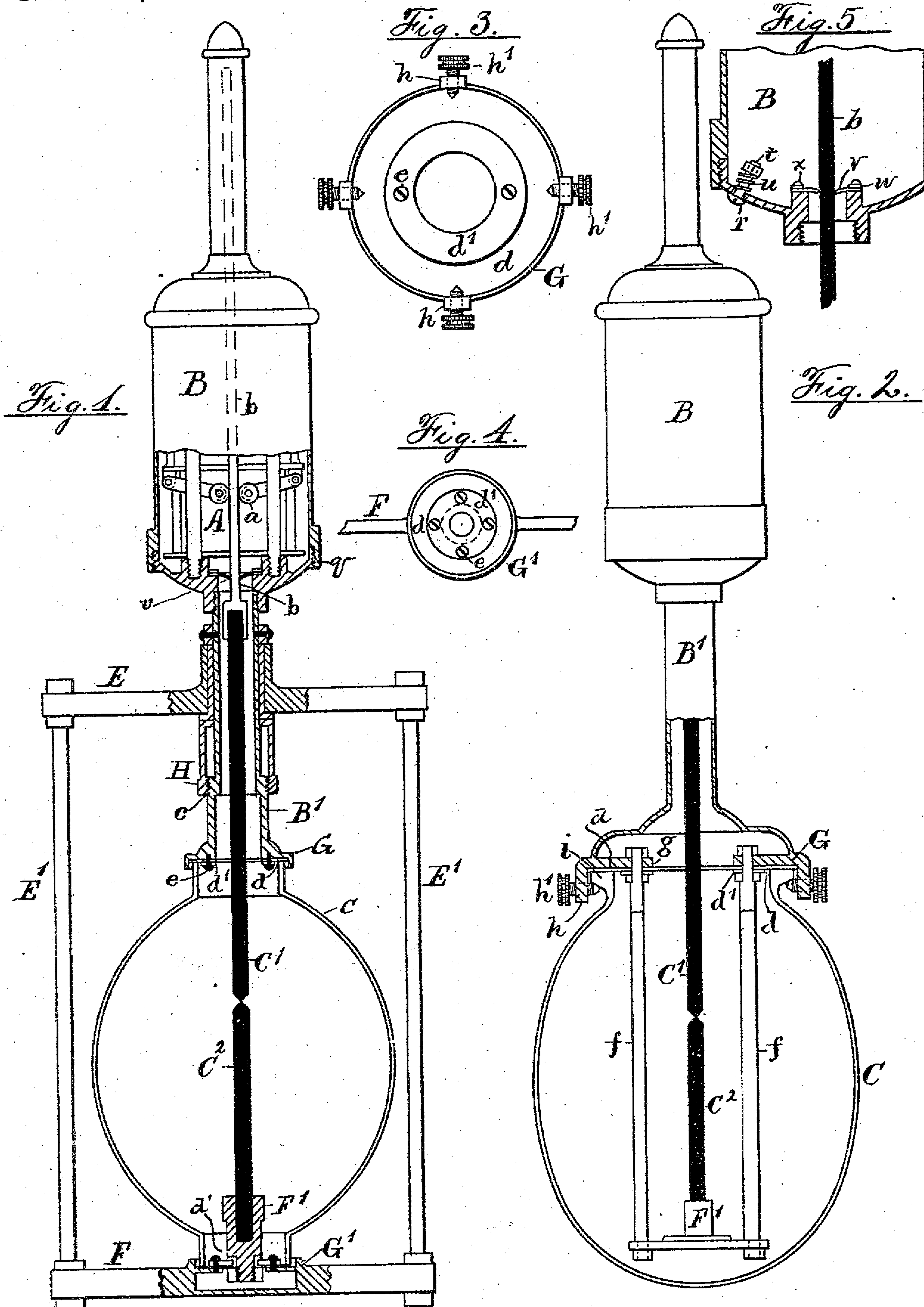
(No Model.)

W. BAXTER, Jr.

VOLTAIC ARC LIGHT.

No. 288,157. Patented Nov. 6, 1883.



Attest:

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UNITED STATES PATENT OFFICE.

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VOLTAIC-ARC LIGHT.

SPECIFICATION forming part of Letters Patent No. 288,157, dated November 6, 1883.

Application filed January 12, 1883. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM BAXTER, Jr., a citizen of the United States, residing in Jersey City, in Hudson county, New Jersey, have invented certain new and useful Improvements in Voltaic-Arc Lights, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

This invention consists in an improved apparatus for burning an electric-arc light in a closed receiver; and its nature and the combinations of mechanism employed will be fully understood from the drawings and description.

The advantages of inclosing an arc-light in a chamber which is air-tight, or practically so, are numerous. In the first place it reduces the consumption of the carbons. In the second place it prevents all flickering of the light that is due to the action of strong currents of air upon the arc, or to the vibrations of the carbons caused by such currents, or to the blazing up of the arc, which is so common in long arcs with currents of high tension and small quantity. In my invention the electrodes, after being properly adjusted and secured in their respective holders, are placed within a closely-fitted or practically air-tight receiver. As soon as the current is turned on and the arc is formed, combustion begins; but as the amount of oxygen confined in the receiver is very small, it soon enters into combustion with the substance of the electrode, forming an oxide, and thus preventing further combustion. As it requires about one hundred and fifty cubic feet of air to convert one pound of carbon into carbonic acid, it is evident that if the receiver which holds the carbons has a capacity of one-third of a cubic foot, the amount of carbon required to absorb all the oxygen would be a very small portion of the whole.

When an arc-light burns in the open air, the carbons are consumed in part by oxidation and in part by the transfer of minute particles from one pole to the other. When the arc is inclosed in an air-tight receiver such as I use, all the consumption due to chemical action is prevented, and the disintegration caused by the passage of the current is reduced in a great degree. This decrease in consumption by the action of the current is due to the fact that when the arc is maintained in the open air some of the carbon particles in passing from one electrode to the other are diverted from their course by the action of the wind, so that, although there is a tendency to accumulate on one carbon as much matter as is taken off the other, no such action is noticeable in practice; but, on the other hand, both carbons are consumed. When the arc burns in an air-tight globe, the amount of matter which is deposited upon the lower carbon is about equal to that which is taken from it, so that its actual consumption is inappreciable. An ordinary arc-light is strongly affected by high winds, and the arc is frequently blown out entirely, necessitating an actual contact of the carbons to re-establish it; or the upper carbon is caused to vibrate, thus making the light very unsteady. When the arc becomes too great and the current thereby weakened, the carbons are apt to blaze up. This not only increases the consumption of the carbon, but reduces the intensity of the light and changes its color, because the flame shades the arc, stopping the light and changing the color of such light as passes through. In my lamp the arc cannot blaze up, because there is no oxygen present to support combustion, and without combustion there can be no blaze. The action of the electrodes under these conditions also tends to maintain the focus of the light at the same point continuously, owing to the deposit upon the apex of the lower carbon, and my lamp is therefore peculiarly adapted for use with a reflector.

In the devices heretofore employed to protect the arc from oxidation and from atmospheric disturbances constructions have been employed which do not apply to the suspended arc-light regulators now in general use, or which do not afford the same convenience in removing the globe for cleaning or when broken as in my construction. As a globe is liable to be broken at any time and requires cleaning whenever a new carbon is inserted, it is obvious that a small point in the connection of the globe to the lamp may be of considerable importance in the saving of an operator's time. It will therefore be seen that while the results obtained by inclosing an arc-light in an air-tight chamber are far superior to those obtained in the ordinary way, unless the devices employed to accomplish the purpose are such as cause objections in no other direction, they can have no practical value. As it is necessary, even in an air-tight arc-lamp, to renew the carbons from time to time, it must be so made that this can be done readily. It is also necessary that the carbons should be fed together by some automatic mechanism governed by the current, and as this may be deranged its casing must be constructed to afford access without much trouble. I have shown herein two forms of construction to accomplish the desired object of inclosing the arc in a practically air-tight chamber, all of which are as accessible and convenient in every respect as the ordinary arc-lamps. The feeding mechanism in such lamps may be inclosed in an air-tight receptacle with the carbons, but provided with a diaphragm or packing intermediate the carbon-chamber and the regulator-chamber, so that the positive electrode may move into the carbon-chamber through a joint tight enough to prevent any circulation of air, because it is useful to protect the feeding mechanism from the corroding-gases liberated by the action of electric arc upon the carbon and other matters associated therewith. As the receiver in which the arc burns is not exhausted, there is no pressure exerted upon such joint, the slight disturbance of equilibrium of pressure caused by the consumption of the oxygen in the receiver C being immediately made good by a passage of air from the case B, past the packing *v*, into the receiver C, and there is therefore no difficulty in securing the desired result by passing the rod which holds the carbon through a closely-fitting hole, or through a flexible disk of yielding but air-tight material, as india-rubber.

In the drawings annexed I have shown two different constructions for the connection between the glass globe used to inclose the carbons and the frame of the mechanism used to regulate the movements of the adjustable carbon.

Figure 1 is a side elevation, chiefly in section, at the center line of a lamp in which the globe is clamped between two movable frames. Fig. 2 is a similar view of a lamp in which the lower-carbon holder is suspended within the globe, and the latter, formed with a closed lower end, is clamped by a flange at the top only to the frame of the regulator mechanism. Fig. 3 is an inverted plan of the last-named clamping device. Fig. 4 is a plan of the lower-carbon holder of Fig. 1, and Fig. 5 is an enlarged sectional view of the lower part of the casing B.

My improvements are intended for application to all forms of arc-light having a moving carbon, and their operation is entirely independent of the mechanical construction or operation of the regulating devices, being based upon the chemical constitution of the carbons and their action when operated to form an electric arc.

In the drawings, A is the regulator, shown of the form described in a patent previously allowed to me, and having a casing, B, of cylindrical form, applied to inclose it entirely from the air. Although round, the casing constitutes the supporting-frame for the regulating mechanism, and is shown herein as provided with a frame, B′, at the bottom, in which the movable carbon is accommodated while it is fed into the arc-receiver C. In this receiver the carbons meet and form the light, and as the movable carbon is the one almost exclusively consumed, the point of meeting is about the middle of the depth of the glass globe, which is now never made deep enough to accommodate the whole of the movable carbon, as the latter is formed of as great length as possible to secure durability. A suitable inclosed space above the globe is therefore required in my invention, to accommodate the carbon and the holder by which it is propelled. The holder is shown herein as attached to the lower end of a long feed-rod, *b*, actuated automatically by the regulating devices.

The regulator as constructed by me consists of certain magneto-electric devices actuated by the voltaic current, and operating upon two rollers, *a a*, Fig. 1, which are mounted so as to clamp the carbon-rod *b*, and to rotate at the same rate as the carbon is consumed.

As the regulating and propelling devices are immaterial to the operation of my improvement, they are not fully illustrated herein, the connection of the receiver with the regulator A by its frame being the material part of the construction. Such connection consists in forming a seat, G, upon the frame B′, against which seat the receiver is held by various clamping devices. That shown in Fig. 1 consists in a sliding cross-bar, E, fitted to the frame B′, and connected by two rods, E′, to a bottom frame, F, carrying the lower-carbon holder F′. A seat, G′, is formed around the holder F′, and the globe C is clamped between the two seats by forcing the bar E upward by a nut, H, applied to a screw-thread, *c*, upon the outside of the frame or sleeve B′. Upon slacking the nut the frame F is separated from the frame B′, and the globe can be removed, the points of the carbons being in practice thus separated sufficiently to tip the globe over between them. The seats are shown supplied with a layer of packing, *d*—as asbestus—held in place by a ring, *d′*, and screws *e*.

In Fig. 2 the receiver is shown as a globe open only at the top end, into which the lower-carbon holder F′ is suspended by two rods, *f*, the upper ends of which are secured in a flange, *g*, formed upon the frame B′ inside the seat G. The margin of the seat is shown provided with four lugs, *h*, and clamping-screws *h′*, and the globe is formed with an annular projecting flange, *i*, having a bevel upon its under side, so that it may be pressed against the seat by the points of the screws h', upon which the globe hangs. The slacking of two or more of the screws enables the flange i to be slipped off of the screws and the globe dropped down to expose the carbons.

The screws h' (shown in Figs. 2 and 3) operate to induce a movement in the flange i at right angles to the direction or length of the screws, owing to the bevel upon the under side of the flange, and the points of the screws may therefore be tapered, as shown in the figures, or rounded, if preferred.

Figs. 3 and 4 show the ring d' and the screws e for holding the packing d upon the seats G and G', and the former figure shows the screws h' and their arrangement. From this view it is obvious that three screws might be used, as a very light pressure is sufficient to make a joint upon a receiver having the same internal and external pressure, as in my constructions, and that for the purposes of this invention a tight joint is very easily made and maintained from the absence of any material pressure. As the frames of arc lights or lamps differ from one another, it is obvious that the mode of connecting the trunk to the same would need to be modified to suit the various frames used, but that to carry out my invention it must make a substantially air-tight joint with the casing and receiver both. This may be done in other than the two ways shown herein in Figs. 1 and 2, and I do not therefore limit myself to the precise mode of connection, provided a trunk be used, as shown and described, to accommodate the long body of the carbon above the receiver C, and the body of the rod b, projected down from the casing B when the carbon is nearly consumed. Such trunk obviates the use of a glass globe as deep as the length of the upper carbon, and secures a removable and close contact or connection between the globe-receiver and the casing B.

I am aware that globes have been fastened to hinged metallic tubes for securing easy access to the carbons, and do not therefore claim any hinge or permanent connection between my receiver and trunk, (or casing,) the object of my invention being to secure the entire removal of the receiver from the lamp or carbon-holders as the most convenient means of cleaning the globes and replacing a broken one with a new one.

In Fig. 5 is shown an enlarged sectional view of the lower part of the casing B, exhibiting the construction of the packing or joint around the rod b, and showing a safety-valve seated in the casing at its bottom. The valve is constructed of a screw, t, inserted loosely in a smooth round hole drilled through the shell of the casing. A nut is applied to the end of the screw inside the casing, and a spring, u, serves to hold the head of the screw against the outside of the casing to stop the hole. Any expansion of the gases in the receiver C is felt in the casing B, and a sufficient amount is discharged around the stem of the screw to produce an equilibrium of pressure.

In Fig. 5 is shown a form of packing by which the carbon-rod b may be inserted into the receiver tightly enough to prevent any circulation of air from the receiver C to the regulator-case B, while it admits of free movement in the rod to feed the carbon downward. It consists in a disk of flexible material, v, held around the rod b by a ring, w, and screws x, a hole being made in the center of the disk to fit the rod, which would then bend the disk at the center, as shown, and slip through it freely while still in contact therewith. With such a joint between the casing of the regulator and the receiver, the former need not necessarily be made air-tight, but may be open to constant inspection. I have, however, shown the regulator in all the views provided with the usual dust-excluding casing, B, and for the purposes of this invention I form it with a joint, as at q in Fig. 1, to admit of removing the casing to regulate the mechanism inside. The joint q is formed by screwing the upper part of the case upon the lower, and when the upper part is removed and fresh air admitted, the packing v serves to prevent free access of such air to the receiver, which would occur if an open channel existed between them. It is not required that the packing v shall be so tight as to absolutely prevent the passage of air, because, as before stated, the pressure within and without the receiver will be in equilibrium, and there will therefore be but small tendency to circulation. Sufficient packing would therefore be obtained by passing the rod b into the receiver through a snugly-fitting hole; but the packing v is preferred.

In Fig. 2 the lower carbon is sustained, by a sort of hanger composed of the rods $f f$ and holder F', from the trunk B' or receiver-seat G, thus maintaining the lower carbon in its normal position when the receiver is removed.

I am aware that certain elements of my invention have been used before, and are shown in British Patents Nos. 2,764 of 1880 and 2,563 of 1881, and I do not therefore claim the same, except as hereinafter specifically set forth.

I am aware that devices have been made to operate an arc-light in a tight receiver and to feed a regulated supply of air thereto, and do not claim herein any construction adapted to such a mode of operation.

My invention is adapted to secure a more convenient means of access to the interior of the receiver and casing, and consists, therefore, in constructive features such as I have herein claimed only.

Having thus fully set forth the nature of my invention, I claim as follows:

1. The casing B, inclosing the regulator and the receiver C for the carbon points, constituting a practically air-tight inclosure for said regulator and carbon points, separated into two independent chambers by a packing

or slip-joint, through which the carbon-rod *b* passes, as set forth.

2. The regulator-case B, provided with the packing *v*, the frame B′, provided with the seat G, and bevel-pointed screws *h*′, combined with the receiver C, having a flange, *i*, around its mouth, adapted to engage the pointed ends of the screws *h*′ and be thereby forced against the seat G, as set forth.

3. The combination, with the casing B, rod *b*, frame B′, connected tightly to the receiver, and the receiver itself, of the flexible packed joint for the rod *b*, formed of the yielding washer *v* and clamping-ring *w*, as herein shown and described.

4. In an electric lamp, two carbons, an automatic regulator for the same, and a supporting-frame, combined with a practically air-tight receiver to inclose the contiguous carbon points, and a slip-joint or packing, through which the moving carbon may enter said receiver without permitting the gases therein to pass to the regulating mechanism.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

WM. BAXTER, JR.

Witnesses:
THOS. S. CRANE,
W. F. D. CRANE.