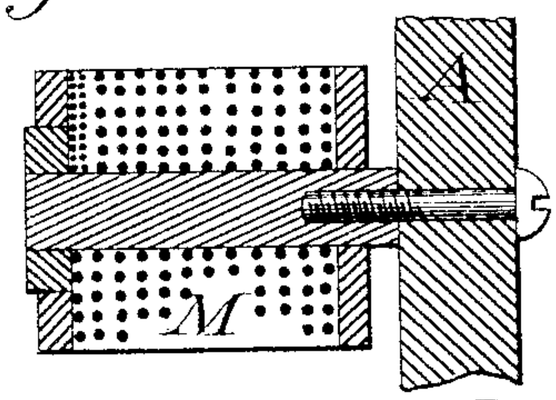




Fig. 5.

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# UNITED STATES PATENT OFFICE.

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## IMPROVEMENT IN ELECTRIC-LIGHT APPARATUS.

Specification forming part of Letters Patent No. **214,242,** dated April 15, 1879; application filed January 25, 1879.

*To all whom it may concern:*

Be it known that I, PHILIP DIEHL, of Elizabeth, in the county of Union and State of New Jersey, have invented a new and useful Improvement in Lamps for Electric Lights; and that the following is a full and exact description and specification of the same.

My invention consists of a solid-frame lamp, to which a movable carbon-pencil holder is attached in such a manner that long carbon pencils can be put in and easily renewed when consumed, and in which the points of the carbon pencil are kept at proper distance from each other. The lower carbon-pencil tube, being open on both ends, admits the use of hollow carbon pencils, through which the air can pass, and are therefore kept clearer from loose carbon hanging around the points, and whereby the electric arch is kept burning on the outside of the pencils.

In the accompanying drawings, in which similar letters of reference indicate like parts, Figure 1 represents a side view of the lamp. Fig. 2 represents a back view of the movable carbon-pencil holder E, armature G, and carbon-pencil clamp H. Fig. 3 represents a view of the lower arm, B, the insulated tube K, with thumb-screw L, by which the lower or positive carbon pencil P is held. Fig. 4 represents a detail view of the links $D^1$ and $D^2$, by which the carbon-pencil holder E is attached to the solid frame A. Fig. 5 represents a view of the hollow carbon pencil P.

The solid frame A thus represented in Fig. 1 may be made of an iron casting, and shaped suitable to serve as a hand, table, or bracket lamp. The form of the frame A is like that of a Roman letter, E, with an extension, *a*, on its lower part when used as table or bracket lamp. The frame A branches out in three arms, B, $C^1$, and $C^2$. The lower arm, B, forms on the extreme end the seat for the lower carbon-pencil tube, K; but the tube K does not sit direct in the arm B. An insulating material is filled between, to insulate the carbon-pencil tube K from the arm B, as shown in Fig. 3. Tube K is provided with a thumb-screw, L, to hold the carbon pencil in proper place.

The upper arms, $C^1$ and $C^2$, of the solid frame A are forked on their outer ends, and links $D^1$ and $D^2$ are hinged between the forks by screw-centers provided with lock-nuts, to keep the screw-centers from getting loose, as shown in Figs. 1 and 4. The arm $C^2$ has at the top a projection, N. Link $D^2$ has also a corresponding one, O, and through both of these projections holes are drilled. The one in projection N is larger than in the link $D^2$. The latter is tapped to receive the adjusting-screw S. Between the arms $C^1$ and $C^2$ are two electro-magnets, $M^1$ and $M^2$, fastened to the frame A in a horizontal position by screws, as shown in Fig. 1.

It is evident that one larger magnet may be substituted in the same position, or one or more electro-magnets may be attached to arm $G^2$ in a perpendicular position, in which case the armature G would occupy a horizontal position, and the extension for the clamp H, instead of being in a line with the armature G, would be about at right angles with it; but I prefer the arrangement as shown in drawings, Fig. 1.

Links $D^1$ and $D^2$ are forked on their outer ends, and the carbon-pencil holder E is held between them by screw-centers provided with lock-nuts, in like manner as the screw-centers of $C^1$ and $C^2$. The hinge-points of the carbon-pencil holder E lie above the hinge-points of the links $D^1$ and $D^2$. The carbon-pencil holder E swings free on these screw-centers, and is, through its own weight, inclined to slide down as much as the adjusting-screw S will permit. By reason of the sliding down of the carbon-pencil holder E the hinge-points are brought more in a straight line, and thereby the carbon-pencil holder E, with armature G attached to it, is carried away from the poles of the electro-magnets $M^1$ and $M^2$.

The carbon-pencil holder E is a tube of metal, so shaped as to correspond to the shape of the carbon pencils, and the interior is made large enough to permit the carbon pencil to slide freely through it. The carbon-pencil holder E, on its lower end and front side, is partly cut open, as shown in Fig. 1. To the upper end of the carbon-pencil holder E, in front of the electro-magnets $M^1$ and $M^2$, is hinged, by the joint F, armature G.

Armature G is made of soft iron, about as wide as the cores of the electro-magnets $M^1$ and $M^2$. It extends down to the cut-away part

of the carbon-pencil holder E, and around it, to form the clamp H, as shown in Fig. 1.

The clamp H is shaped in such a manner that when the cores of the electro-magnets $M^1$ and $M^2$ become magnetized and attract the armature G, the clamp H will clamp the carbon pencil P to the inner face of the carbon-holder E, and hold it tight.

One end of the wire of the electro-magnets E is connected with the insulated tube K; the other end with the positive pole of a generator of electricity. The negative pole of the generator of electricity is attached in a suitable way with frame A, or the bracket upon which the lamp is fastened, so as to conduct the electricity to the upper carbon pencil.

The carbon pencils P (shown in Figs. 1, 3, and 5) are tubes hollowed out, as shown, having no center, in order to allow the air free passage through them.

It is well known that in lamps with solid carbon pencils the negative carbon pencil will burn convex and the positive concave, and the electric arch is thereby kept too much in the center of the positive pencil. To overcome this objection, and to cause a free and uninterrupted flow of air to the points of combustion alike, so that they will burn even and uniform, the carbon pencils (both negative and positive) are made hollow, as described, and thus the air has free access to the portion under combustion.

In lamps used out of doors, or where there is a strong current of air, I have found it to be an advantage to stop up the extreme outer end (one or both) of the pencils partly or entirely, as occasion may require. The same amount of carbon used in a solid pencil converted into a tube or hollow pencil of the same length will give a pencil of a larger circumference, and the burning-surface will be enlarged to the best advantage.

To set the lamp in operation is very simple. The lower carbon pencil is first put in the insulated tube K and fastened by the thumb-screw L. The upper carbon pencil, which, as before mentioned, must slide in the carbon-pencil holder freely, is inserted in the carbon-pencil holder E from the top. It will slide down and rest on the lower pencil. The carbon-pencil holder E hangs down as low as the adjusting-screw S will permit. The clamp is held open by the spring R. If a generator is now attached, as before mentioned, the cores of the electro-magnets $M^1$ and $M^2$ become magnetized and attract the armature G. The clamp H, being a part of armature G, will clamp the carbon pencil to the inner face of the carbon holder E and hold it tight. In order to get still closer to the cores of the electro-magnets $M^1$ and $M^2$, the armature G is obliged to lift up the carbon-pencil holder E, to which it is hinged, and thereby the points of the carbon pencils are separated and the electric arch is formed.

When the points of the pencils are burned off so far that the electric current does not pass strong enough from one point to the other, the cores of the electro-magnets become weaker, the carbon-pencil holder E slides down, the clamp H releases the carbon pencil, so that it also can slide down, the carbon-pencil points come in contact again, and the clamping and lifting up are repeated.

What I claim is—

1. A movable carbon-holder, E, consisting of a tube or pipe, to which is hinged an armature, G, with a clamp, H, attached, which alternately clamps and releases the carbon pencil, substantially as and for the purpose described.

2. The movable carbon-pencil holder E, hinged to a solid frame, A, by links $D^1$ $D^2$, which are standing in an angular position to the carbon-pencil holder E, substantially as and for the purpose described.

3. The movable carbon-holder E, linked to frame A, as shown, in combination with the carbon-pencil clamp H and the electro-magnets $M^1$ and $M^2$, substantially in the manner and for the purpose described.

PHILIP DIEHL.

Witnesses:
RUDOLPH DIEHL,
L. DUSTIN.