(No Model.)

2 Sheets—Sheet 1.

M. S. OKUN.

ELECTRIC ARC LAMP.

No. 562,090. Patented June 16, 1896.

Fig. 1.

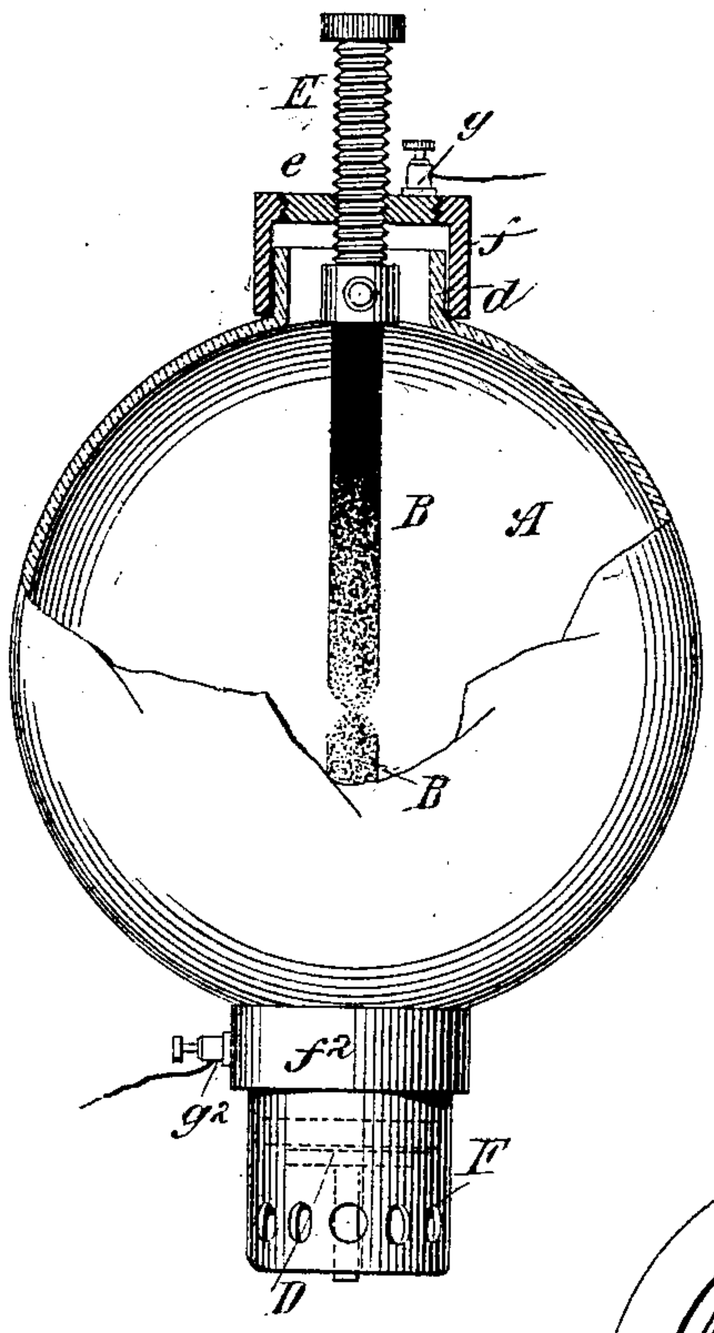


Fig. 5.

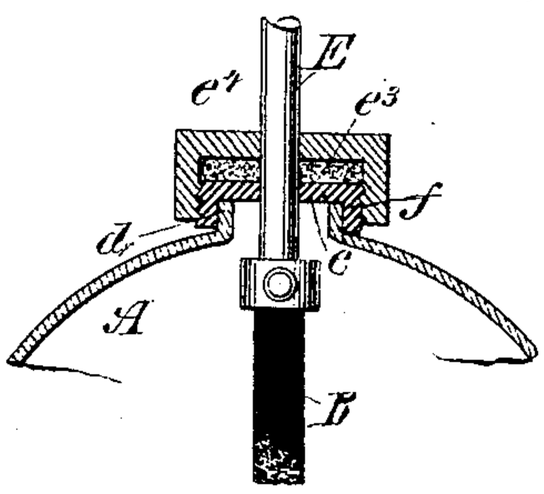


Fig. 4.

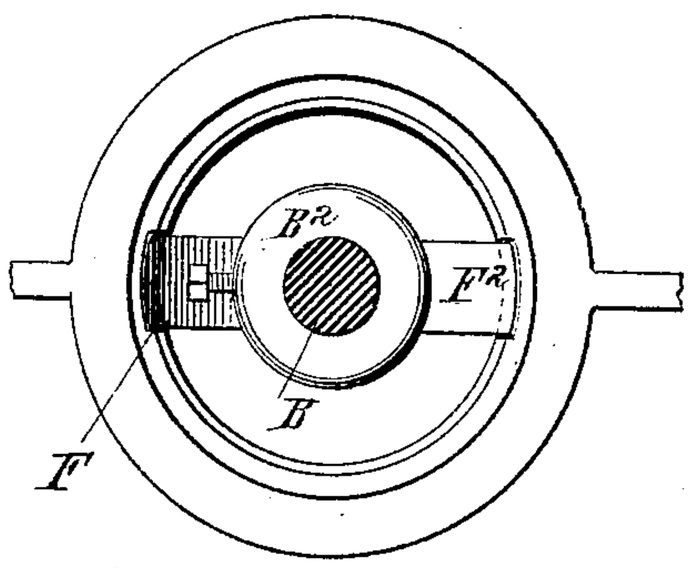
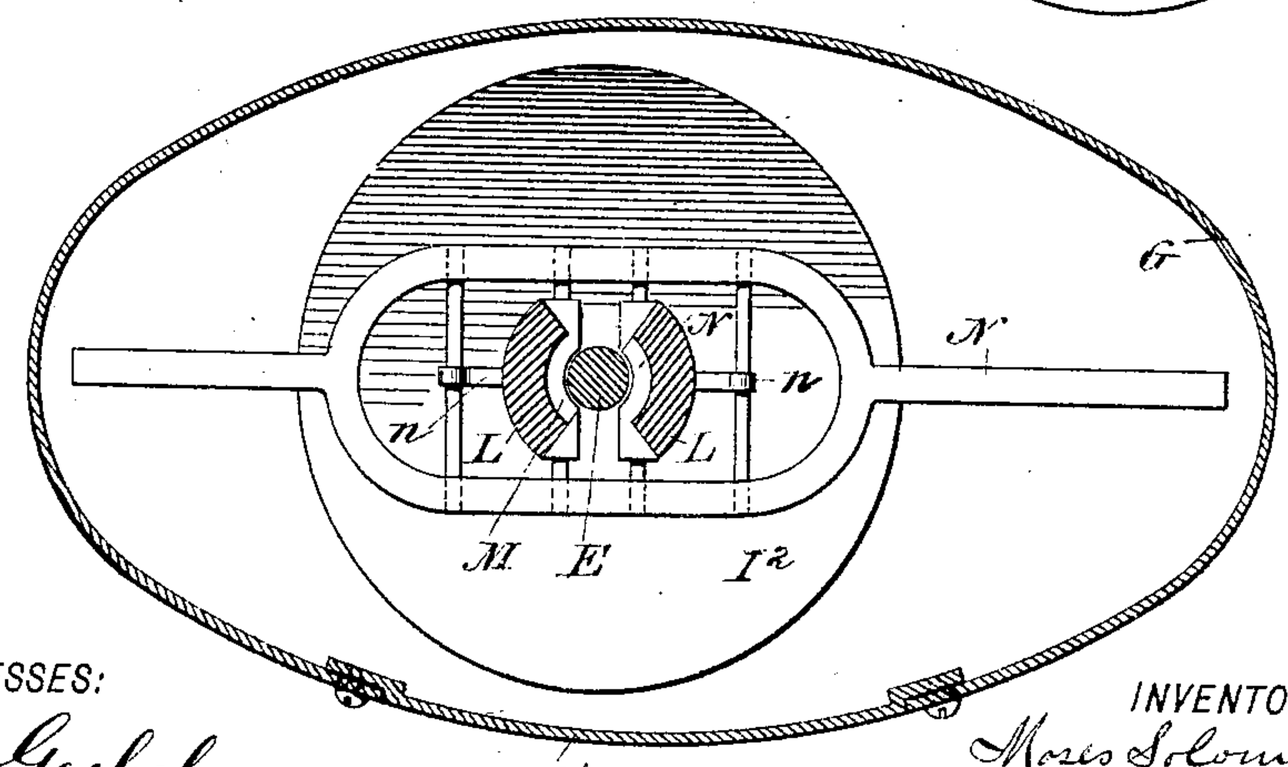


Fig. 3.



WITNESSES:

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J. J. Killham.

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His ATTORNEY.

(No Model.)

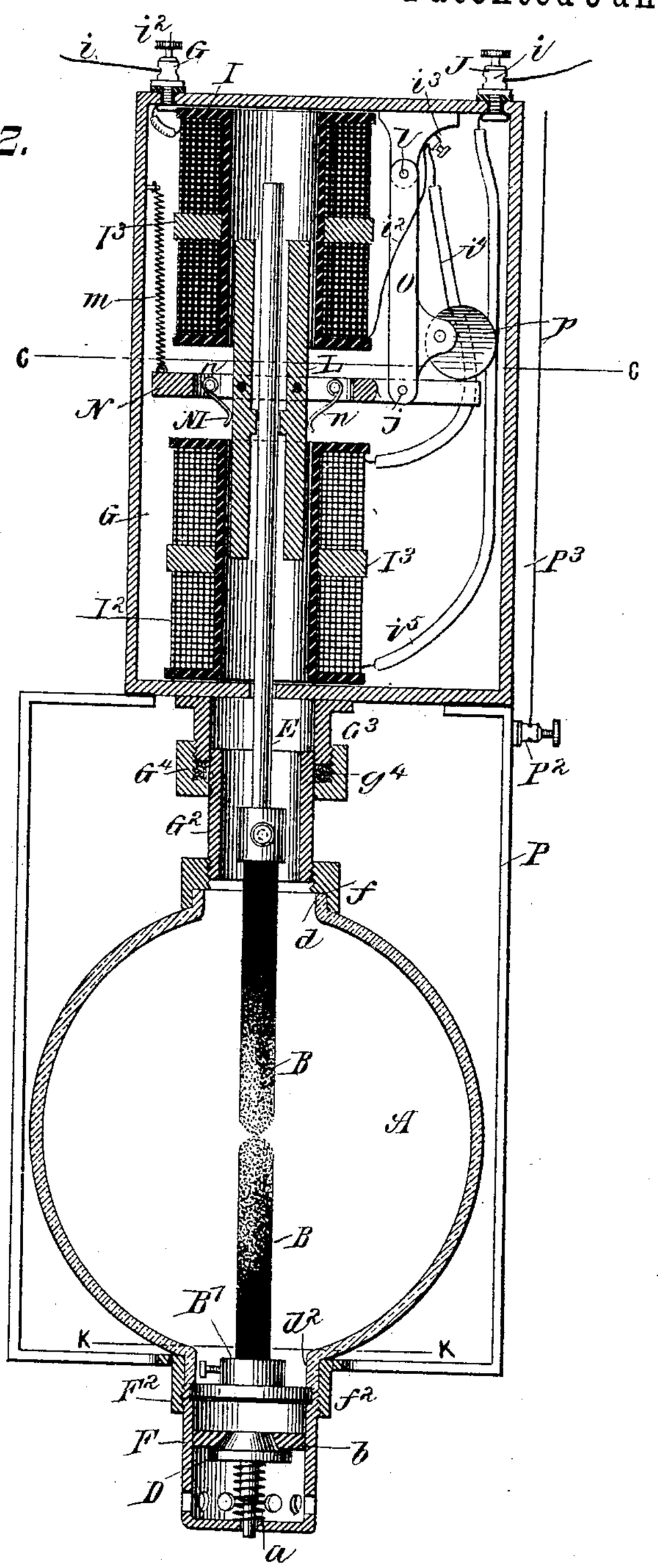
2 Sheets—Sheet 2.

M. S. OKUN.

ELECTRIC ARC LAMP.

No. 562,090. Patented June 16, 1896.

Fig. 2.



WITNESSES:

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INVENTOR

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his ATTORNEY.

UNITED STATES PATENT OFFICE.

MOSES SOLOMON OKUN, OF NEW YORK, N. Y., ASSIGNOR TO MICHAEL F. BURNS, OF BROOKLYN, NEW YORK.

ELECTRIC-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 562,090, dated June 16, 1896.

Application filed April 8, 1892. Renewed December 6, 1893. Serial No. 492,946. (No model.)

To all whom it may concern:

Be it known that I, MOSES SOLOMON OKUN, a resident of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Electric-Arc Lamps, of which the following is a specification.

The object of my invention is to retard or reduce to an inappreciable extent the consumption of the carbon pencils or rods in electric-arc lamps.

Another object is to improve the carbon-feeding mechanism of arc-lamps, so that a more uniform, positive, and regular feeding of the carbon can take place.

The invention consists in the novel details of improvement that will be more fully hereinafter set forth, and then pointed out in the claims.

Reference is to be had to the accompanying drawings, forming part hereof, wherein—

Figure 1 is a partly broken side elevation of an arc-lamp embodying my invention. Fig. 2 is a central longitudinal sectional view of a lamp embodying my invention, showing my improved carbon-feeding mechanism. Fig. 3 is a horizontal section, enlarged, on the plane of the line *c c*, Fig. 2. Fig. 4 is a similar view on the plane of the line *k k*, Fig. 2; and Fig. 5 is a sectional detail view hereinafter explained.

In carrying out my invention I utilize a globe or other chamber A, which is hermetically closed (or as nearly so as is possible) to prevent the admission of air. Within the globe or chamber A are placed carbon or similar pencils or rods B, by which to produce the electric arc in manner well known. These carbon pencils may be supplied with the electric current to produce the arc in any manner desired. To the globe or chamber A is connected a valve-cock or its equivalent D, so arranged as to permit the escape from the globe or chamber A of gases, but to prevent or retard the admission of air. In the drawings the valve D is shown pressed to its seat *b* by a spring *a*, but any suitable means may be used for this purpose.

The carbon or carbons B may be operated or fed to produce the arc or maintain it while the current passes in any desired manner; but as the carbon, according to my invention, consumes or disintegrates very slowly it is feasible to actuate the carbon B by hand. An arrangement for this purpose is shown in Fig. 1, wherein the open end or neck *d* of the globe A is closed by a disk or the like *e*, which is shown connected with a ring or mounting *f*, securely fastened (air-tight) to the neck *d* or the globe A. Through the disk *e* a carbon-carrying rod E passes, said rod being shown screw-threaded to engage similar threads in the disk *e* to enable the carbon B to be adjusted longitudinally. The disk *e* may be made removable to enable the carbon B to be reached.

The neck d^2 of the globe or chamber A also has or may be a ring or mounting f^2, secured air-tight thereto, to which is shown screwed a cup or frame F, that carries the seat *b* for the valve D, as well as the valve; but the lower end of the globe A may be closed in any well-known manner. The lower-carbon holder B^2 is shown carried by the frame F, a bar F^2 being shown supporting the carbon-holder B^2, space being left on the sides for the passage of air or gas to the valve D. In Fig. 1 one binding-post *g* is shown connected with the disk *e* and the other post g^2 with the ring or mounting f^2, so that the current can enter the disk *e* from post *g*, pass thence to the rod E, to the upper carbon B, thence to the lower carbon B, to B^2, f^2, and g^2 to the line.

In the operation of my invention the carbons are placed in position and the globe is then tightly closed to prevent the admission of air. The electric current is next passed through the carbons B B, the latter being then separated to produce the electric arc. The burning carbon or the products of combustion therefrom next unite with the oxygen in the air contained in the globe A, and generate or produce a combustion-destroying gas, such as carbonic-acid gas or carbonic oxid, leaving the nitrogen of the air in the globe. The presence of this combustion-destroying gas or carbonic-acid gas or carbonic oxid and the absence of oxygen or combustion-supporting gas, which has been eliminated by uniting with the carbon, reduces or retards the combustion, consumption or disintegration of the carbons B, while the electric arc continues

between the carbons, said gases having no injurious effect on the electric arc. The carbons B will be heated, but on account of the presence of the combustion-destroying gas and the absence of combustion-supporting gas their consumption, or disintegration will be reduced to so inappreciable an extent that the carbon will last many times longer than when the arc is produced in the presence of fresh air, as in the old manner.

Should the gases in the globe or chamber A expand, (or an explosion occur,) they will be permitted egress by the valve D, but air is prevented from entering. If air should leak into the globe or chamber by any means, say through the joints of the parts, its oxygen will be quickly converted into carbonic-acid gas by the burning of a little carbon; but the presence of the gas in the globe, and its tension, will tend to check the entrance of air. As the carbons consume or disintegrate so slowly under the foregoing method feeding of the carbons is required only at comparatively long intervals, whereby it is possible to use hand-fed carbons and yet produce satisfactory results; or any of the well-known carbon-feeding mechanisms in general use can be utilized. After the light is turned off the gas generated, as stated, will remain in the globe or chamber to retard the consumption of the carbon when the arc is next formed. When the arc is first formed after the globe is closed, a small amount of the carbon will be burned to unite with the oxygen of the air and produce the carbonic-acid gas, but after this the wasting of the carbon will be exceedingly slow until the next fresh air, if any, enters the globe. After the carbons have been consumed the globe will be opened and new carbons adjusted in place; but as fresh air will necessarily enter the globe when this is done the slight burning out of carbon and formation of new carbonic-acid gas will have to be again effected with the new carbons and oxygen of the admitted air.

On account of the infrequent feeding of the carbon, caused by its slow consumption, the steadiness of the light is greatly increased, or, in other words, the "flickering" of the arc-light heretofore in general use is reduced to such an extent that the light becomes practically steady.

Although almost any, if not all, of the well-known carbon-feeding devices can be adapted for use in connection with my invention, I have shown an improved carbon-feeding mechanism giving useful results.

The globe or chamber A in Fig. 2 is connected with a closed tube or chamber G, that is to be hermetically closed, yet in communication with a globe A, as shown, so that the carbon-holding rod E will be wholly within this closed receptacle to give it free movement without admitting air to the globe; but in Fig. 5 the rod E is shown passing through the disk *e* on the globe A, suitable packing e^3 being shown held between the disk *e* and a packing nut or ring e^4 to prevent the admission of air to the globe, although the packing may be dispensed with. It will be understood, however, that the upper carbon can pass through the closely-fitting opening in the cover or disk on the globe instead of the carbon-carrying rod E for the purpose of feeding the carbon in the globe.

The chamber G, for convenience in adjusting the carbon B, is shown connected with the globe A by a tube G^2, that is screwed to the ring or mounting *f*, its upper end connecting with a thimble or tube G^3 (being an extension or part of the chamber G) and preferably sliding within the same. A packing ring or nut G^4 on the extension G^3, containing suitable packing g^4, effects an air-tight yet detachable joint between the parts G^2 G^3. By this means the tube G^2 can be unscrewed from the globe A and slipped upward to permit access to the rod E and carbon B, and can be readily replaced and a tight joint made.

I I^2 are coil magnets or solenoids arranged substantially as usual for actuating the carbon-rod holders, the coil I having coarse wires and the coil I^2 having fine wires, and being coupled in manner well known or as follows: The current entering by a wire *i* passes into a binding-post i^2 (preferably insulated from the chamber or casing G) and from thence into the coil I, whence it passes by a wire i^2 to a post i^3. From i^3 a wire i^4 leads to the coil I^2, from whence a wire i^5 leads to a post J on the chamber or casing G and preferably insulated therefrom. The current is divided by this means, as usual. In each coil I I^2 is or may be an iron ring I^3, which attracts the levers L L, that are magnetized by the current of the spools, as hereinafter described. The rod E is shown passing within the coils I I^2, whose bores are alined, and within the bores of said coils levers or arms L L are placed to be actuated by the coils to regulate the movement of the carbon-holding rod E. The levers L L correspond substantially with solenoid-cores.

The levers or arms L L preferably carry projections or shoes M M to grip or clasp the carbon-rod E and yet allow lateral swinging movement of the levers or arms L L. The levers or arms L L are pivotally carried by a bar or lever N, that is shown pivoted within the casing G, as at *j*, to a hanger O, that is preferably jointed, as at *l*. A spring *m* may be used to assist in balancing or counterweighting the lever N. Springs *n n*, carried by the lever N, tend to press the shoes or projections M against the rod E to make perfect electrical contact. The lever N, and thereby the levers or arms L, can be regulated vertically by a cam or equivalent means *p*, (say a screw.)

The binding-post i^3 is preferably connected with the hanger O, so that the main current can pass into O, from thence into N, to L L, to M M, into the rod E to the carbons. The lower-carbon holder B^2 and its bar F^2

are electrically connected with the ring or mounting f^2, which is connected to the frame P, shown joined to the chamber G, but insulated therefrom. A binding-post P^2 on the frame P is shown connected by a wire P^3 with post J, whereby the current passes from B^2 to the lever; but the manner of connecting the wires and posts for conducting the current to the carbons can be arranged as may be found most convenient.

The operation of the foregoing parts in feeding the carbon B is as follows: When no current is passing, the lever N will descend slightly to permit the carbons B B to touch, as shown. When the current is turned on, it magnetizes the levers L L and lifts them and the carbon-holding rod E. The coils I I^2 also act to swing the ends of the levers L L outwardly; but as the coil I has the greater force it will press the projections or shoes M M against the carbon-holding rod E to hold or support the carbon. As the arc lengthens the magnetic action in I I^2 will decrease, as usual, whereupon the pressure of the shoes M M upon the rod E will lessen to enable the latter to descend. When the proper arc is next formed, the coils I I^2 will immediately move the levers L L and press the shoes M M firmly upon the rod E to hold it. As the shoes M M are always in contact with the rod E no appreciable motion of the shoes is necessary to release or hold the rod E, merely the change of pressure permitting the motion of rod E. By this means a very fine and quick adjustment of the rod E is effected, and the liability of its slipping too far to break the arc or permit the carbons B B to touch is reduced or overcome, whereby a comparatively steady arc is produced.

When the lamp is used on arc or high-tension circuits, the magnetism of coil I^2 on the levers L L tends to equalize the effect of coil I on the levers L L, whereby a very fine positive action is produced and slipping of the carbon-rod E avoided. When the lamp is used on incandescent or low-tension circuits, the coil I^2 can be cut out or wholly dispensed with, as the coil I will be sufficient. The iron rings I^3 in the coils I I^2 becoming charged tend to attract the magnetized levers L L, (which are preferably made of iron,) said levers also tending to separate on account of the repulsion of similar poles of the magnets. Coils without said rings can be used, if desired.

The foregoing carbon-feeding mechanism will be found very useful with my before-described method of reducing the consumption or combustion of the carbon, as my improvements together produce a very steady light and one not subject to frequent changes in brilliance.

It will be noticed that the feeding mechanism for the carbon is wholly within a closed chamber, as well as the carbons, which tends to overcome the danger of air reaching the carbons on account of the necessary movement of the carbons for feeding purposes.

By adjusting the part *p* the vertical movement of the levers L L can be regulated, as described. The manner of arranging the wires and other parts can be changed as may seem most desirable.

Any suitable switch, cut-out, or other safety devices can be used in connection with my improvements, as may be most desirable.

The valve may be situated at any suitable point in direct and uninterrupted communication with the globe and not necessarily at the bottom of the globe or chamber A.

Any suitable means may be provided to permit access to the chamber G, such, for instance, as an opening closed air-tight by a door or cover G′, (see Fig. 3,) suitably held to the casing or chamber G.

Any desired means can be employed to permit the rod E to slide without admitting air to the globe.

Having now described my invention, what I claim is—

1. A globe having its upper end closed from the outside air, and a carbon-holding rod E, combined with a mounting f^2, at the lower end of the globe, a frame F, a carbon-holder B^2, adapted to permit gases to pass to said frame and a valve connected with said frame substantially as described.

2. The combination of a globe closed at the lower end, a valve connected with the globe, neck *d*, on the globe, ring or mounting *f*, sealed to said globe or neck, tube G^2, connected with the mounting *f*, a closed chamber G, having extension G^3, with which the tube G^2, connects packing-nut G^4, and packing to make a tight joint between G^2 and G^3, a carbon-holding rod E, passing within said globe and chamber and carbon regulating or feeding mechanism, substantially as described.

3. In an electric-arc lamp a magnet-coil having a central bore, and a carbon-holding rod passing therein, combined with levers L, L, to grip said rod, and extending within said bore and substantially parallel with the carbon-holding rod and with a lever N to which the levers L, L, are pivoted for supporting said levers to permit the coil to attract and move said levers longitudinally and also laterally on their pivots, substantially as described.

4. In an electric-arc lamp a magnet-coil having a central bore, and a carbon-holding rod passing therein, combined with levers L, L, to grip said rod, and extending within the bore a lever N, to which the levers L, L, are pivoted, and means for regulating the movement of the lever N, substantially as described.

5. In an electric-arc lamp the combination of a magnet-coil having a central bore, a carbon-holding rod E, therein, levers L, L, to grip said rod and also extending within said

magnet, a lever N, to which the levers L, L, are pivoted, a hanger O, to which the lever N is pivoted a joint, as *l*, in said hanger, the levers L, L, being adapted to be placed in electrical connection with the main line to conduct current to rod E, and means to regulate the movement of the lever N, substantially as described.

6. In an electric-arc lamp, the combination of a magnet having a central bore and coarse-wire windings, a corresponding magnet having fine-wire windings, said magnets being adapted to be placed in electrical connection with the main line, the bores of said magnets being alined, a carbon-holding rod E passing through said magnets, levers L, L, having part within one magnet and part within the other, said levers being pivotally supported at a point between said magnets, shoes or projections on said levers to bear on said rod E, and means for supporting the levers L, L, and permitting lateral movement on the pivots by the attraction of the magnets, substantially as described.

7. The combination of a magnet-coil, having an iron ring I^3, and a central bore, with a carbon-holding rod and levers or arms within said bore, to hold said rod, substantially as described.

Signed at New York, in the county of New York and State of New York, this 2d day of April, A. D. 1892.

MOSES SOLOMON OKUN.

Witnesses:

IRVING HOWARD BROWN,

WM. S. TISDALE.