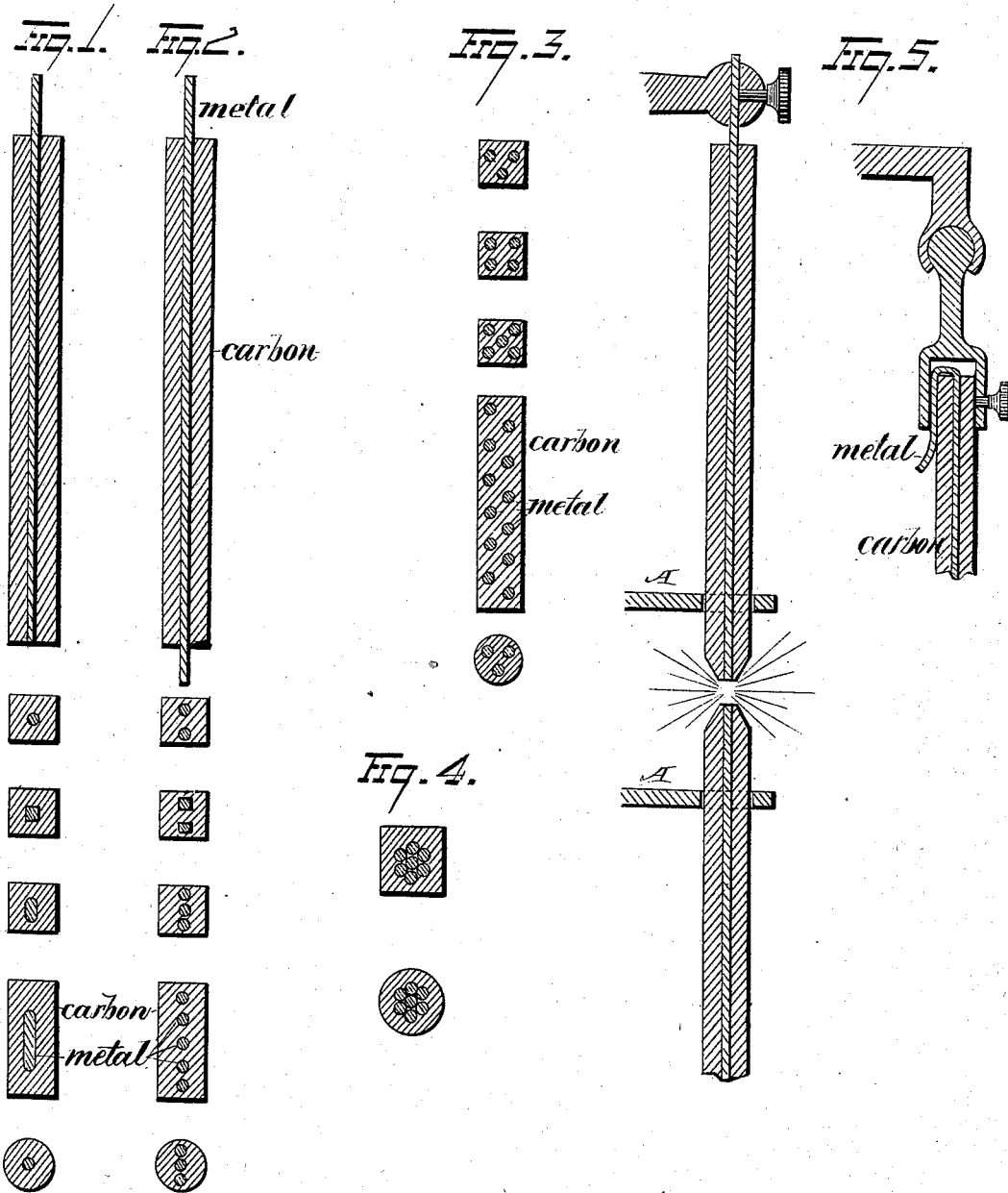


C. F. BRUSH.  
Carbons for Electric-Lamps.

No. 219,210.

Patented Sept. 2, 1879.



WITNESSES  
E. J. Nottingham  
G. Dudley Seymour.

INVENTOR  
Chas. F. Brush.  
B. Seagrett & Seagrett.  
ATTORNEYS

# UNITED STATES PATENT OFFICE.

CHARLES F. BRUSH, OF CLEVELAND, OHIO.

## IMPROVEMENT IN CARBONS FOR ELECTRIC LAMPS.

Specification forming part of Letters Patent No. **219,210**, dated September 2, 1879; application filed November 8, 1878.

*To all whom it may concern:*

Be it known that I, CHARLES F. BRUSH, of Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Electric-Lamp Carbons and mode of attaching same; and do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use it, reference being had to the accompanying drawings, which form part of this specification.

My invention relates to electric-lighting apparatus, and especially to the carbons or illuminating-points of such apparatus; and my said invention consists in means for attaching these carbons to a lamp or regulator; also, in the combination, with either one or both carbons of any electric lamp, of a suitable supporting or guiding device, whereby a proper apposition of the carbons is insured, and whereby liability to a material lateral displacement of the carbons on account of jolting or other cause is prevented.

My invention, furthermore, consists in a carbon containing or inclosing a rod, cable, wire, or ribbon of copper, or equivalent electro-conducting substance, said electro-conductor extending throughout the length of the carbon, and projecting from one end of said carbon to afford, when attached to a lamp, a flexible and automatically-adjusting and yielding joint or connection between the carbon and lamp mechanism.

In the drawings, Figure 1 shows various forms of carbons inclosing a single metallic conductor of various forms of cross-section. Fig. 2 shows said carbons inclosing two or more of said metallic conductors. In both of these figures the conductors are shown, according to my invention, projecting from one or both ends of the carbons. Fig. 3 shows several of many ways of arranging several conductors within various forms of carbons. Fig. 4 shows a cable of several conductors inclosed within carbons; and Fig. 5 illustrates a method of utilizing the projecting ends of the conductors to afford a flexible and automatically-adjusting and yielding connection between the carbon and the lamp. Fig. 5 also shows one of an indefinite variety of forms of my support or

guide, which operates to insure a proper presentation of the carbons to each other, and to prevent the liability of their material lateral displacement; and this guiding and supporting device I consider to be a very important feature of my invention, and I do not propose to be limited to the specific form shown in the drawings, inasmuch as this element of my device and invention is susceptible of an indefinite degree and variety of modification.

In the use of the electric light in places where the mechanism or carbons are subjected to jolting, (as, for instance, in a locomotive head-light,) any form of lamp of which I am aware would be inoperative, as its illuminating-points, not having any guides or supports, could not be maintained in that proper line or apposition with each other which is an essential requisite in maintaining a satisfactory light.

In Fig. 5 of the drawings, A represents the guide or support referred to, and this guiding or supporting device may partially or completely surround the carbon, or it may impinge against it in any manner so long as it shall operate to guide its carbon to a proper apposition with its fellow of opposite polarity, and also operate to maintain the illuminating-points of said carbons against material lateral displacement. This guiding and supporting device may be made adjustable in its position, so that its proper application to the carbon under all circumstances can be made. It is equally suitable to the carbons of any lamp, whether said carbons are attached to the lamp by a rigid or by a flexible or yielding connection.

I have found when experimenting with powerful electric currents that it is impracticable to employ sufficiently thin carbon sticks to produce the best illuminating effect on account of their high resistance and consequent rapid consumption, due to the action of the air on the highly-heated carbon. A great amount of heat is generated in small carbons in consequence of their resistance, aside from the heat produced at the ends by the voltaic arc. The resistance of the carbons is detrimental, not only for the reasons given above, but on account of the loss or waste of current occasioned thereby.

I have sought to provide a remedy for these

evils, and have fully accomplished my purpose by inclosing within the carbon rod, stick, disk, or plate one or more wires, rods, ribbons, or cables of copper or any good electro-conducting material. The main objects of this construction are to decrease the resistance of the carbons and to provide a ready means of electrically connecting the carbon to its holder in a thorough manner. This last important object is attained by allowing the copper or other conductors to project beyond the end of the carbons proper, thus allowing them to be connected with the source of electricity easily and thoroughly. This construction also allows the projecting conductor, when made of suitable pliable material, to perform the functions of a universal joint for centering the carbons in the regulator when the other ends of the carbons are provided with a support or guide, A, Fig. 5, through which the carbons slide as they are consumed. This method of using carbons is of great value when the regulator is subjected to much jolting or other violent motion, as in the case of electric locomotive head-lights, &c.

Although many other forms of universal joint, such as the ball-and-socket, &c., may be employed in combination with the carbon-supports, as above, using carbons either with or without the inclosed conductors, I find the use of the projecting conductor the most simple and effective device for this purpose.

I do not in any degree limit myself to any manner or method of inclosing said conductors in said carbons. I prefer to inclose a single copper wire of suitable size in each carbon during the process of its manufacture, and while the carbon (or mixture of carbon and other material for increasing its illuminating power, such as lime, alumina, magnesia, gypsum, &c.) is in a pulverized or plastic condition; but, instead of this, the carbons may be formed with suitable cavities, in which the metallic or other conductor is afterward inserted or cast in a melted state.

In operation, the intense heat generated by the voltaic arc melts and disperses the inclosed conductors at the opposing points of the carbons and for a proper distance beyond, while as fast as the carbons are consumed

just so fast will the inclosed conductor be removed.

In Letters Patent numbered 196,425, granted to me October 23, 1877, I described carbons coated with a suitable metallic substance, thus securing some of the advantages of my present invention. The principal objection to my former device arises from the fact that the voltaic arc, seeking the path of least resistance, frequently leaves the center of the carbon rods—its normal position—and plays from side to side around the outer portion of the carbons, attracted by the vapor of the volatilized copper or other metal, or by the metal itself. This produces a disagreeable flickering of the light. Further, a deposit of metallic oxide, silicate, &c., often collects about the lower carbon at its edges, thus obstructing much of the light.

My present invention obviates these grave difficulties, while securing most of the advantages of my former one.

What I claim, broadly, is—

1. In an electric lamp, a carbon having a jointed or flexible connection with said lamp, and one or more guides partially or completely surrounding said carbon, for the purpose of directing it to a proper apposition with its fellow or opposite carbon, substantially as specified.

2. In an electric lamp, a carbon provided with the described inclosed conductor, made of pliable material, and projecting beyond the end of the carbon, said conductor being adapted to serve as a universal joint for centering the carbon in the regulator, substantially as set forth.

3. The combination of one or more guides, A, adapted to impinge against or to surround a carbon of an electric lamp, with a flexible or jointed connecting or attaching device between said carbon and electric lamp, substantially as and for the purpose shown.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

CHARLES F. BRUSH.

Witnesses:

WILLARD FRACKER,  
W. E. DONNELLY.