(No Model.)

2 Sheets—Sheet 1.

R. NIEWERTH.

ELECTRIC ARC LAMP.

No. 512,482. Patented Jan. 9, 1894.

Fig: 1.

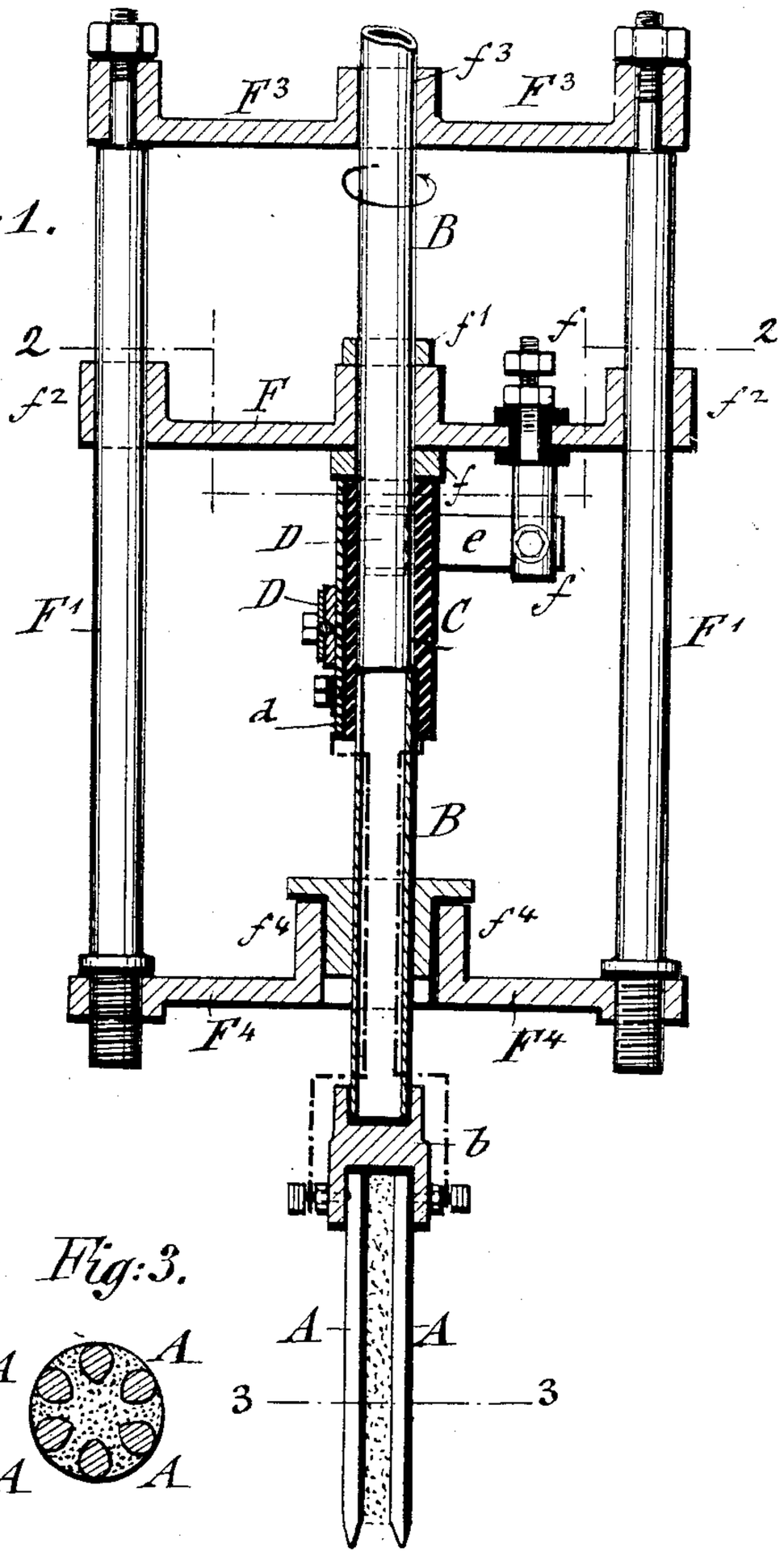
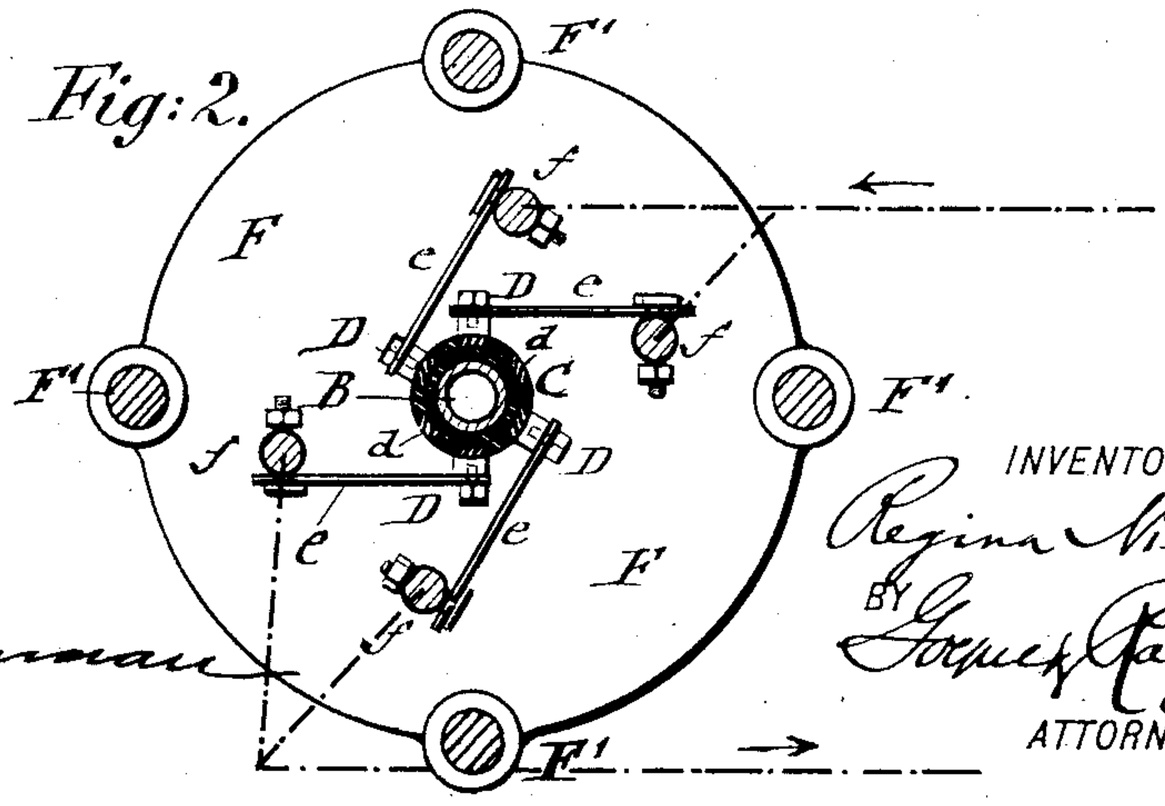


Fig: 3.

Fig: 2.



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(No Model.) 2 Sheets—Sheet 2.

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Fig: 4.

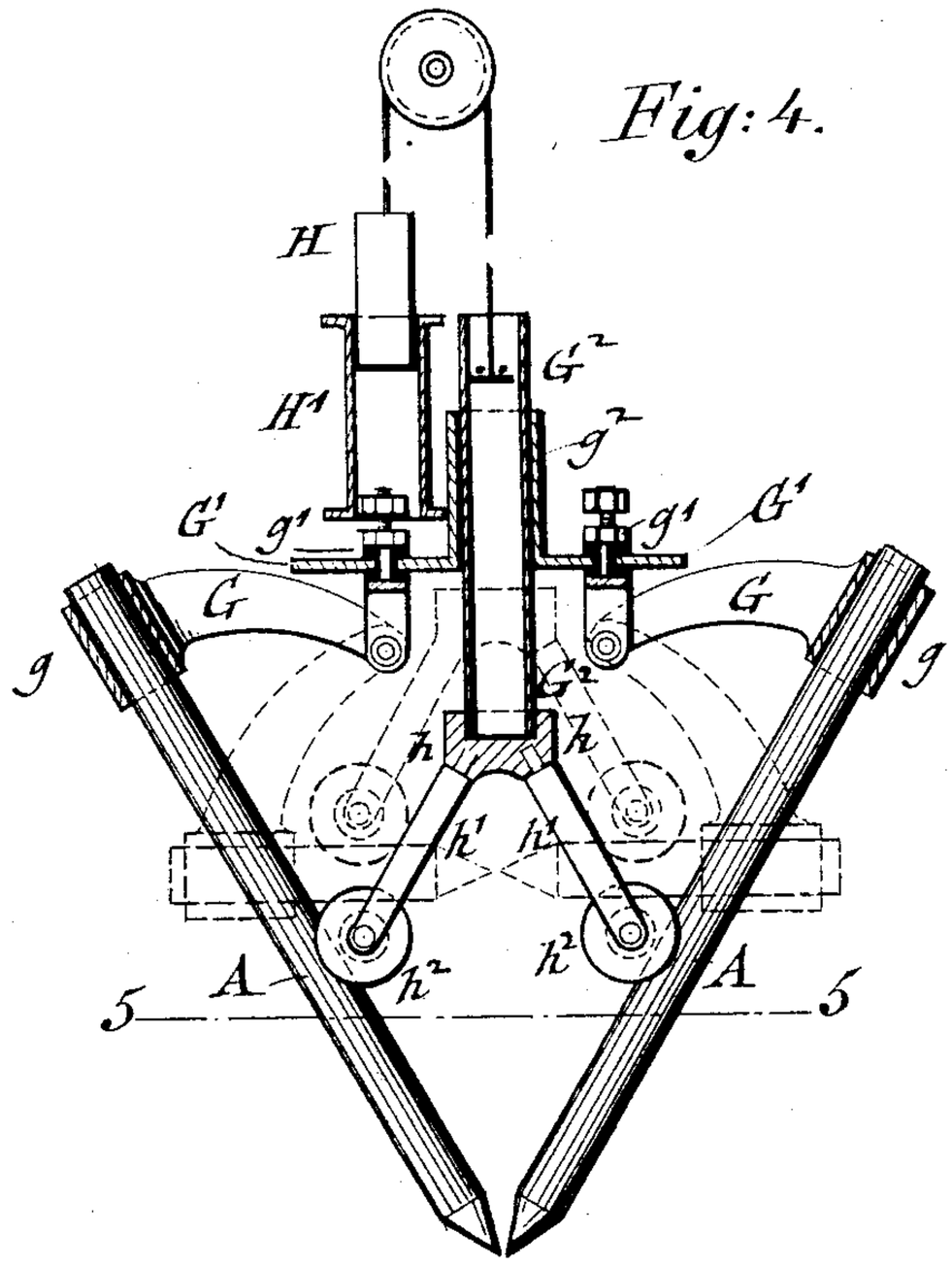


Fig: 5.

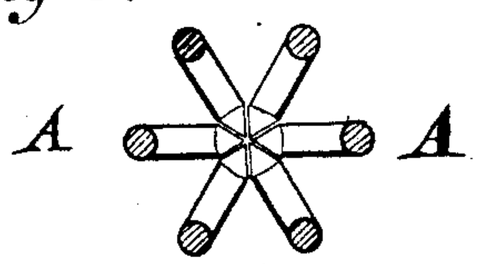
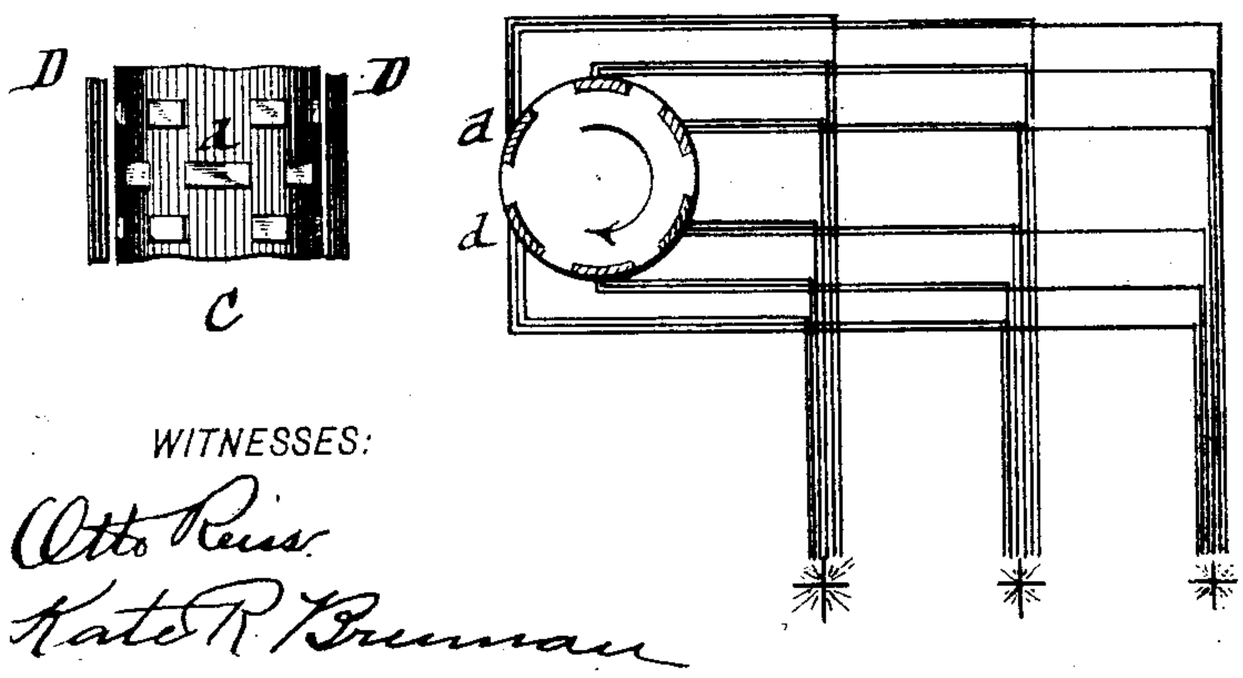


Fig: 6.



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REGINA NIEWERTH, OF BERLIN, GERMANY.

ELECTRIC-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 512,482, dated January 9, 1894.

Application filed October 24, 1893. Serial No. 489,059. (No model.)

To all whom it may concern:

Be it known that I, REGINA NIEWERTH, a subject of the Emperor of Germany, residing at Berlin, in the Kingdom of Prussia and Empire of Germany, have invented certain new and useful Improvements in Electric-Arc Lamps, of which the following is a specification.

This invention has reference to an improved electric arc-lamp, in which the voltaic arc is produced in such a manner that an arc of uniform size and the even and uniform burning off of the carbons are obtained, by comparatively simple and inexpensive means, the lamp being adapted in a higher degree for illuminating purposes, as well as for the heating, melting or distilling of metals or other substances.

The invention consists of an electric arc-lamp, in which the electrodes are grouped around a common axis, and in which the current is supplied alternately in opposite directions to the electrodes, so that the arc is formed between two or more pairs of electrodes while the remaining electrodes are not supplied with the current, said electrodes being either rotated on their axis and supplied with current from a suitable commutator, or the electrodes are made stationary and connected with a rotatable commutator, as will be fully described hereinafter and finally pointed out in the claims.

In the accompanying drawings, Figure 1 represents a vertical central section of one form of my electric arc-lamp, on line 1, 1, Fig. 2, in which the carbon-electrodes are arranged parallel around a common axis. Fig. 2 is a horizontal section of the same, on line 2, 2, Fig. 1. Fig. 3 is a horizontal section, on line 3, 3, Fig. 1, drawn on a larger scale. Fig. 4, is a sectional side-elevation of a modified form of lamp, in which the electrodes are arranged around a common axis but at an inclination to each other. Fig. 5 is a horizontal section in line 5, 5, Fig. 4, and Fig. 6 is a diagram showing a number of lamps with stationary electrodes, connected with a common commutator, to which rotary motion is imparted.

Similar letters of reference indicate corresponding parts.

Referring to the drawings, A represents a number of carbon-rods or pencils, preferably six, which are arranged equi-distantly from each other around a common axis and either separated from each other by suitable insulating material, as shown in Figs. 1 and 3, or arranged without any separating material, or at a suitable inclination to, or even in the same plane with, each other, as shown in Fig. 4.

In the lamp shown in Fig. 1, the carbon-electrodes are arranged in a socket *b* of suitable non-conducting material, which is attached to the lower end of a tubular shaft B. On the shaft B is arranged a commutator C, which has as many segments *d* as there are carbon-electrodes, said segments being made of conducting material and separated from each other by insulating material. Four contact-pieces or brushes D D are arranged adjacent to the segments *d*, said brushes being made of conductive material and pressed against the segments by springs *e* which are supported on screw-posts *f*. The screw-posts *f* are supported on a disk F from which they are insulated in a suitable manner, the hub of the disk being retained on the tubular shaft by means of collars *f'* and guided by sleeves f^2 on upright rods F', which form the connection between the disk-shaped top and bottom-plates F^3 and F^4 of the lamp. The top and bottom plates F^3 and F^4 are provided with suitable bearings f^3, f^4, for the tubular shaft C, so that the latter can be freely rotated in the same by means of an electro-motor, or in any other suitable manner, as indicated by the arrow in Fig. 1. The motor by which the rotary motion is imparted to the tubular shaft C is not shown in the drawings. Two of the screw-posts *f* are connected with the positive conductor, and the other screw-posts with the negative conductor, which conductors are connected in turn with a suitable generator of electricity. The commutator-segments are connected by suitable wires, which are arranged at the interior of the tubular shaft C, with their corresponding electrodes.

In the modified form of a lamp shown in Fig. 4, the electrodes A are not embedded stationary in a body of insulating material, but are arranged at an inclination to each other and supported in sleeves or sockets *g* of arms G, which are hinged to the lower ends of insulated screw-posts *g'* below a support-

ing disk G′ that has a central hub or sleeve g^2 for guiding a tube G^2. The lower end of the tube G^2 is closed by a suitable cap h that is provided with as many screw-sockets, carrying fixed outwardly-inclined arms h' as there are electrodes A. The arms are provided at their outer ends with circumferentially-grooved guide-rollers h^2 along which the electrodes are guided as they are slowly moved in an upward direction owing to their getting gradually shorter by being consumed. The electrodes gradually change by the force of gravity from the inclined position, shown in full lines, to the horizontal position shown in dotted lines in Fig. 4. The tube G^2 on which the guide-rollers h^2 are supported is made movable in the hub g^2 of the supporting disk, and it follows the motion of a balancing core H which is connected with the tube G^2 and which is gradually drawn into a hollow solenoid H′ arranged adjacent to the tube G^2, so as to permit the electrodes to gradually approach their horizontal position. The current is supplied to the binding-posts g' g' above the disk G′ and from the same to the supporting-arms G and the electrodes, each electrode being connected to a corresponding segment of a suitable commutator.

The commutator is rotated independently of the electrodes, or a number of lamps may be connected with one and the same commutator, having as many groups or rows of segments as there are lamps, which in many cases is preferable, when it is not convenient or desired to provide separate motors for each individual lamp, as shown in Fig. 6. The operation of my improved electric arc-lamp is as follows: The current passes from the positive conductors to one pair of screw-posts and over the springs and brushes to the segments on the commutator. The negative conductors are connected to the other pair of binding-posts, which are also in electric connection with the remaining springs and brushes of the commutator. From the commutator the current passes to the several carbon-electrodes in such a manner that in each pair of electrodes one electrode will have positive polarity and the other diametrically-opposite electrode will have negative polarity. When two opposite electrodes are connected by a suitable conductor and this conductor is removed, an arc will be formed between this pair of electrodes. By imparting rotary motion to the shaft B, the commutator and the electrodes are rotated with the same. The segments of the commutator are made wide enough so that when the brushes pass over the same, each brush will pass on to the next segment before it leaves the adjacent segment so that consequently the next pair of electrodes will receive current before the current is discontinued in the remaining electrodes, one pair of electrodes being thrown in and receiving at the same time alternating polarities by the change in the direction of the electric current supplied to the same. By the rotation of the shaft, the voltaic arc formed between the pairs of electrodes that receive the current will produce a uniform size of the arc, which is formed between the ends of the electrodes, while simultaneously the position of the arc will change by the rotation of the electrodes on their axis and as the carbons will have alternating negative and positive polarities, all of them are steadily and uniformly consumed. As the electrodes receive the current in quickly following intervals, the arc will fill the space below the ends of the electrodes and assume a hemispherical shape. In place of imparting rotary motion to the electrodes, the same can be arranged stationary in which case the brushes together with the conductors by which the electricity is supplied may be rotated around the commutator, or the commutator may be rotated, in which cases the electrodes receive likewise alternately electric currents of opposite directions, so as to change their polarity, so that the arc is formed in the same manner as before described when rotary motion is imparted to the electrodes. In all cases it is necessary that two or more pairs of electrodes are supplied with electric current in a regular and uninterrupted manner, while an intermediate pair of electrodes is without current, but which, by the rotation of the commutator, is gradually introduced into the circuit, while another pair is cut out. In this manner a uniform size of arc only can be sustained, and the gradual and uniform consumption of the electrodes produced. As the brushes in passing over the segments of the commutator, lap over the next segments before they leave the adjacent set of segments a, a uniform and uninterrupted supply of current to the electrodes is secured and thereby a regular and uniform arc formed between the ends of the electrodes.

In my application for Letters Patent of the United States, Serial No. 467,141, for an improvement in electric arc lamps, filed March 22, 1893, I have presented claims for the form of lamp illustrated in Figs. 1, 2 and 3, and I do not herein claim the same except as it is included generically in the claims hereinafter contained.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. An electric arc-lamp, composed of a series of electrodes arranged around a common axis and means for supplying the electrodes in pairs successively with electric currents in opposite direction, so as to impart alternately positive and negative polarities to the electrodes and form a continuous arc of uniform size, substantially as set forth.

2. An electric arc-lamp composed of a number of electrodes arranged around a common axis, means for supplying the electrodes in pairs successively with electric currents in opposite direction, so as to impart alternately positive and negative polarities to the electrodes in such a manner that one pair of elec-

trodes is always without current, while the remaining pairs of electrodes receive a uniform supply of current in opposite direction, substantially as set forth.

3. An electric arc-lamp, composed of a series of electrodes arranged around a common axis, a commutator for supplying the electrodes in pairs successively with electric current in opposite direction, and brushes in contact with said commutator and adapted to cut out one pair of electrodes while the remaining pairs receive alternately a supply of current in opposite direction, substantially as set forth.

In testimony that I claim the foregoing as my invention I have signed my name in presence of two subscribing witnesses.

REGINA NIEWERTH.

Witnesess:
ADOLPH HENNIGER,
BRUNO SCHEIDEMANN,