(No Model.) 2 Sheets—Sheet 1.

R. SCHEFBAUER.

ELECTRIC ARC LAMP.

No. 568,798. Patented Oct. 6, 1896.

Fig. 1.

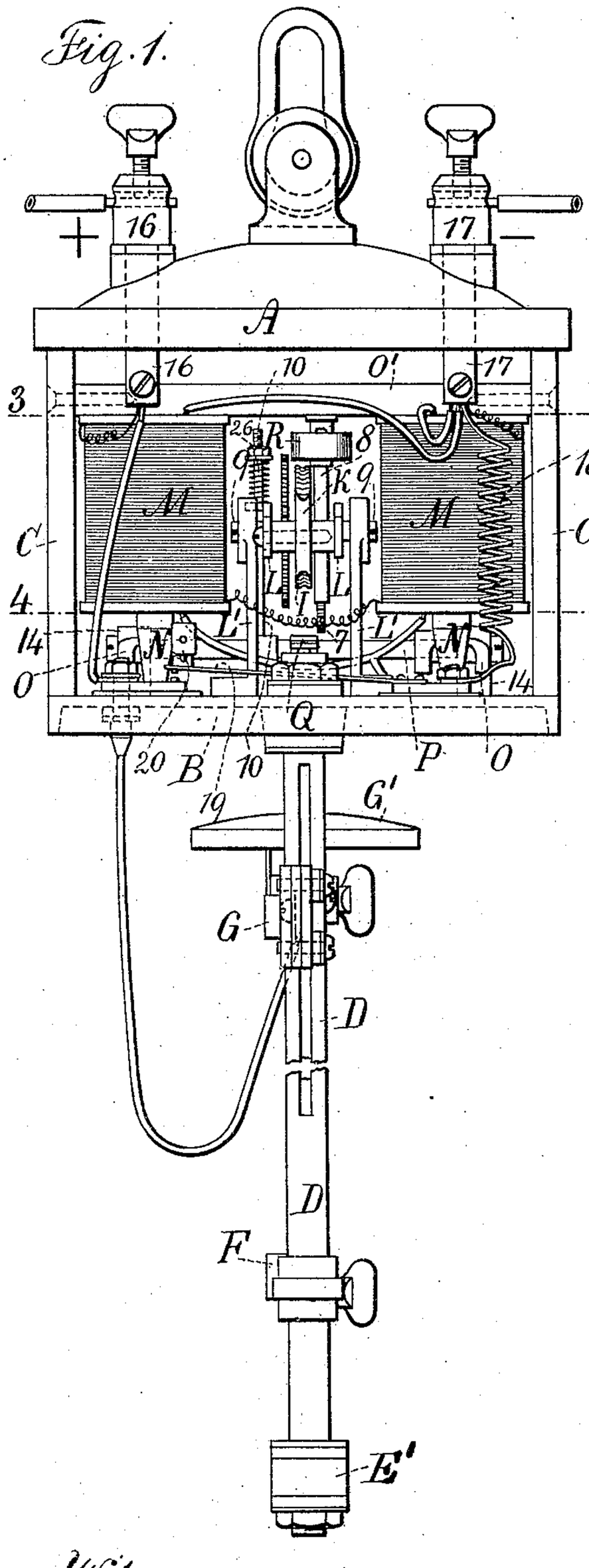
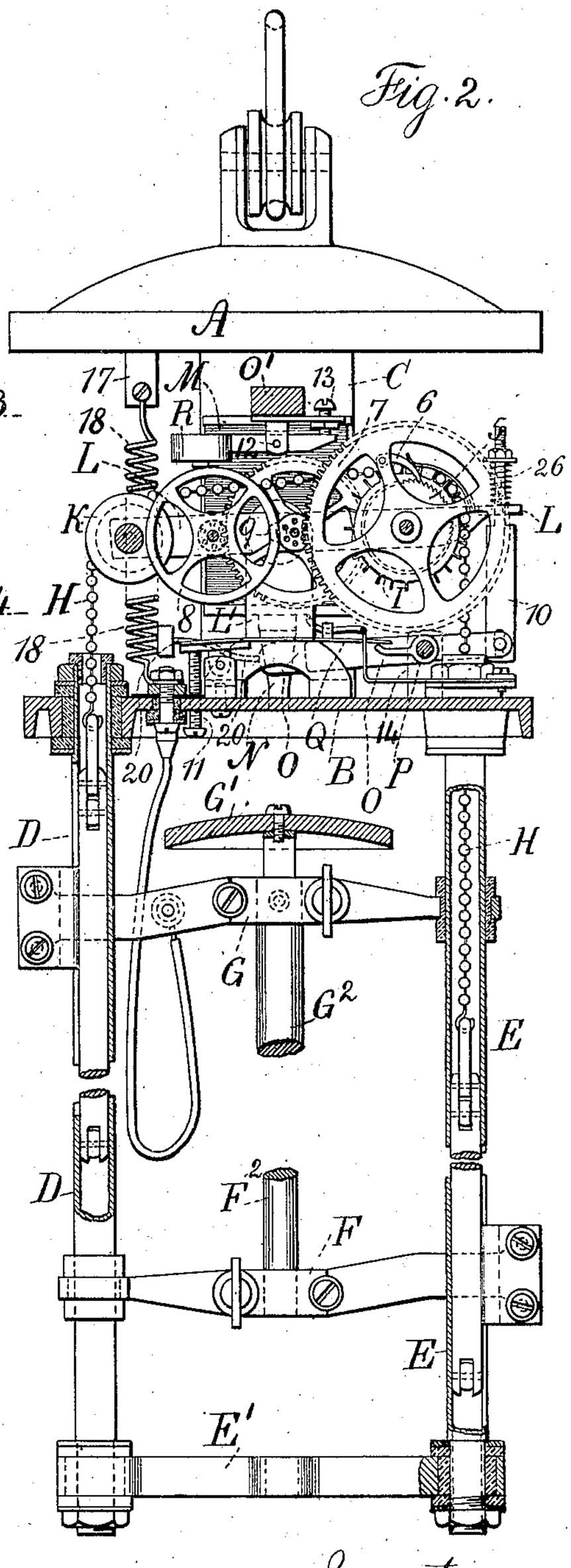


Fig. 2.



Witnesses:
J. Stahl
Chas. N. Smith

Inventor:
Rupert Schefbauer
per Samuel W. Serrell Atty

(No Model.) 2 Sheets—Sheet 2.

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Fig. 4.

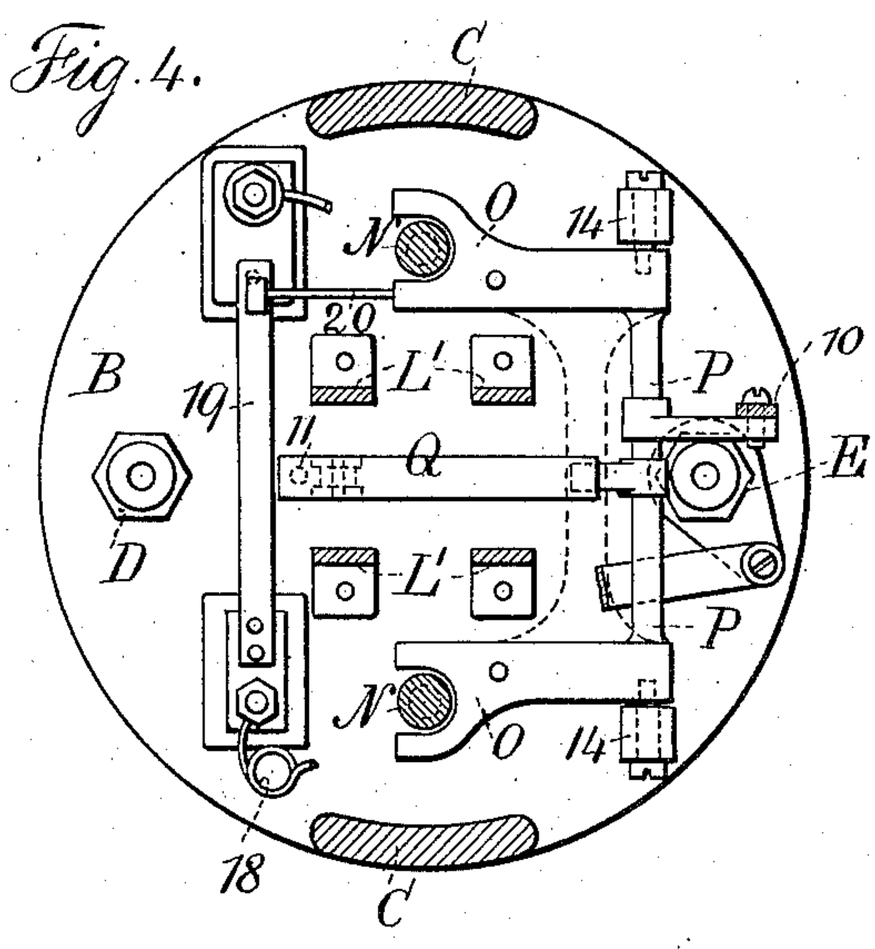


Fig. 3.

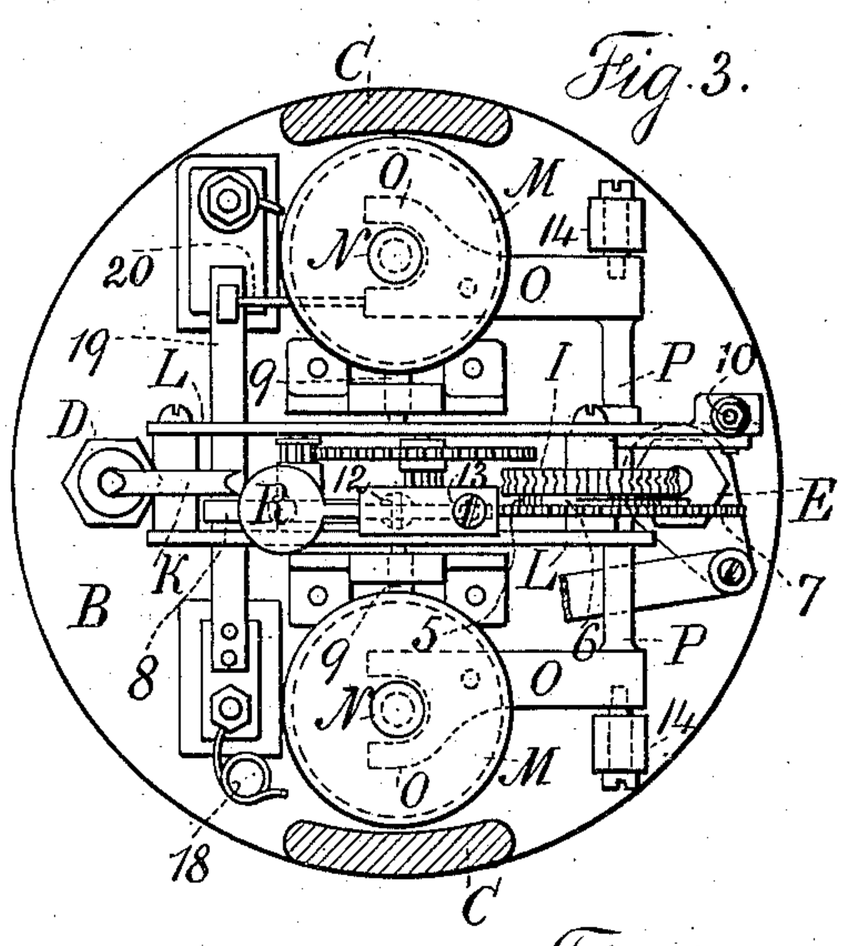


Fig. 6.

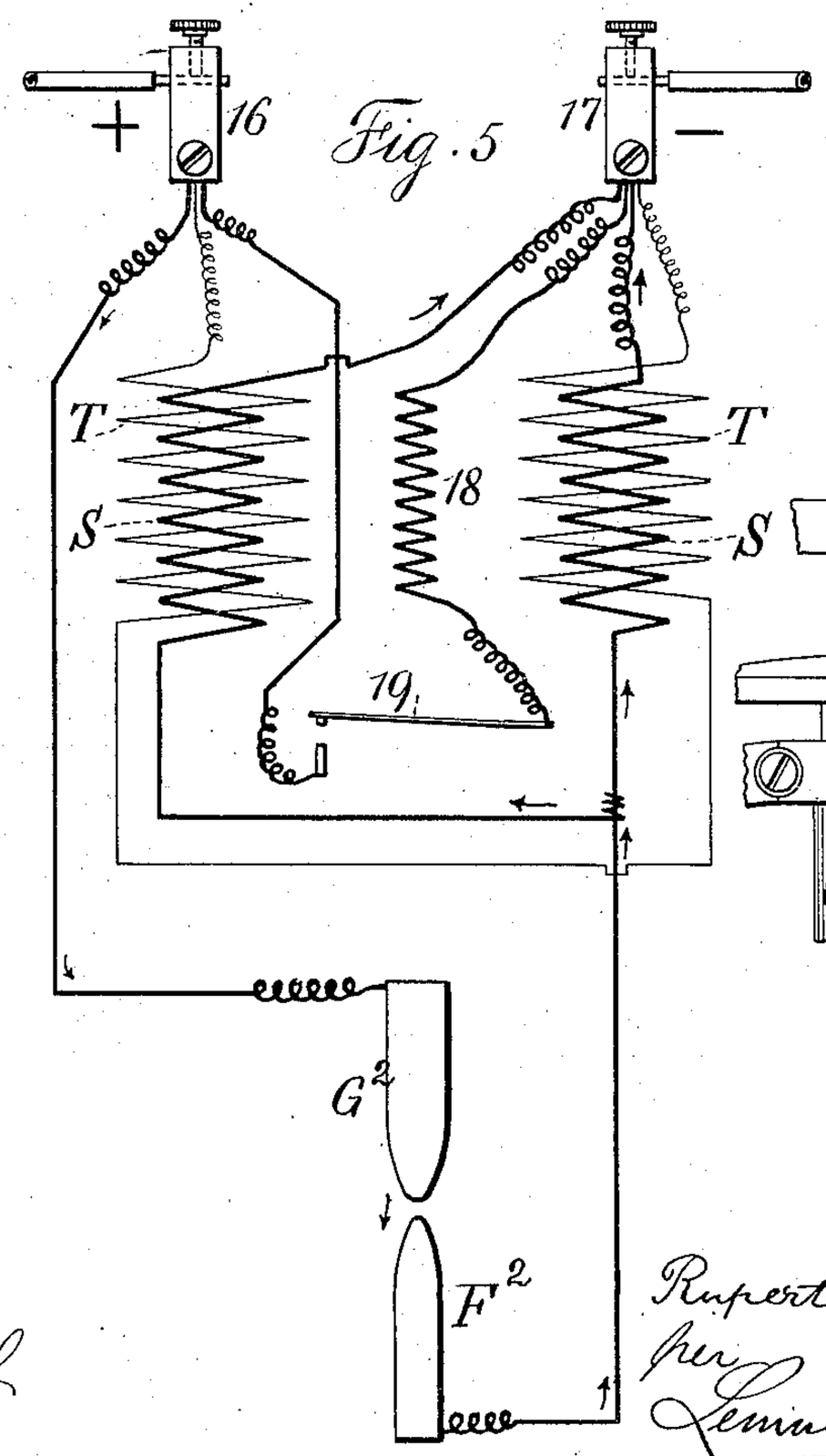
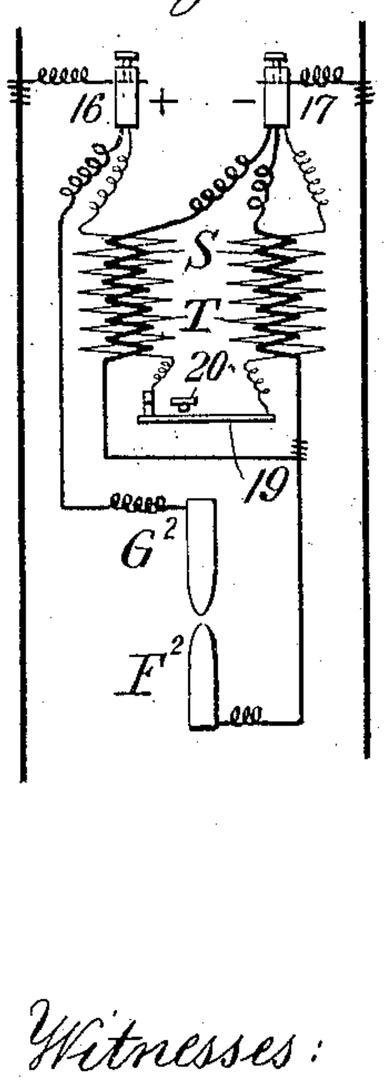
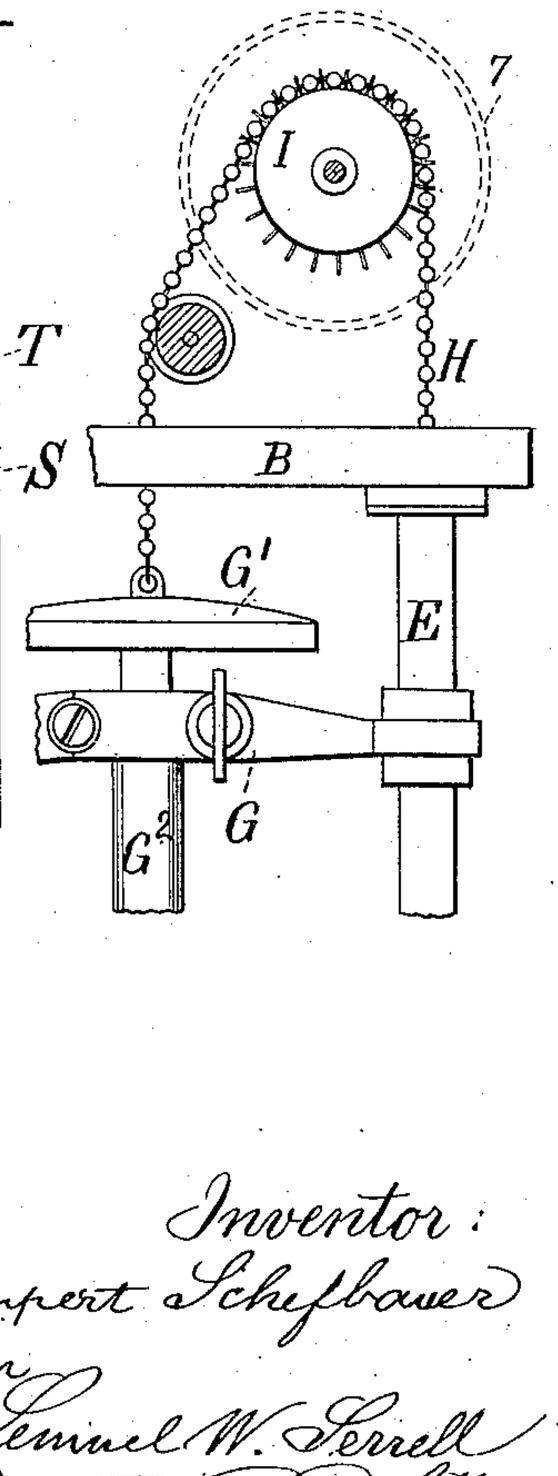


Fig. 5

Fig. 7.





Witnesses:
J Stail
Chas H. Smith

Inventor:
Rupert Schefbauer
per
Lemuel W. Serrell
Atty

UNITED STATES PATENT OFFICE.

RUPERT SCHEFBAUER, OF HOBOKEN, NEW JERSEY, ASSIGNOR TO THE AUERBACH-WOOLVERTON ELECTRIC COMPANY, OF SAME PLACE.

ELECTRIC-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 568,798, dated October 6, 1896.

Application filed September 24, 1895. Serial No. 563,482. (No model.)

To all whom it may concern:

Be it known that I, RUPERT SCHEFBAUER, a citizen of the United States, residing at Hoboken, in the county of Hudson and State of New Jersey, have invented an Improvement in Electric-Arc Lamps, of which the following is a specification.

In this improvement the carbon-holders are fitted to slide upon hanging tubes, and they are connected by a chain passing over a sprocket-wheel, so that as the upper-carbon holder descends by a weight the lower-carbon holder and carbon are raised, and the sprocket-wheel is connected by a ratchet and pawl with a train of gears and a fly-wheel in a rocking frame that receives its motion from a connection to the magnet-armature, and there is a stop-weight above the fly-wheel which moves with the fly-wheel as the frame is rocked in drawing the arc, and there is an adjustable stop to limit the descent of the weight, so that at a given place in the movement of the rocking frame the fly-wheel can be rotated by the chain and sprocket-wheel as the carbons move toward each other.

The electromagnet made use of is usually in two parts surrounding stationary cores with tapering ends that act upon the armature, and usually the electromagnet is differentially wound, and there is a cut-out containing a resistance, the cut-out being closed by the action of the armature. By this improvement the arc can be drawn with great facility and a very slight difference in the current passing through the carbons will bring the feed into operation, and the entire mechanism is easily constructed and kept in working condition.

In the drawings, Figure 1 is a general elevation. Fig. 2 is an elevation at right angles to Fig. 1 and partly in section, and Fig. 3 is a sectional plan view at the line 3 3 of Fig. 1. Fig. 4 is a sectional plan view at the line 4 4 of Fig. 1. Fig. 5 is a diagrammatic view showing the circuit connections. Fig. 6 is a diagrammatic view of a modification in the connection to the carbon-holder, and Fig. 7 is a diagram showing the circuit connections for a lamp in multiple arc.

The top plate A and bottom plate B are connected together by suitable columns C, and any desired suspending device may be connected with the top plate A, and below the bottom plate B the hanging tubes D and E are provided, there being a bottom connection E′ and insulating material intervening between the hanging tubes and the bottom plate and also between the hanging tubes and the bottom connection E′.

The lower-carbon holder F and the upper-carbon holder G are fitted to slide upon the hanging tubes D E and they are insulated from such tubes, and from the upper-carbon holder a plate passes through a slot in the hanging tube D, and this plate is connected with one end of the chain or cord H by an insulating-link or similar device, and the lower-carbon holder F is provided with a similar plate passing through the vertical slot in the hanging tube E, where it is connected to the other end of such chain H, and this chain H passes over the sprocket-wheel I and guide-wheel K, and there is a weight G′, connected to the upper-carbon holder G, so that when not otherwise acted upon the weight G′ will move the carbon-holder G downwardly, and, through the connecting chain or cord H, draw the lower-carbon holder F upwardly, so as to bring the carbons that are retained by the respective holders toward each other or their ends into contact.

Any desired character of carbon-holder may be made use of. I have, however, represented a screw-clamp upon each carbon-holder to receive and secure the respective carbons. The connecting-chain H may be composed of links adapted to the sprocket-wheel I. I, however, prefer to make the chain of short links having globular ends, that are connected the one to the other by hollow globes that are pressed together to receive and contain the globular ends of the solid links, and these hollow globular links pass in between the projections upon the sprocket-wheel. A chain made in this manner is preferable, because it is equally flexible in all directions, and there is not any risk of the chain slipping in the sprocket-wheel or the parts wedging or becoming inoperative.

The sprocket-wheel I and guide-wheel K are supported in a rocking frame L, that is

pivoted at 9 upon standards L′, that rise from the bottom plate B, and the frame receives its rocking motion from the armature O and a connecting-link 10, that is pivoted at one end to the frame and at the other end to an arm upon the rock-shaft of the armature.

Usually I employ a differentially-wound magnet, there being two spools M to such magnet, and the cores N of the magnet are connected at their upper ends to the yoke O′, which extends across between the columns C and is permanently fastened to such columns, and it is advantageous to make the projecting ends of the cores N tapering or conical, their lower and smaller ends passing into holes in the bottom plate B, so as to be supported thereby, which prevents the cores of the magnets being displaced in their relation to the armature.

The armature O is made in two parts projecting from the cross or rock shaft P, the ends of which are supported in suitable bearings 14 upon the bottom plate, and where the electromagnet has two spools there will be two armatures O projecting from the shaft P, the end of each armature being forked, so that the core N comes between the fork. This is advantageous, as the armature is constantly within the magnetic field of the core and the armature can be moved the necessary distance by the attraction of the core and the power of the magnetism in moving the armature will increase as the armature is raised, because the surfaces of the fork will be in closer proximity to the larger portion of the tapering core. It is to be understood that the poles of these cores, where there are two spools, will be magnetized north and south, and the armature-shaft P should be of iron and integral with the armature in order that the armatures may assume the proper polarity. It is usually advantageous to apply a spring Q, acting upon a toe of the armature-shaft P, to aid in holding down the armatures and render it unnecessary to make such armatures as heavy as would otherwise be necessary, and the adjusting-screw 11, acting upon such spring Q, serves to regulate the power by which the armatures are held against the lifting action of the electromagnet.

Adjacent to the sprocket-wheel I is a ratchet-wheel 5 and a pawl 6 upon the gear-wheel 7 in the train of gears that rotate the fly-wheel 8. These gears and fly-wheel are within and supported by the rocking frame L, and above the fly-wheel 8 is a stop-weight R, pivoted at 12 and fitted with an adjusting-screw 13 to determine the point to which the stop-weight may move downwardly before it is arrested by such screw 13.

It will now be understood that when there is not any current passing through the lamp the armature falls, and by the link 10 the frame L is rocked, so that the fly-wheel 8 is moved out of contact with the stop-weight R, and the weight G′ causes the upper-carbon holder to descend and the lower carbon is simultaneously raised through the action of the chain H until the ends of the carbons stop one against the other, and as soon as the current passes through the electromagnet the armature is raised and the link 10 draws down this end of the frame and raises the upper-carbon holder and the lower-carbon holder simultaneously descends, and the arc is drawn between the ends of the carbons, and as the carbons are consumed and the current passing through the electromagnet is lessened by the increased length of the arc the armature descends, so as to maintain a nearly uniform length of arc, and the continuance of this movement causes the fly-wheel to separate from the stop-weight R. Hence the fly-wheel is free to rotate by the action of the weight G′ as the carbons are brought toward each other, and in this manner a nearly uniform arc is maintained until the carbons are consumed, or nearly so.

It will be observed that by moving the screw 13 the point at which the stop-weight R will be supported can be varied, and in this manner the action of the lamp can be adjusted, and the place at which the fly-wheel will commence to rotate and feed the carbons can be varied according to the point at which the descent of the stop-weight is arrested.

The + binding-post is represented at 16 and the — binding-post at 17, and I remark that any suitable switch or cut-out can be employed for turning the current onto or off of the lamp; but the same is not represented in the drawings. I, however, make use of a rheostat or resistance 18 in a shunt between the binding-posts containing also the spring 19, which is acted upon by the armature to make or break the shunt-circuit, according to the manner in which the lamp may be made use of. I have represented the arm 20 with a button of insulating material upon the end to act upon the spring 19 to close the shunt-circuit when the armature falls.

Referring now to the diagram Fig. 5, illustrating the circuit connections, it will be seen that the current passes from the + binding-post 16 to the upper carbon G^2, and from the lower carbon F^2 through the multiple helices S in the electromagnet and thence to the binding-post 17, and a current also passes from the binding-post 16 through the fine-wire helices T, which are in series, to the binding-post 17. In consequence of using two helices in multiple arc in the circuit to the carbons, the resistance and self-induction in the helices are lessened, which is especially advantageous when alternating currents are made use of, and these helices in multiple arc in the circuit to the carbons being in the magnet-spools that are differentially wound with the fine-wire helices, which are connected in series between the binding-posts, the necessary resistance is introduced in the shunt-circuit and the action of the magnets in regu-

lating the arc between the carbons is rendered very reliable. The mode of winding and applying these differentially-wound helices of the electromagnet will be understood; and I remark that the length of the fine-wire helices will vary according to the normal current upon the line, and in some instances where alternating currents are made use of upon the line the coarse-wire helices only may be made use of, and the spring Q will be adjusted by the screw 11 so as to exert more or less force upon the armatures according to the voltage of the current, and where these arc-lamps are employed in multiple arc instead of in series the contact-point for the spring 19 may be reversed, as illustrated in Fig. 7, so as to close the shunt-circuit through the high-resistance helix when the lamp is in operation, and to break the circuit by the fall of the armature if the circuit is broken at the carbons. In consequence of the magnet-spools being differentially wound the action of the lamp is unified by the magnetism being lessened as the voltage of the current increases, and the reverse.

It is advantageous to make the circuit connection to the upper-carbon holder flexible, so that it is only necessary to have the current from the lower-carbon holder pass through the hanging tube E, such tube being insulated and having connected to it one of the contacting-wires, as indicated in the diagram.

If the armatures are cut out of laminated iron, they are better adapted to alternating currents than forged armatures. These armatures may be approximately in the form indicated by dotted lines in Fig. 4, and supported by pivot-screws. In cases where it is desired to have one carbon-holder stationary, the other carbon-holder alone may move and rotate the sprocket-wheel through the intervening chain or cord, as indicated by the diagram Fig. 6.

The link that connects the armature with the rocking frame is slotted where one of the connecting screws or pivots passes through the link, the object of this construction being to allow the electromagnet to give to the armature a movement before the rocking frame is moved; and in case of a carbon breaking and the current through the lamp suddenly being interrupted the armature will fall, and in so doing the projecting arm 20 will act on the spring 19 and suddenly close the shunt-circuit between the binding-posts with greater rapidity than would be possible if the swinging frame had to move before the shunt-circuit could be closed.

I prefer to add a spring 26 at the connection between the rocking frame L and the link 10, so that in case an alternating current is made use of and the armature O is vibrated the spring 26 will yield and lessen the risk of the vibration being communicated to the carbons. This spring may be applied in any desired manner, and it is advantageous to pass the upper end of the link 10 through an eye upon the frame L, with a helical spring above the frame and an adjusting-nut to regulate the pressure of the spring.

I find that when a core is employed with a forked armature adjacent to the core it is advantageous to make the armature laminated, the plates or sheets of iron being cut out in the proper size and shape and connected together by rivets, as the magnetism set up in such armature is more rapid than when the armature is made of a single piece of metal.

In consequence of introducing the yoke O′ between the columns C and securing the same in place and also securing the lower ends of the cores N to the frames or bottom plate B the parts are rigidly connected and rendered very strong and the risk of injury, especially in transportation, is reduced to a minimum.

I claim as my invention—

1. The combination with the carbon-holders and a chain or cord connected at its ends to the carbon-holders, of a frame, pivots on which said frame can be rocked, a sprocket-wheel for the chain, gearing and a fly-wheel carried by the rocking frame, a stop-weight and a separate stationary support for the same, and an electromagnet and connections therefrom for swinging the rocking frame and moving the fly-wheel into contact with the weight or away from the same, substantially as specified.

2. The combination in an electric-arc lamp, of an electromagnet having two differentially-wound spools, stationary cores with tapering projecting ends and a yoke connecting the cores, armatures having forked ends adjacent to the tapering cores, a rock-shaft of magnetic material uniting the armatures, a rocking frame and mechanism for drawing the arc, and a connection between the armatures and such rocking frame, and a spring and screw for adjusting the spring and regulating the force with which the armatures are held against the action of the electromagnet, substantially as set forth.

3. The combination in an electric-arc lamp, of carbon-holders and mechanism for connecting the same and allowing them to be moved toward or from each other, gearing and a fly-wheel acted upon by the movement of the carbon-holders, a rocking frame carrying such gearing and fly-wheel, a stop for the fly-wheel, an electromagnet having a tapering core, a forked armature adjacent to the core and a connection therefrom to the rocking frame carrying the gearing, a spring and rheostat in a shunt between the binding-posts, and an arm extending from the armature and acting upon the spring to open or close the shunt-circuit, substantially as set forth.

4. The combination in an electric-arc lamp having an electromagnet and a stationary core with tapering projecting end, of an armature having a forked end adjacent to the tapering core, pivots for the armature, a rock-

ing frame and connection therefrom to the armature, carbon-holders and mechanism for drawing the arc, a spring and screw for adjusting the spring and regulating the force with which the armature is held against the action of the electromagnet, substantially as set forth.

5. The combination in an electric-arc lamp having a differentially-wound electromagnet, a stationary core with tapering projecting end, an armature having a forked end adjacent to the tapering core, pivots for the armature, a rocking frame and connection therefrom to the armature, carbon-holders and mechanism for drawing the arc, a spring and screw for adjusting the spring and regulating the force with which the armature is held against the action of the electromagnet, substantially as set forth.

6. The combination in an electric-arc lamp, of carbon-holders and mechanism for connecting the same and allowing them to be moved toward or from each other, gearing and a fly-wheel acted upon by the movement of the carbon-holders, a rocking frame carrying such gearing and fly-wheel, a stop for the fly-wheel, an electromagnet having a tapering core, a forked armature adjacent to the core and a connection therefrom to the rocking frame carrying the gearing, a circuit-closing spring in a shunt between the binding-posts and an arm extending from the armature and acting upon the spring to open or close the shunt-circuit, substantially as set forth.

7. The combination in an electric-arc lamp, of carbon-holders and mechanism for moving one of such carbon-holders toward or from the other, gearing and a fly-wheel acted upon by the movement of the carbon-holders, a rocking frame carrying such gearing and fly-wheel and a stop for the fly-wheel, an electromagnet having a tapering core, a forked armature adjacent to the core and a connection therefrom to the rocking frame carrying the gearing, substantially as set forth.

8. The combination in an electric-arc lamp, of carbon-holders and mechanism for moving one of such carbon-holders toward or from the other, gearing and a fly-wheel acted upon by the movement of the carbon-holders, a rocking frame carrying such gearing and fly-wheel, and a stop for the fly-wheel, an electromagnet having a tapering core, a forked armature adjacent to the core and a link having a slot for connecting the armature and rocking frame, substantially as specified.

9. The combination in an electric-arc lamp, of carbon-holders, a rocking frame, gearing and a fly-wheel and a connection to the carbon-holder for rotating the fly-wheel, an electromagnet in the circuit to the carbons, an armature acted upon by the same, a shunt-circuit between the binding-posts and the spring-contact in the same, an arm or projection on the armature for acting upon the said spring and a slotted link connecting the armature and rocking frame for allowing the armature to act upon the circuit-closing spring without moving the rocking frame, substantially as set forth.

Signed by me this 21st day of September, 1895.

RUPERT SCHIEFBAUER.

Witnesses:
GEO. T. PINCKNEY,
WILLIAM G. MOTT.