(No Model.) 2 Sheets—Sheet 1.

M. S. OKUN.

ELECTRIC ARC LAMP.

No. 581,997. Patented May 4, 1897.

Fig. 1

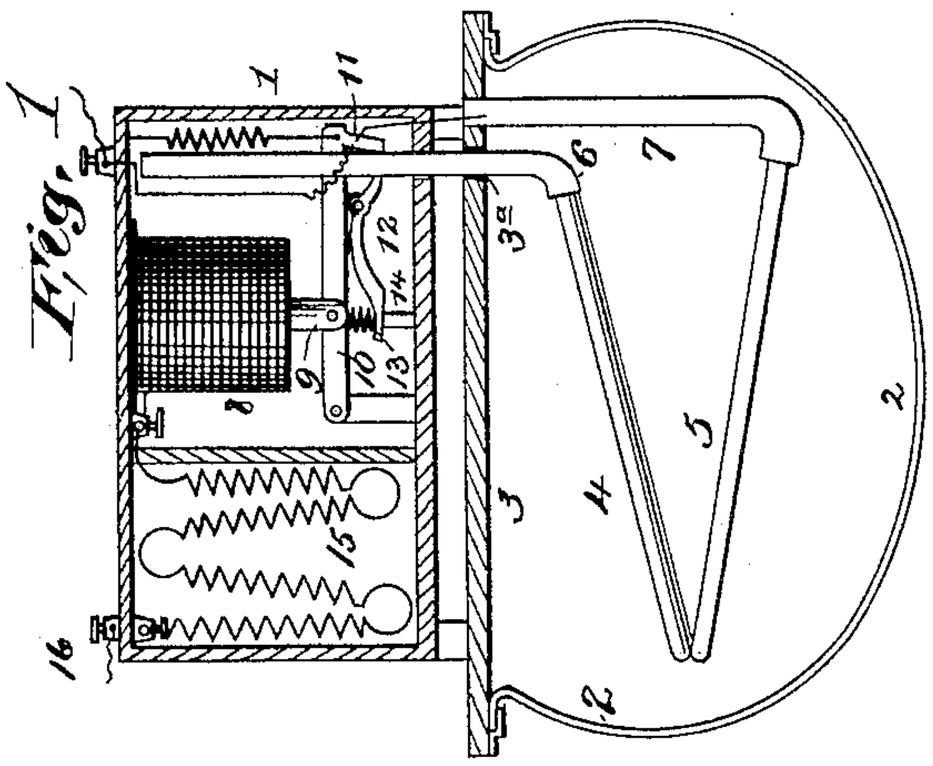

Fig. 2

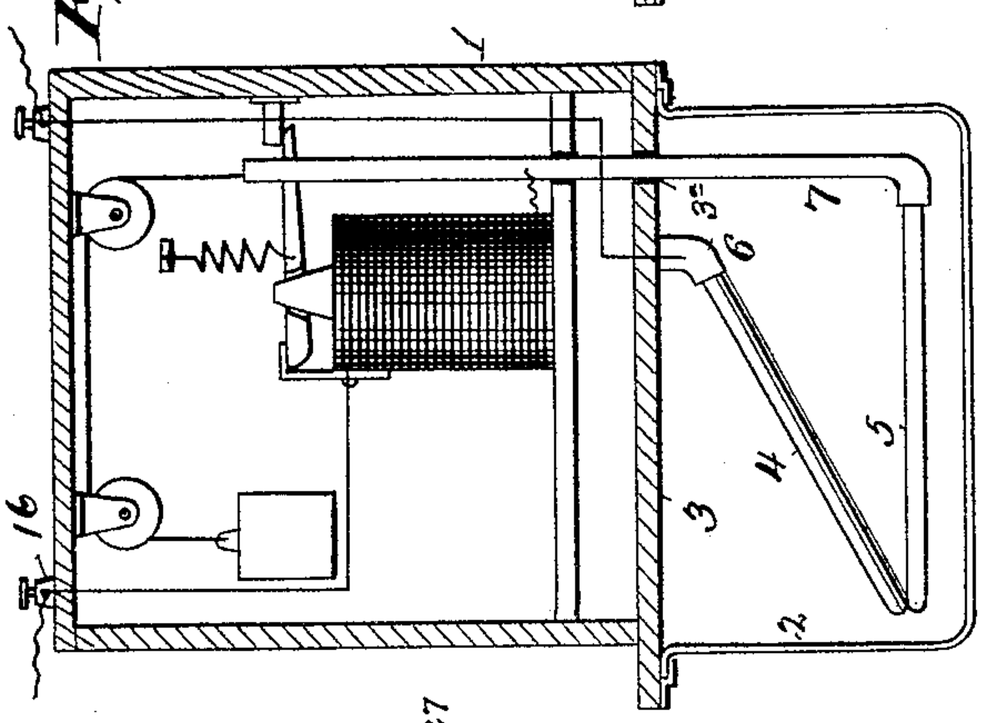

Fig. 3

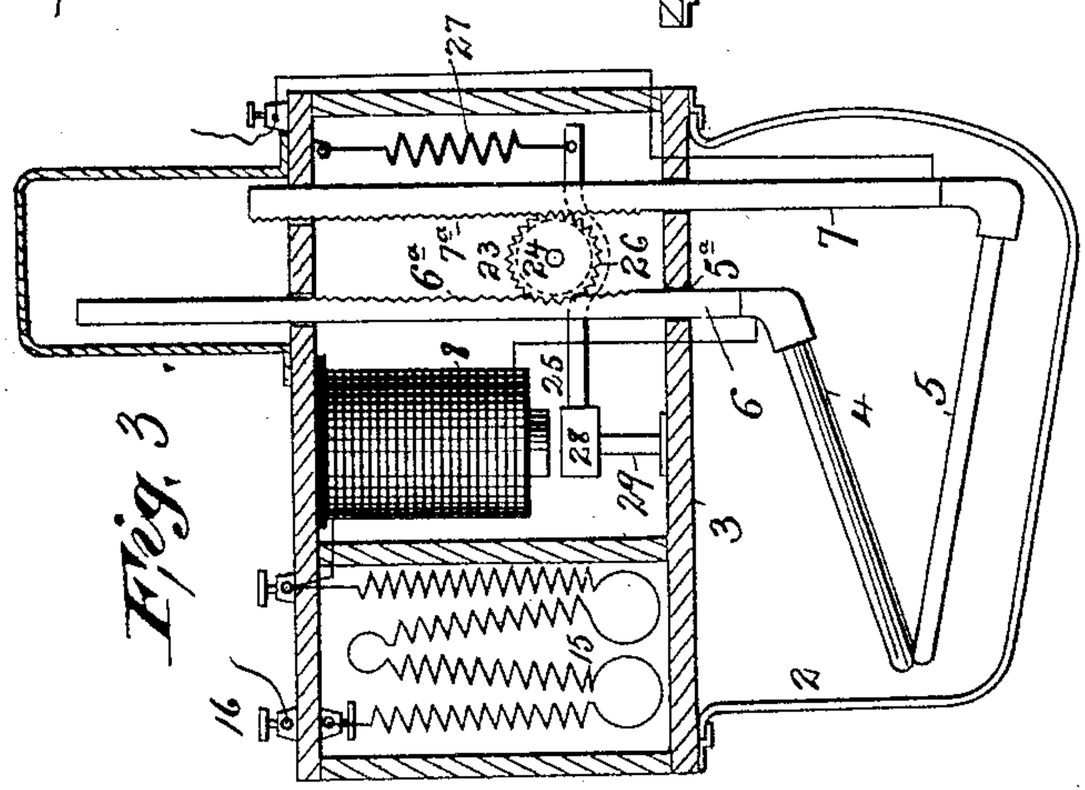

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Fig. 4.

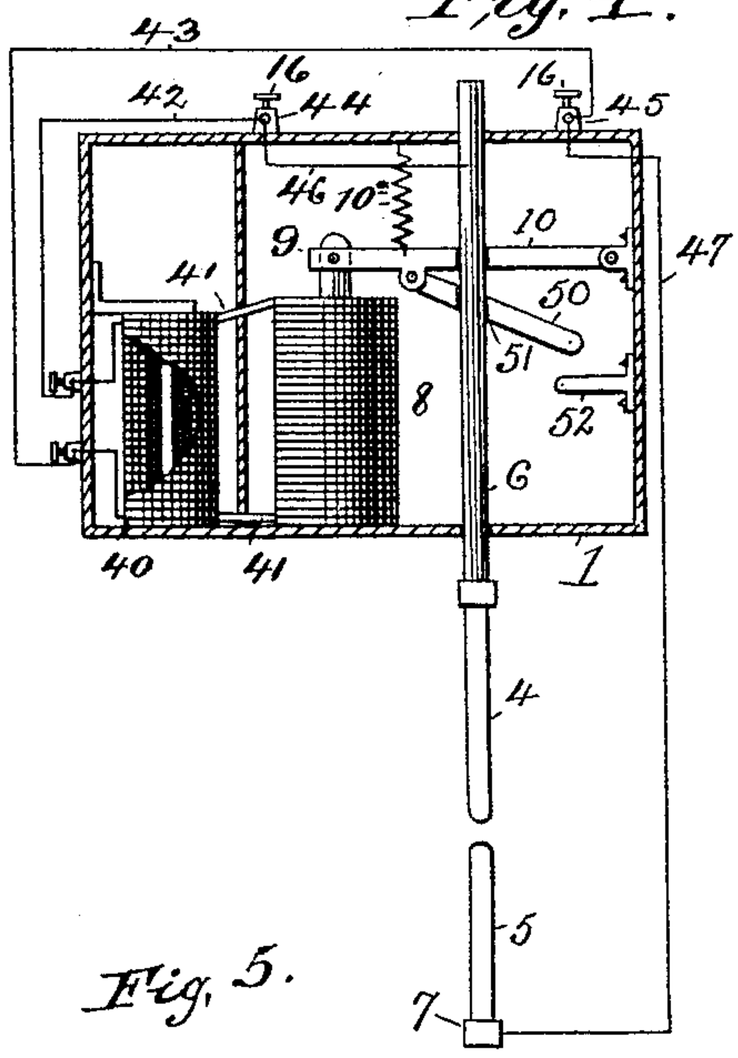
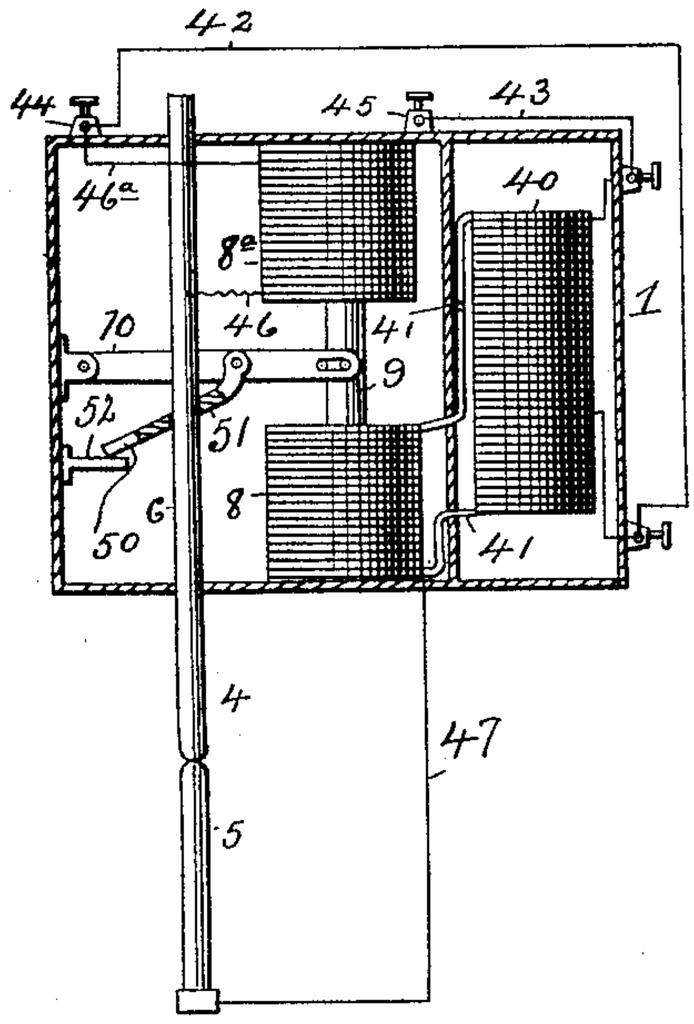


Fig. 5.



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UNITED STATES PATENT OFFICE.

MOSES S. 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. 581,997, dated May 4, 1897.

Application filed August 30, 1895. Serial No. 560,979. (No model.)

To all whom it may concern:

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

One portion of my invention relates to improvements in the class of arc-lamps in which the carbons diverge from their meeting ends or form an angle between them; and the invention has for its objects to cause the light to be thrown downwardly, to keep the arc at the ends of the carbons, and to decrease the height of the lamp. In carrying out this portion of my invention I arrange the carbons at an angle one above the other sidewise, so that they diverge from their meeting ends or points, thereby forming an angle between them, one or both of the carbons being arranged to move up and down sidewise from and toward each other to regulate the arc. By preference I surround the carbons with a tightly-closed globe, so as to produce gases that will retard the consumption of the carbons.

Another portion of the invention relates to certain new and useful improvements in carbon-regulating mechanisms which are so arranged as to enable arc-lamps to be successfully used in series with alternating currents. In carrying out this portion of the invention I provide a transformer the primary (or fine) coil of which is connected by suitable wires in shunt with the terminals of the lamp, and the secondary (or thick) coil of the transformer is connected with a magnet-coil which has substantially the same action as the shunt-coil in the continuous-current lamps for operating the carbon-operating devices. By this means the magnet-coil is supplied with an induced current for causing it to operate the carbon-operating devices.

The invention also consists in the novel details of improvement and the combinations of parts 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 vertical section of an arc-lamp embodying my improved arrangement of carbons for producing an improved light. Figs. 2 and 3 are corresponding views showing different forms of carbon-operating mechanisms. Fig. 4 is a vertical section of a lamp embodying my improved arrangement of transformer and magnet-coil adapting the lamp for use in series on the alternating current, and Fig. 5 is a corresponding view showing two magnet-coils for actuating the carbon-rod.

In the accompanying drawings, in which similar numerals of reference indicate corresponding parts in the several views, the number 1 indicates a suitable box or casing for the carbon-operating devices, and 2 is a suitable globe or shield which is provided with a cover 3, which cover may be a separate plate or disk carried by the box or casing 1, as in Fig. 1, or otherwise arranged to close the opening in the globe, or may be the bottom of the box or casing, as shown in Figs. 2 and 3. Any suitable means may be provided for holding the cover and globe together to make a tight fit to retard or prevent the passage of air or gas.

4 5 are the carbons, which may be carried by any suitable carbon-supports 6 7. In Figs. 1, 2, and 3 the carbons are arranged one sidewise and lengthwise above the other, and said carbons are placed at an angle to each other, so that they diverge from their meeting ends outwardly, as shown. The angles of divergence of the carbons may vary, as desired, so as to form any suitable angle between them. With this arrangement when the arc is formed at the meeting ends of the carbons the light will be unobstructed in its downward passage and the arc will be kept at the points of the carbons. By this means also the steadiness and efficiency of the light produced are increased.

In regulating the arc the movable carbon (or both carbons) moves (or move) bodily toward and from the other carbon (or toward and from one another) sidewise in a vertical line. Any suitable means may be used for operating the carbon or carbons. I have shown several forms of mechanism which will be useful for this purpose, although my invention is not limited to being used in connection with any of these forms. In Fig. 1 the carbon-support 7 is stationary, and the carbon-operating rod

6 is arranged to slide vertically, passing snugly through an opening 3^a in the cover 3 of the globe to retard the passage of air or gas. As the rod 6 rises and falls the carbon 4 will be raised and lowered bodily sidewise from and toward the negative carbon 5. The solenoid-coil 8 is carried by the box 1, and its core 9 is jointed to a lever 10, pivotally carried by the box 1. The lever 10 has an abutment 11, against which the rod 6 bears, and said lever carries another lever 12, pressed by a spring 13 against the rod 6, an abutment or stop 13 serving to relieve the pressure of lever 12 on rod 6 when the action of the magnet decreases.

15 is a suitable resistance between the line-wire 16 and magnet 8 for lamps on incandescent circuits.

In Fig. 2 the negative carbon 5 operates to regulate the arc, and the support 6 is stationary, the rod 7 passing through the opening 3^a to retard the passage of air or gas, the negative carbon moving sidewise up and down.

In Fig. 3 both carbons are arranged to move vertically bodily sidewise to regulate the arc. Any suitable means may be provided for this purpose. I have shown the following arrangement: The rods 6 7 are provided with racks 6^a 7^a, which mesh with a toothed wheel 23, journaled in the box 1, and provided with a cylindrical portion 24. (Shown in dotted lines.)

25 is a box having a curved part 26 to bear on the part 24 of the wheel 23, one end of bar 25 being supported by a spring 27, carried by box 1. The opposite end of bar 25 has an armature 28 to be attracted by magnet 8 and normally resting on a support 29. When the magnet 8 is energized, it attracts armature 28, which raises bar 25, the frictional contact of its part 26 with cylindrical part 24 of wheel 23 causing the latter to turn to raise rod 6 and lower rod 7, the spring 27 acting to reverse the movement of the parts to move the carbons toward each other when the action of the magnet 8 decreases. Both rods 6 7 fit snugly in the openings 3^a to retard the passage of air and gas.

The supports or rods 6 7 in Figs. 1, 2, and 3 are preferably rectangular to keep them from turning.

In cases where arc-lamps are used in series it is necessary to use a fine coil in shunt-circuit for regulating the resistance of the arc. Such arrangements are not successful for use with the alternating current on account of the self-induction which will arise in such coils during the passage of the alternating current. To overcome this, I use the following arrangement, as shown in Figs. 4 and 5: 40 is a transformer of suitable construction, being suitably carried by box 1. The primary coil of the transformer is connected with the main circuit 16 by suitable conductors 42 43, which lead to the terminals 44 45 of the lamp, as shown, and the secondary coil of the transformer is connected, as by conductors 41, with the magnet-coil 8. From the posts or terminals 44 45 electrical connection is made with the supports 6 7, as by conductors 46 47. (See Fig. 4.) The carbons are normally separate and may be actuated by any suitable devices. I have shown the core 9 of magnet 8 as pivotally connected with lever 10, which is connected by a spring 10^a with box 1, which spring acts against the action of the magnet 8. The rod 6 passes through an aperture in lever 10, and said lever carries a pivoted arm 50, provided with an aperture 51 for the rod 6, the weight of said arm serving to bind or clutch it on the rod 6, so that it can lift the latter. A stop or abutment 52, carried by the box 1, serves to reduce the frictional engagement of said arm on the rod 6 when the lever 10 is pulled down by the magnet 8. When the current is first turned into the lamp, a strong current passes through the transformer, wherein a strong induced current is produced, which passes to the coil 8, energizing the latter, causing it to draw in the core 9, and thereby depress the rod 6 and carbon 4, and the arm 50 engages stop 52, thus releasing the rod 6, allowing it to drop until both carbons engage, whereupon the main current passes through the carbons. At that moment the current in the transformer decreases, which decreases the action of magnet 8. The spring 10^a then lifts the lever 10 and the carbon 4 to strike the arc. The current in the transformer now increases and also the action of magnet 8 upon the core 9 until the arc reaches the proper length, and so on, as the lamp is used, the induced current from the transformer and the spring serving to operate the rod 6 as required to regulate the arc.

In Fig. 5 substantially the same arrangement of the transformer for producing an induced current in the coil 8 and the clutch devices of Fig. 4 are used, but in this case, instead of using a spring to act with the magnet-coil, a magnet 8^a is provided. A wire 46^a leads from the terminal 44 to the coil 8^a, and the wire 46 leads from the other end of said coil 8^a to the rod 6, the conductor 47 likewise leading from the terminal 45 to the negative carbon. The core 9 at its ends enters said coil, as shown. When the current first enters the lamp, the carbons are in contact and the whole current passes through the main magnet-coil 8^a, and a very small current passes through the shunt-coil of the transformer. The coil 8^a now acts to lift the carbon 4, striking the arc. The current in coil 8^a weakens and the current in the transformer increases, and consequently the induced current in coil 8 increases. The latter coil now acts on the core to draw it down to regulate the arc, and, so on, as the lamp continues to burn.

The above-described arrangements of transformer and magnet-coils can of course be used with any desired or appropriate carbon-operating mechanisms and are not limited to

use with the devices shown. This arrangement is also particularly adapted for use with the alternating current for lamps placed in series, as the transformer placed in shunt with the main circuit and connected with the magnet-coil 8 of the carbon-operating mechanism serves to supply said magnet with the proper amount of induced current as and when required in accordance with the resistance of the arc. This construction can be used on an alternating incandescent circuit as well as on an alternating series circuit.

Having now described my invention, what I claim is—

1. In an arc-lamp, the combination of a sliding carbon-carrying rod and a carbon-carrier at an angle to said rod, the coöperating carbon being held at an angle to the first-mentioned carbon, and feeding devices for raising and lowering the carbon-rod.

2. An arc-lamp having its carbons in the main circuit and a feeding-magnet in the secondary of an induction-coil whose primary is in shunt to the main circuit.

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