(No Model.)

J. W. T. OLÁN.

ELECTRIC ARC LAMP.

No. 455,576. Patented July 7, 1891.

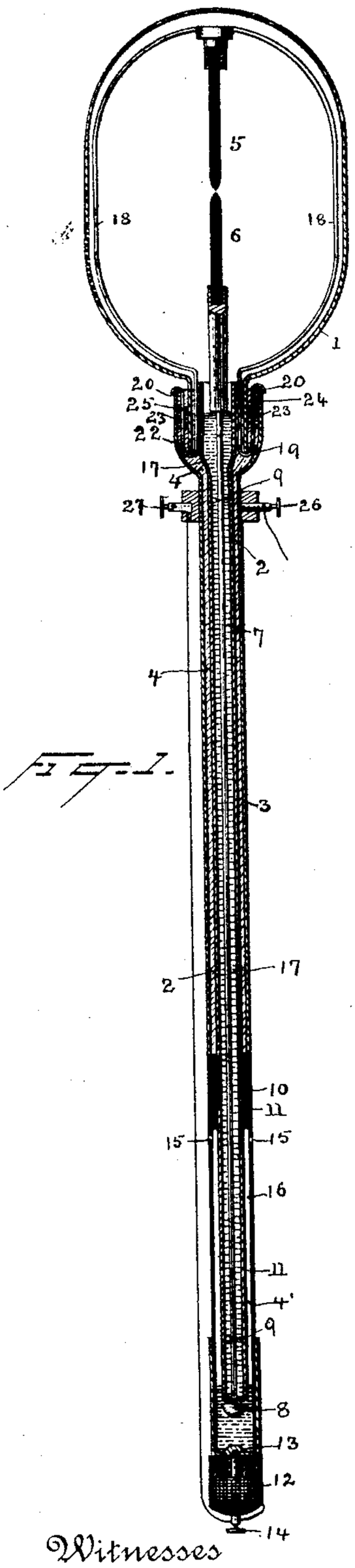

Fig. 1.

Fig. 2.

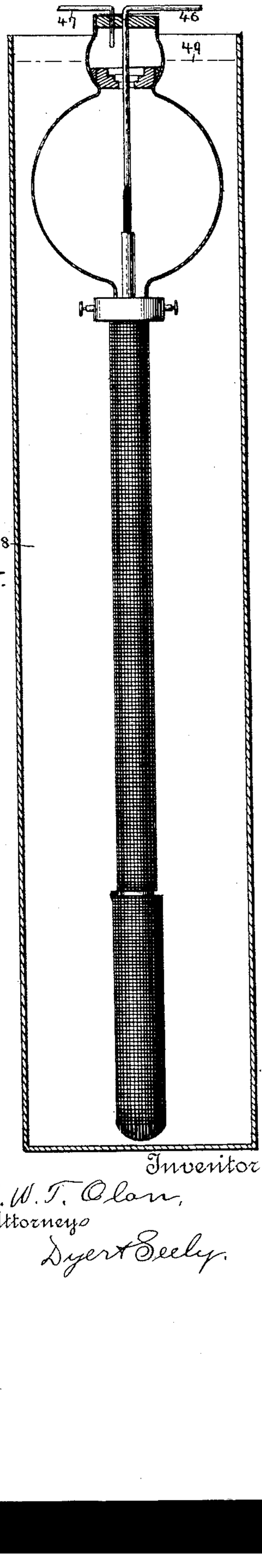

Fig. 3.

Witnesses
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UNITED STATES PATENT OFFICE.

JOHAN W. TH. OLAN, OF NEW YORK, N. Y., ASSIGNOR OF ONE-HALF TO EDWARD H. JOHNSON, OF SAME PLACE.

ELECTRIC-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 455,576, dated July 7, 1891.

Application filed January 12, 1891. Serial No. 377,418. (No model.)

To all whom it may concern:

Be it known that I, JOHAN W. TH. OLAN, a subject of the King of Sweden, residing at New York, county and State of New York, have invented a certain new and useful Improvement in Arc Lamps, of which the following is a specification.

My invention relates to that class of arc lamps in which the arc is formed and maintained in a vacuum or in a chamber containing a rarefied inert or neutral gas.

My object is to provide a simple and efficient lamp and to provide a simple and practicable means for controlling and supporting the movable electrode or carbon of the lamp and sealing the globe, as hereinafter set forth.

In the accompanying drawings, which illustrate the invention, Figure 1 is a central section through the lamp-globe and through the tubes below said globe. Fig. 2 shows a modified form of lamp, partly in section; and Fig. 3 shows the method of exhausting my improved lamps.

1, Fig. 1, is the globe.

2 is a glass tube of about thirty-four inches length and is supported within an iron tube 3, being held centrally therein by a filling 4 of plaster-of-paris or similar material.

5 is the upper carbon or electrode of the lamp, and 6 is the lower movable electrode supported in a socket in the end of the iron rod 7, which extends to the bottom of the tube 2, as shown. 8 is an armature carried at the lower end of this rod. At suitable points on the rod 7 are mounted rollers 9 to guide the rod and hold it centrally in the tube. The iron tube 3 is connected at 10 with a hard-rubber or other insulating-tube 11. At the bottom of this latter tube is supported a coil or magnet 12, having a pole 13 under the armature before referred to and extended up for a distance over the rubber tube.

14 is a binding-post for one terminal of the coil, the other terminal being connected directly to the core of the magnet.

15 are air-holes leading from the space 16 around the glass tube to the external air.

17 is a barometric mercury column.

18 18 are conductors which support the upper carbon and at the same time form a circuit for the current. I preferably use four of these arms. At the base of the globe they are bent back, as shown at 19, and are connected by soldering or otherwise to the iron tube at the point 20. Around these conductors in the space between the iron tube and the base of the bulb at 22 is placed a filling of plaster-of-paris, and over the plaster-of-paris a small quantity of mercury 23, and over the mercury another layer of plaster-of-paris 24. To permit expansion of the mercury 23, owing to changes in temperature, a rubber or other elastic ring 25 is placed in the position shown. This allows the mercury to expand without forcing out the plaster-of-paris above it. The plaster-of-paris holds the mercury in place, and the plaster-of-paris and mercury together form an air-tight seal. Plaster-of-paris is also placed between the enlarged upper portion of tube 2 and the base or neck of the globe.

At suitable points on the lamp are mounted binding-posts 26 27 for the lamp-terminals. The former binding-post is shown connected directly to the tube 3 and thence to the upper carbon. The post 27 is shown connected by a wire to the binding-post 14, coil 12, mercury in the tube to the armature 8, and rod 7 to the lower carbon of the lamp. The space 4′ around the bottom part of the glass tube 2 is not filled with plaster-of-paris, but is left empty and allows the mercury to rise and fall as the air-pressure varies. Since this space is quite small, while the tube at the top is much larger, the variation in the height of the mercury in the tube will vary but little. The rod 7, supporting the movable carbon, is of such size and form that it will readily move in the tube, and, since it floats in the mercury, will press the lower carbon against the upper carbon.

The lamp shown in Fig. 2 is of slightly-different construction from that above described. In this form the globe and the glass tube are integral, and the globe is open at the top. In the upper neck of the globe is placed a steel or other suitable nut 28, formed with a shoulder 29. On the rod carrying the upper carbon is an enlargement 30, the lower side of which is conical, and which is adapted to rest

on the shoulder aud form a tight joint. 31 is a layer of mercury. 32 is a plaster-of-paris, rubber, or other removable plug. 33 is a metal tube around the upper part of the globe, fixed by plaster-of-paris 33′ to protect it, and 35 is a rubber or other packing around 30. An iron tube 36 is placed directly on the glass tube. At the bottom is a short iron tube 37, having a closed end 38, which serves as a magnet-pole. 39 is the enlarged end of the lower-carbon carrier and serves as an armature. 40 are holes by means of which the space 41 is put in communication with the air. The holes should be so far from the bottom that the mercury 42 will never rise to them under varying conditions of the atmosphere. 43 is a coil around the whole or any suitable part of the iron tube. 44 45 are the two terminals of the lamp. In this lamp a coil is shown around both the upper and lower sections of the tube. The upper coil terminates in a plate or spring 43′, and the lower coil terminates in a corresponding part 43″. When the lower section is placed in the position shown, the two plates come together, connecting the two coils in series. The opposite end of the lower coil is connected to the metal tube.

In exhausting the globes I pass through them a neutral gas—such as hydrogen, naphtha, or any of the carbonic-hydrogen gases—inserting into the globes a long and a short tube 46 47 and forcing the gas in through one of said tubes and taking the air and gas out through the other. When the air is thus removed, the globe is filled with mercury from which air has been removed by inserting the globe in a vessel of mercury 48 or in any other suitable manner. The globe is filled to the level indicated at 49. The tubes 46 47 are then removed. The upper-carbon carrier is then screwed into place on the sleeve 28, which has been previously secured by plaster-of-paris or otherwise, (the lower-carbon carrier and carbon being already in.) The plug or filling 32 is then put in place over the mercury 31, above the nut, and the seal is complete. The globe is then raised from the mercury in which it is immersed, and the mercury in the globe and tube runs out until the mercury reaches the level indicated at 50, this being the top of the barometric column.

In constructing the lamp shown in Fig. 1 it is necessary to invert the globe and the connected tubes, thus placing them in the position shown, after exhausting the globe and filling it up with mercury. It will be evident that the mercury in the globe will descend into the glass tube until the surface of the mercury rests at a height above the base of the tube equal to the height of the barometric mercury column. In this way a very perfect vacuum is obtained in the bulb, and at the same time a perfect seal is produced, and the mercury is left in the position where it is desired to utilize it for supporting the movable electrode of the lamp. By removing the atmospheric air before putting in the mercury, and by filling the bulb with a gas of the character described, not only the oxygen, but the nitrogen, in the globe is removed, and this I find advantageous, since at the exceedingly high temperature produced at the arc nitrogen is found to unite with the carbon, forming cyanogen, which is objectionable.

The operation of the lamp will be readily understood. It is briefly as follows: When a current is sent through the circuit, the magnet or coil, supported as shown or in any other suitable manner, so that it will pull down on the lower electrode or its support, attracts the armature 8, thereby overcoming the buoyant effect of the mercury on the rod 7, pulling the latter down and establishing an arc. This of course tends to weaken the current passing through the coil. In this manner the position of the lower electrode is automatically regulated in a very simple and delicate manner. When for any reason it becomes necessary to replace the carbons, the rubber tube 11 can be unscrewed and taken off, the mercury removed from the inner tube, and the rod 7 and its carbon can be pulled out, a new carbon put in place of the old one and replaced in the globe, and the seal again made, as already described. In this way the globe is preserved.

Sometimes I leave a small quantity of a neutral gas in the globe. In that case the height of the mercury column would be somewhat less than the barometric column, (owing to the pressure of gas in the globe;) but the construction and operation of the lamp would be essentially the same as above set forth.

If a liquid other than mercury be used in exhausting and sealing the globe, it is evident that the length of the barometric column would vary in accordance with the specific gravity of the liquid.

Having thus described the invention, what I claim is—

1. The combination, with the carbons or electrodes of an arc lamp and inclosing globe therefor, of a tube extending from the base thereof and containing a column of liquid, said column supporting one of the lamp-carbons, and means for separating the carbons to form an arc, substantially as described.

2. The combination, with the carbons or electrodes of an arc lamp and inclosing globe therefor, of a tube extending from the base thereof and containing a column of mercury equal in height to a barometric mercury column, a float in said mercury supporting the movable electrode of the lamp and carrying or forming an armature, and a coil or magnet adapted to attract said armature, substantially as described.

3. The combination, with the carbons or electrodes of an arc lamp and inclosing globe therefor, of a tube extending from the base thereof and containing a column of liquid, a float in said liquid supporting the movable electrode of the lamp, and a coil or magnet adjacent to said float, whereby when the cir-

cuit is closed the movable carbon is retracted and an arc formed, substantially as described.

4. The combination, with the carbons or electrodes of an arc lamp and inclosing globe therefor, of a tube extending from the base thereof and containing a column of liquid, a float in said liquid supporting the movable electrode of the lamp, guides for the float within the tube, and means for moving one of the carbons to establish the arc, substantially as described.

5. The combination, with the glass globe of an arc lamp, of an iron tube projecting from the globe and a support for the upper carbon, consisting of one or more conductors leading from said carbon through the mouth of the globe and being connected to the iron tube and to one of the external terminals of the lamp, substantially as described.

6. The combination, with the inclosing globe of the lamp, of a tube into which the base of the globe extends, and a seal between said tube and the globe, consisting of a mass of plaster-of-paris or similar material, a mass of mercury, and a second mass of plaster-of-paris or similar material above the mercury, substantially as described.

7. The combination, with the inclosing globe of the lamp, of a tube into which the base of the globe extends, and a seal between said tube and the globe, consisting of a mass of plaster-of-paris or similar material, a mass of mercury, a second mass of plaster-of-paris or similar material above the mercury, and a conductor supporting the upper carbon and extended through the mass of plaster-of-paris and mercury for connection to a terminal, substantially as described.

8. A seal for globes, &c., consisting of a layer of plaster-of-paris or similar material, a layer of mercury, a mass of elastic material adjacent to the mercury, and a second layer of plaster-of-paris or similar material, substantially as described.

This specification signed and witnessed this 9th day of January, 1891.

JOHAN W. TH. OLAN.

Witnesses:

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