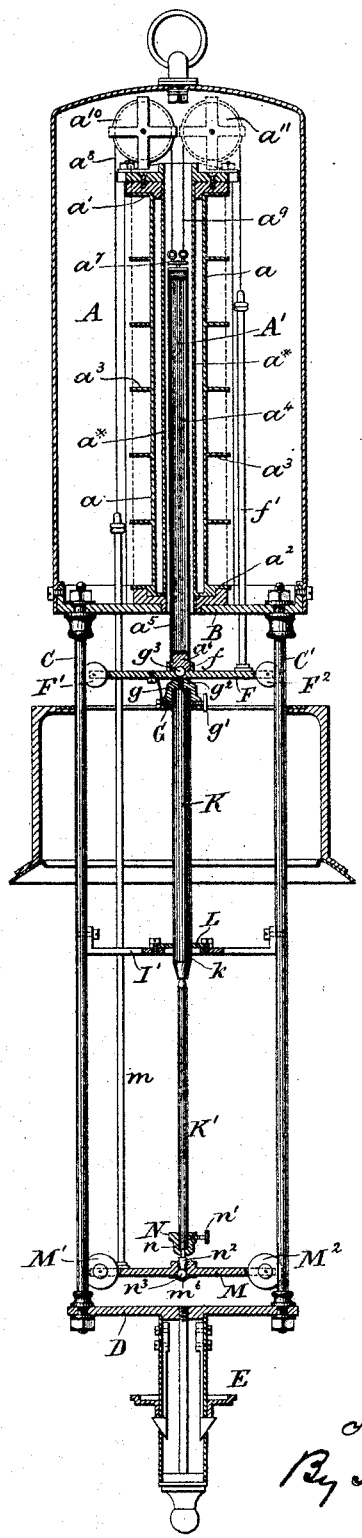
(No Model.) 3 Sheets—Sheet 1

H. HARPER.

ELECTRIC ARC LAMP.

No. 492,201. Patented Feb. 21, 1893.

Fig. 1.



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(No Model.) 3 Sheets—Sheet 2

H. HARPER.

ELECTRIC ARC LAMP.

No. 492,201. Patented Feb. 21, 1893.

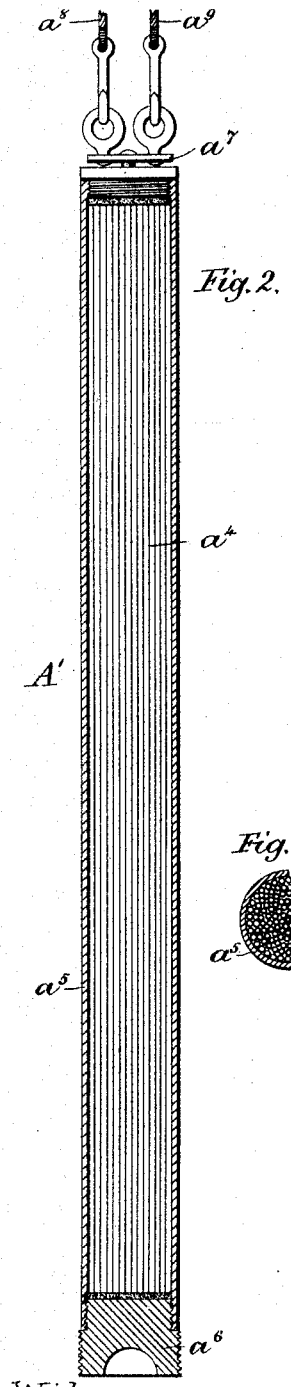


Fig. 2.

Fig. 6.

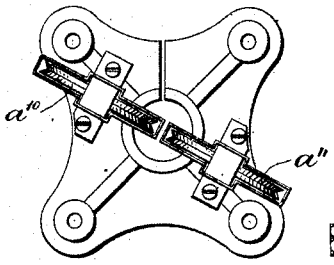


Fig. 4.

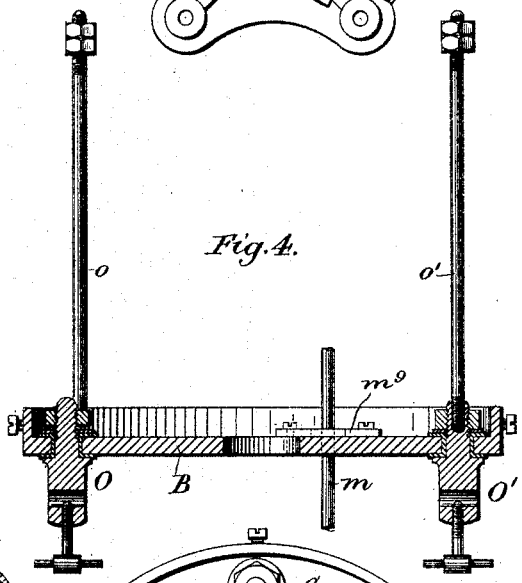
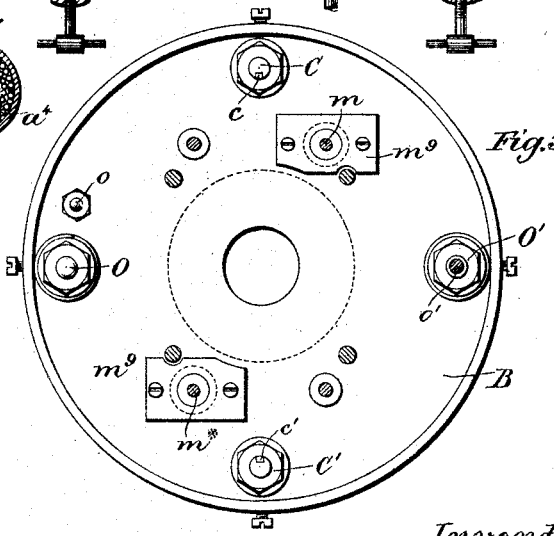


Fig. 3.

Fig. 5.



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(No Model.) 3 Sheets—Sheet 3.

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ELECTRIC ARC LAMP.

No. 492,201. Patented Feb. 21, 1893

Fig. 7.

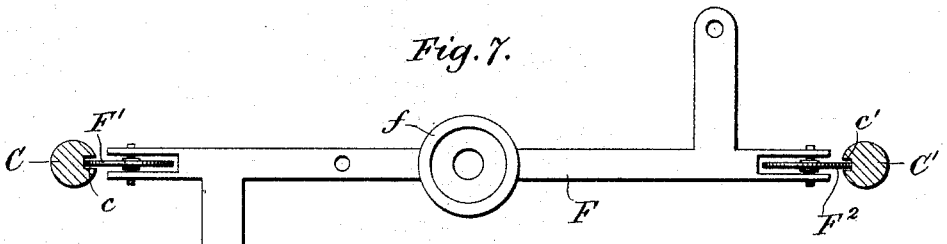


Fig. 8.

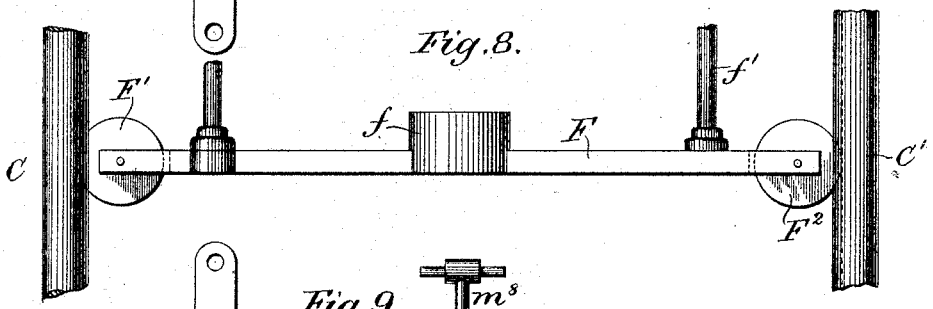


Fig. 9.

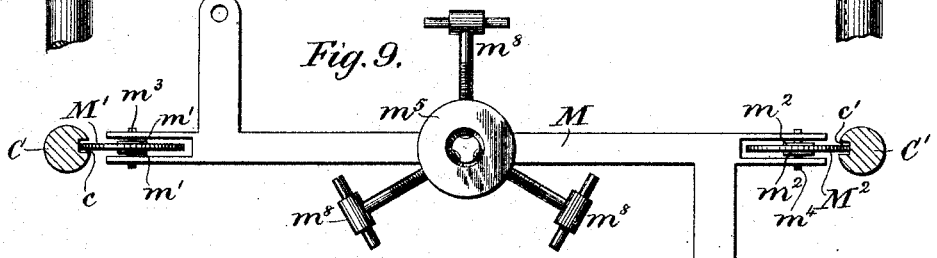


Fig. 10.

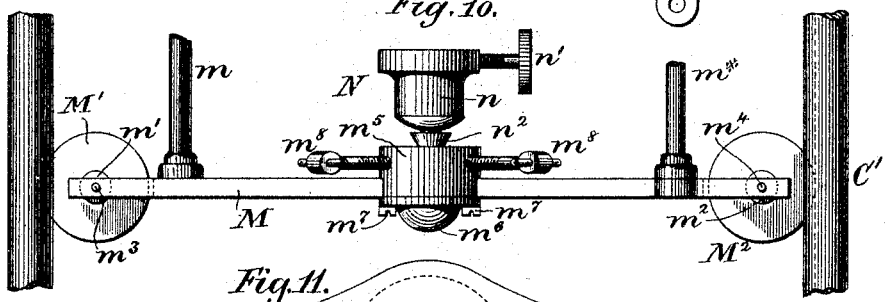
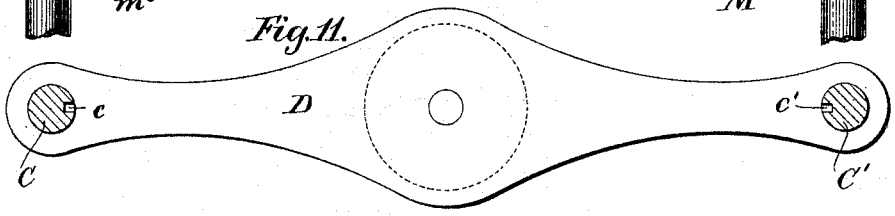


Fig. 11.



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UNITED STATES PATENT OFFICE.

HENRY HARPER, OF LONDON, ENGLAND, ASSIGNOR TO HIMSELF, JOHN TRYON, AND THOMAS GEORGE POOLE, OF SAME PLACE.

ELECTRIC-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 492,201, dated February 21, 1893.

Application filed July 10, 1891. Serial No. 399,108. (No model.) Patented in England November 2, 1889, No. 17,425.

To all whom it may concern:

Be it known that I, HENRY HARPER, electrical engineer, a subject of Her Majesty the Queen of Great Britain and Ireland, residing at 3 Cornwall Gardens, Queen's Gate, London, in the county of Middlesex, England, have invented new and useful Improvements in Electric-Arc Lamps, (in respect of which I have applied for and obtained Letters Patent in Great Britain, bearing date November 2, 1889, No. 17,425,) whereof the following is a specification.

This invention relates to solenoid arc lamps for electric lighting, and consists, first, in improved means for regulating the feed of the carbons, secondly, in an improved method of constructing the solenoid-core whereby it is rendered specially adapted for use with alternating currents, and, thirdly, to certain devices for enabling the carbons to be readily fixed, accurately centered, and so guided as to insure efficiency in the working of the lamp.

In the accompanying drawings, Figure 1 represents, in vertical section, an arc lamp constructed in accordance with this invention. Figs. 2 to 11 are detail views drawn to larger scales. Fig. 2 is a vertical section of the improved solenoid-core; Fig. 3 being a corresponding horizontal section. Fig. 4 is a vertical section of the base-plate; Fig. 5 being a corresponding plan. Fig. 6 is a plan showing the pulleys on the top of the solenoid. Fig. 7 is a plan of the upper cross-piece; Fig. 8 being a corresponding side elevation. Figs. 9 and 10 are similar views of the lower cross-piece and carbon-holder. Fig. 11 is a plan of the cross-piece employed for uniting the two grooved rods which serve as guides for the carbon-holder cross-pieces.

The improved arc lamp is provided with a solenoid A of a length determined by the number of hours the lamp is required to burn continuously, and comprising a tube a having two flanges a' and a^2 and gills a^3; the tube, flanges, and gills being split longitudinally to prevent heating by induced currents. The frame formed by the tube, flanges, and gills is wound in series with the lamp circuit with wire of sufficient size to carry the current required. An inner coil of fine wire in a shunt to the lamp circuit is wound on the tube a^*. The magnetizing influence of the current flowing through the outer coil of thick wire is diminished to an extent corresponding with the current flowing through the inner coil of thin wire, as explained in the specification to my application entitled "Improvements in electro-magnets and in their application to arc lamps," filed concurrently herewith.

The tube a^* and the inner coil may, when the lamp is one of a set connected parallel, be dispensed with. The coils of wire are, for the sake of clearness, omitted from the drawings. The solenoid is fixed to a base-plate B. To the under side of the latter, and at a convenient distance apart, are attached two longitudinally-grooved rods C and C'; the groove c in one rod facing the groove c' in the other rod. The lower ends of the rods are, to insure stability, joined together by a cross-piece D, which also serves to support the gallery E for carrying a globe. The grooved rods C and C' act as guides for the cross-pieces carrying the holders of the upper and under carbons.

The solenoid-core A', which is specially adapted for use with alternating currents, comprises a bundle of iron wires a^4; each wire being insulated by a covering of cotton, or by shellac, or in any other suitable manner. These wires are placed lengthwise in a split tube a^5 of brass, or in an unsplit tube of vulcanite, fiber or other non-conducting material. To the lower end of the tube a^5 is rigidly attached the cross-piece F carrying the upper carbon-holder G, which comprises a socket g fitted with a radial set-screw g' for receiving and holding the carbon K; the socket g being attached to the cross-piece F by a ball-joint in order that the carbon may have the desired freedom of movement. The joint is preferably constructed in the following manner:—A vertical hole terminating at its upper end in a cup-shaped cavity is formed in a boss f in the center of the cross-piece. A screw g^2 with a ball-shaped head g^3 is then passed through the hole and firmly screwed into the top of the socket; the lower part of the head g^3 of the screw fitting within the cavity. The bottom of the solenoid-core-tube a^5, which is provided with a plug a^6 containing a recess corresponding with the cup-shaped cavity and fitting over the upper part of the head g^3, may

then be screwed into the boss *f;* the parts being thus securely held in position. The lower end *k* of the upper carbon is passed through and guided by a hole in a plate L, which is fastened to a cross-bar L′ carried by the grooved rods C and C′, and is situated about three-quarters of an inch above the arc. This plate is made removable, so that, should the guide-hole therein be too large or too small, a plate containing a larger or a smaller hole may be substituted.

The extremities of the cross-piece F are furnished with guide-wheels F′ and F^2, which may be of brass and which run in the grooves *c* and *c′*. To the top of the solenoid-core is attached a two-eyed swivel a^7 to which are connected cords a^8 and a^9 running over two grooved pulleys a^{10} and a^{11} mounted on the top of the solenoid; these cords being in turn connected to two vertical rods *m* and m^* fixed to the lower carbon-holder cross-piece M. These rods pass through holes in the base-plate B, from which they are insulated by perforated plates m^9 of non-conducting substance. The cross-piece is provided at each end with a guide-wheel M′ or M^2 formed of insulating material held between two central brass plates or collars m' or m^2, through which the brass pivot-pin m^3 or m^4 is passed. For these guide-wheels, I prefer to employ mica, which, besides being a good non-conductor, is well adapted to withstand the heat radiated by the electric arc. The socket *n* of the lower carbon-holder N, in which the lower carbon K′ is held by a set-screw *n′*, is connected to the cross-piece M by means of a ball-joint of the following description:—A taper pin n^2 with a ball-shaped head n^3 and a screw-threaded extremity is passed from the under side through a central boss m^5 projecting from the upper surface of the cross-piece and is screwed firmly into the socket *n*. A small cap m^6 is fastened by screws m^7, over the head n^3 of the pin, to the cross-piece in order to keep the parts in position vertically. Three radial adjusting screws m^8 are screwed at equal distances apart through the boss m^5 and against the neck of the taper pin n^2; adjustment of the lower carbon-holder N being by their means readily effected.

For use with a continuous current, a solenoid-core of the kind described and claimed in the specification hereinbefore referred to forming part of my said application filed concurrently herewith may be substituted for the core A′ above described.

The positive wire from the generator is connected to the binding post O, whence the current flows to the outer coil *a* of the solenoid. From the latter it passes into the base of the rod *o* and along that rod, the top of which is electrically connected by a flexible wire with the rod *f′* carried by the cross-piece F. From the rod *f′*, the current flows into the upper carbon K, thence into the lower carbon K′, along the rod *m* and through a flexible wire to the binding rod *o′*, and thus to the binding post O′, to which the negative wire leading to the generator is connected. The inner coil *a′* is connected in shunt as described in the said specification to my application filed concurrently herewith.

What I claim, and desire to secure by Letters Patent of the United States, is—

1. In an electric arc lamp, the combination with the solenoid, of the core thereof bearing the upper carbon, said core composed of insulated iron wires massed together and inclosed in a non-magnetic tube, and the holder of the upper carbon, connected to said core substantially as and for the purposes set forth.

2. In an electric arc lamp, the combination with the solenoid, of the solid core thereof, bearing the upper carbon, said core composed of insulated iron wires inclosed in a non-magnetic tube, substantially as and for the purposes set forth.

3. In an electric arc lamp, the combination with the holder G and screw g^2, secured therein, said screw provided with a ball-shaped head, of the cross-piece F, secured to the solenoid core and provided with a recess corresponding in form to the head of the screw g^2, whereby the parts are assembled in an adjustable and elastic manner.

4. The combination with the holder N and pin n^2, having a conical body and a ball-shaped head n^3, of the cross piece M, having a boss m^5, provided with a recess corresponding in form to that of the pin n^2, the set screws m^8, arranged with their tips bearing against the conical sides of said pin, and the cap m^6, substantially as set forth.

5. In an electric arc lamp, the combination with the solenoid, of the core thereof, composed of a split tube a^5, of non-magnetic material, closed at the ends with plugs and containing a mass of iron wires, a^4, each covered with insulating material, and the holder for the upper carbon, secured to the lower end of said core.

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