C. H. SPRAGUE.

ARC LAMP.

APPLICATION FILED JULY 16, 1908.

967,684.

Patented Aug. 16, 1910.

3 SHEETS—SHEET 1.

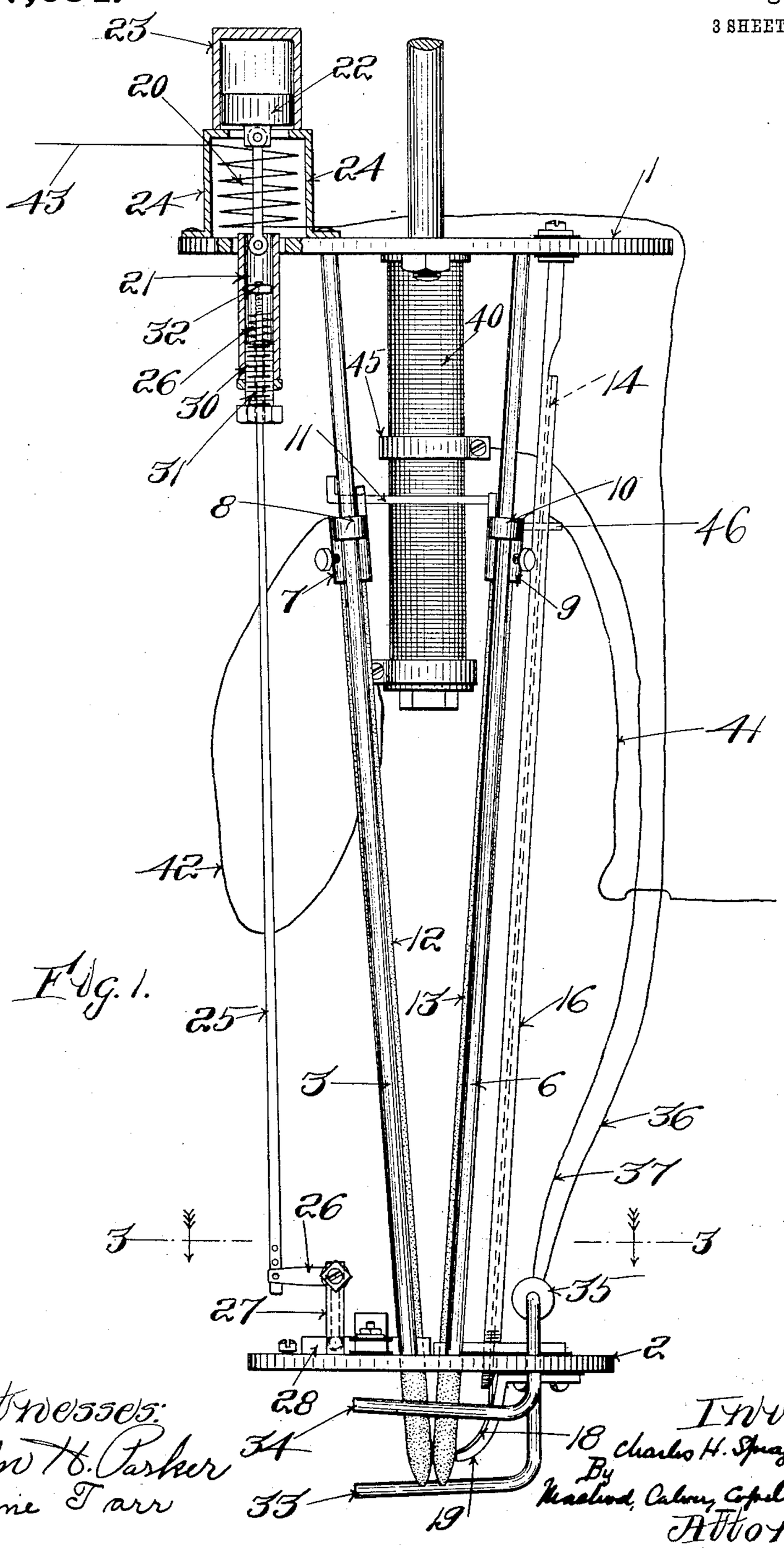


Fig. 1.

Witnesses:
John H. Parker
Alice Tarr

Inventor:
Charles H. Sprague
By
Macleod, Calvert, Copeland & Dick
Attorneys.

C. H. SPRAGUE.

ARC LAMP.

APPLICATION FILED JULY 16, 1908.

967,684.

Patented Aug. 16, 1910.

3 SHEETS—SHEET 2

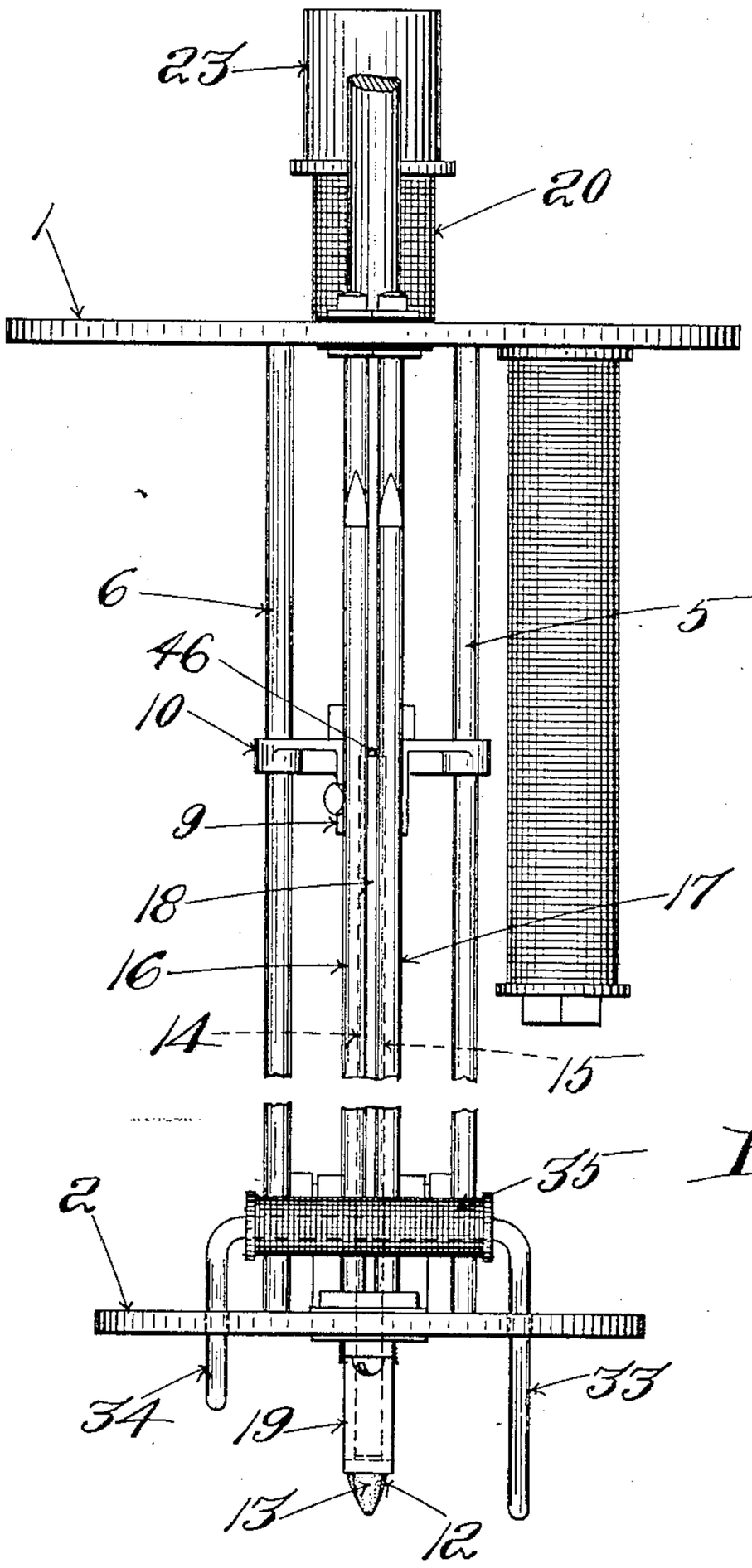
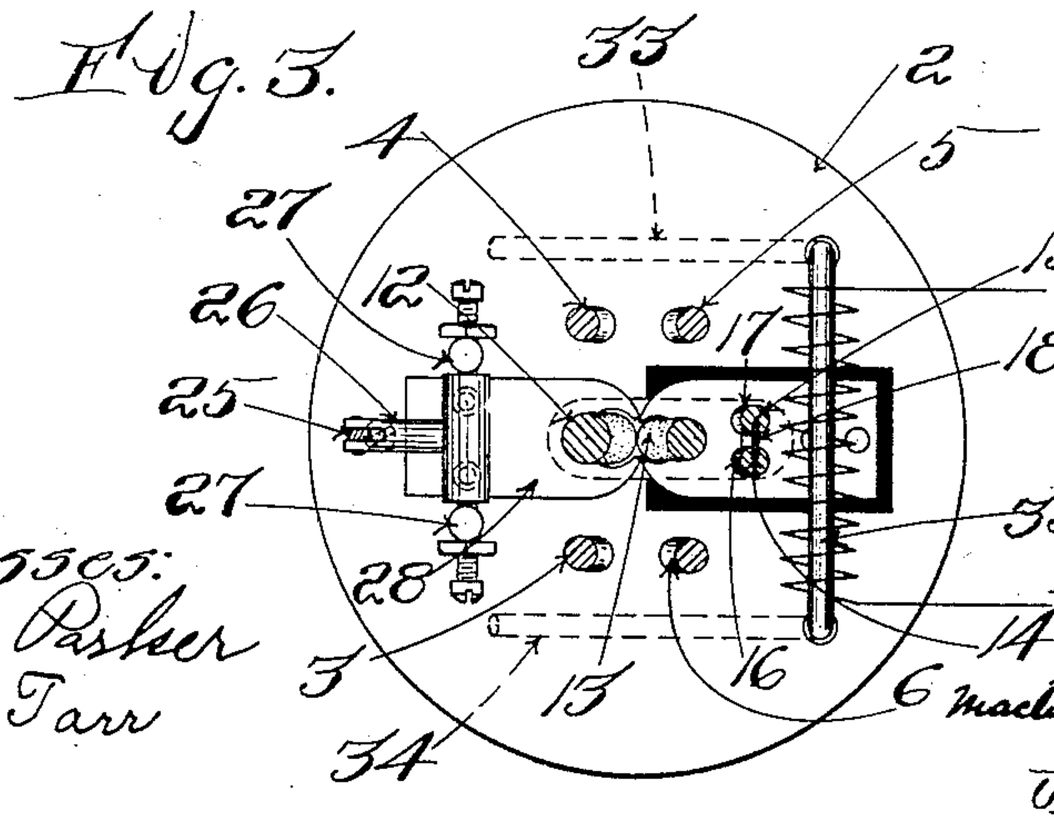


Fig. 2.

Fig. 3.



Witnesses:
John H. Parker
Alvin Tarr

Inventor:
Charles H. Sprague
By Macleod, Calvert, Copeland & Dilg.
Attorneys.

C. H. SPRAGUE.

ARC LAMP.

APPLICATION FILED JULY 16, 1908.

967,684.

Patented Aug. 16, 1910.

3 SHEETS—SHEET 3.

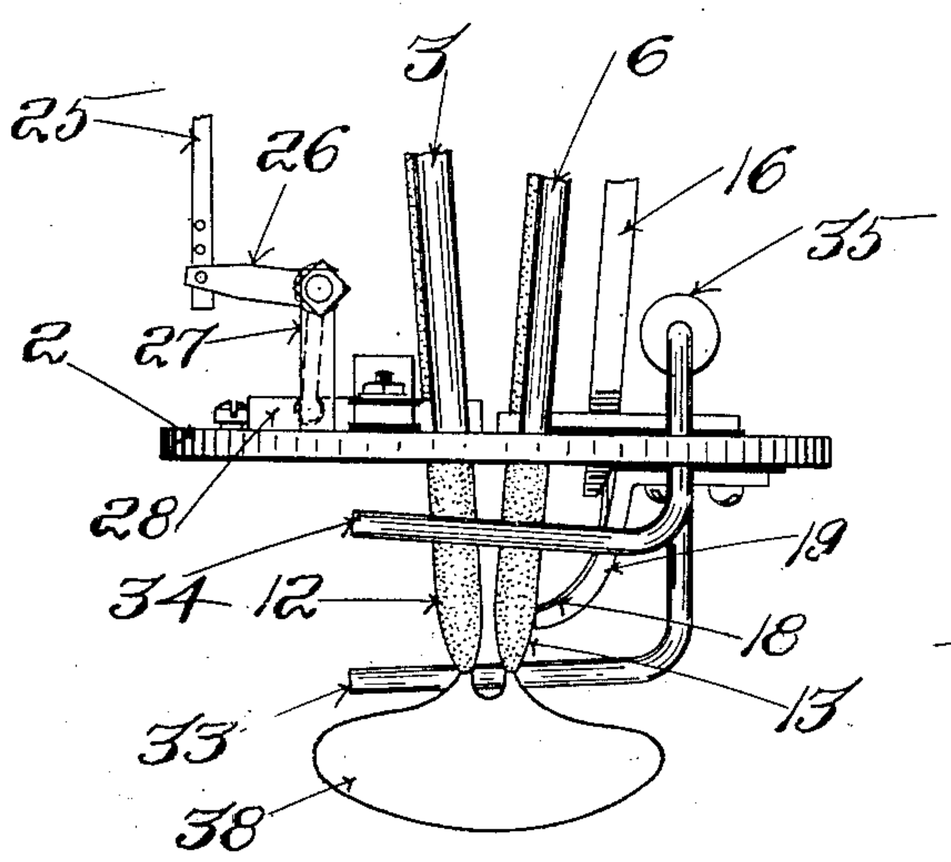


Fig. 4.

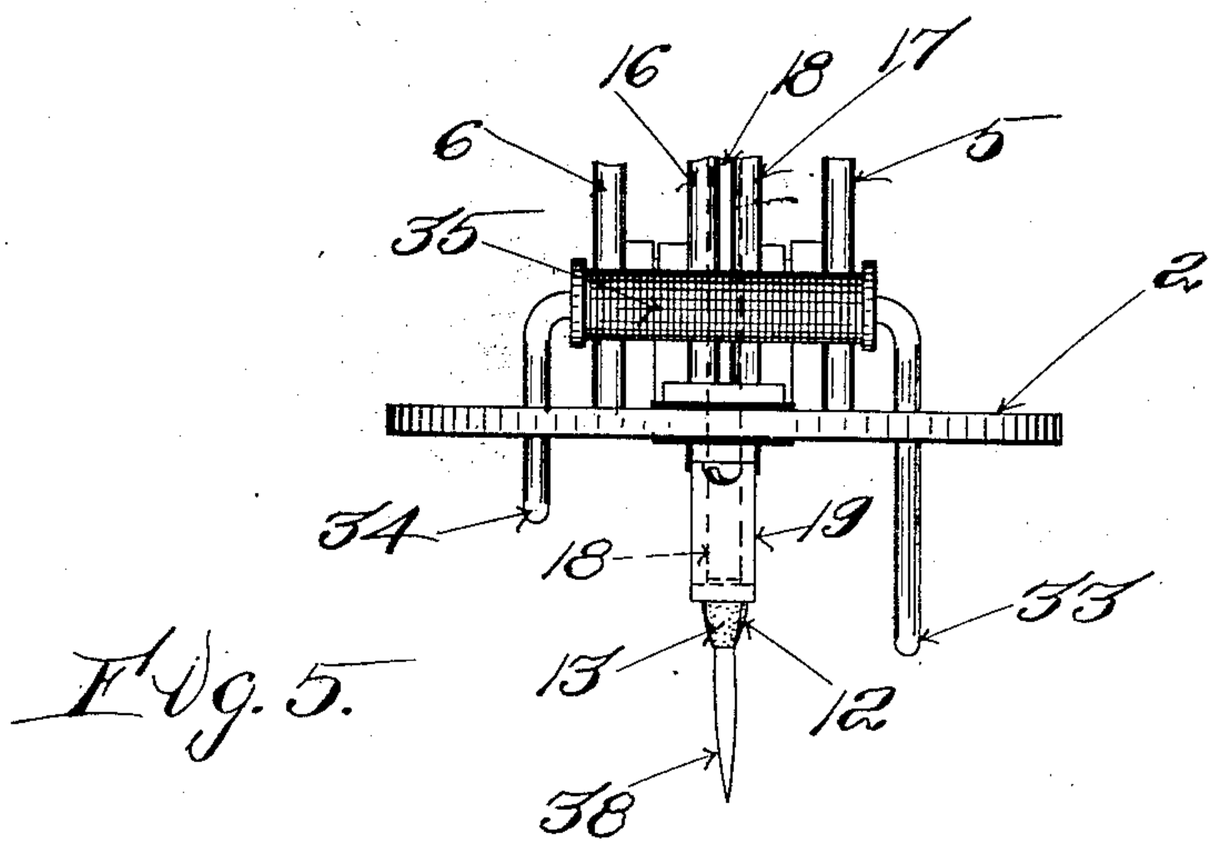


Fig. 5.

Witnesses:
John H. Parker
Alvie Farr

Inventor:
Charles H. Sprague
by Macleod, Calvin, Copeland & Dike
Attorneys.

UNITED STATES PATENT OFFICE.

CHARLES H. SPRAGUE, OF NEWTON, MASSACHUSETTS, ASSIGNOR TO STARBUCK SPRAGUE, OF BOSTON, MASSACHUSETTS.

ARC-LAMP.

967,684. Specification of Letters Patent. Patented Aug. 16, 1910.

Application filed July 16, 1908. Serial No. 443,798.

To all whom it may concern:

Be it known that I, CHARLES H. SPRAGUE, citizen of the United States, residing at Newton, in the county of Middlesex and State of Massachusetts, have invented a certain new and useful Improvement in Arc-Lamps, of which the following is a specification, reference being had therein to the accompanying drawings.

The invention relates especially to feed mechanism or mechanism for regulating the feed of the electrodes.

The feed regulating mechanism is especially adapted to lamps in which there is a pair of downwardly pointed converging electrodes whose converging points contact with each other before they are separated to form the arc, the electrodes being secured at their upper ends to holders which are tied together or to a common holder which is supported upon the upper end of a movable strip, tube or bar of aluminum or other material which fuses at a lower temperature than that at which the electrode fuses or disintegrates and which is so arranged that the lower end thereof engages one of the electrodes at a point above the arc and the strip is thereby prevented from moving downward until the end of the strip is fused and which is fused by the heat generated by the arc, thereby allowing the strip to move downward as fast as it fuses and thereby also permitting the feed of the two electrodes.

In the following specification, the invention is described as embodied in a lamp in which a pair of downwardly pointed converging electrodes is employed, but it will be seen that the invention may be otherwise embodied.

The invention will be fully understood from the following description taken in connection with the accompanying drawings, and the novel features are pointed out and clearly defined in the claims at the close of the specification.

In the drawings,—Figure 1 is a side elevation of a lamp embodying my invention. Fig. 2 is an elevation at right angles with Fig. 1. Fig. 3 is a section on line 3—3 of Fig. 1. Fig. 4 is a view of the lower portion of the lamp, the carbons being separated and the arc formed. Fig. 5 is a view taken at right angles to the view shown in Fig. 4.

Referring to the drawings,—1 and 2 are respectively the top and bottom plates for supporting the apparatus and are connected by the rods 3, 4, 5, 6, which converge toward each other from the top toward the bottom, and on which slide the cross-bars to which the electrode holders are attached, the holder 7 being attached to the cross-bar 8 which runs on the rods 3, 4, and the holder 9 being attached to the cross bar 10 which slides on the rods 5, 6. The cross bar 8 is hung from a bar 11 which is attached rigidly to the cross bar 10 in well known manner to cause the two electrode holders to move in unison. The positive electrode 12 is mounted in the holder 7 and the negative electrode 13 is mounted in the holder 9, the two electrodes converging toward each other downward so that normally their lower ends will be in contact with each other. A strip or bar 18 of aluminum or other suitable metal which fuses at a lower temperature than that at which the electrode fuses is slidably mounted in grooves 14, 15, in the parallel rods 16, 17.

Projecting from the electrode holder is a pin or other suitable projection 46 which rests upon the upper end of the strip 18, thereby preventing the holder and the connected cross bars and their electrodes from descending except as fast as the fusible strip descends, so that the downward movement of the electrode is controlled by the movement of the fusible strip.

The lower end of this strip passes down a curved guide 19 which is of copper or some other not easily fused material and presses against the electrode 13 at a point above the arc; that is, a little above the lower end of the electrodes at the point where the two electrodes are in contact with each other before the arc is formed. The strip 18 is prevented by its engagement with the electrode 13 from slipping down, until the electrode 13 has fused or disintegrated up to a point somewhat below the point of contact of the fusible strip with the electrode. It is then slightly fused at its lower end and this allows the remainder of the strip 18 to descend slightly being carried down by the weight of the holders and the electrodes.

It will be seen that the electrodes 12 and 13 can descend only as fast as the fusible strip 18 descends and that the rapidity of descent of the said fusible strip 18 is dependent upon the rapidity with which the

electrodes are consumed so that the arc moves up toward the point of contact of the fusible strip with the electrode and fuses the end of the fusible strip, thereby allowing the fusible strip to descend. While the above movement has been described as a step by step movement, it is found in practice that the movement is apparently a continuous one, the steps and the interval of time between them being infinitesimal.

Since the two electrodes 12 and 13 converge toward their lower ends, as has been previously described, they tend to keep in contact with each other; consequently it is necessary that starting mechanism be provided by means of which the electrodes may be moved out of contact with each other after the current has begun to pass through them in order that the arc may be formed. In order that the arc may not be broken which is likely to occur if the carbons are suddenly separated, it is desirable that the separation of the electrodes be accomplished by as gentle and steady a movement of the electrode as is possible. This desirable result is accomplished in the following manner. On the top plate 1, is supported a solenoid 20 provided with a movable core 21 which is tubular in form and furnished at its upper end with a piston 22 moving in a dash pot 23 supported at 24 on the top plate 1. The piston of the dash pot is directly connected to the end of the said core and serves to retard and equalize the movement of the solenoid which would otherwise be sudden and unsteady. The core 21 acts upon the electrode 12 by means of a connecting rod 25, a bell crank lever 26 supported in posts 27 on the bottom plate 2 and a sliding yoke 28 which engages the lower end of the electrode 12 and is slidably mounted on the bottom plate 2. The sliding yoke 28 is made either wholly or in part of some insulating but heat resisting material such as soap stone. When the core 21 is lifted by the solenoid 20, the bell crank lever 26 is caused to turn slightly about its pivot and the electrode 12 is pulled away from the other electrode 13. As long as the current continues to pass through the solenoid 20, the core 21 is held up and the electrodes are kept out of contact, but as soon as the current ceases to pass through the solenoid, the continues to pass through the solenoid 20, with the other electrode 13.

In order that the movement of the electrode 12 toward and from the other electrode may be still slower and gentler than would be possible if the connecting rod 25 were rigidly connected to the core 21, I provide a loose connection between the said core 21 and the said connecting rod 25 which greatly increases the smoothness of action of these parts. The tubular core 21 is tapped at its lower end as shown at 30 and a screw threaded thimble 31 is screwed in for the desired distance. Through this thimble 31 the upper end of the connecting rod 25 passes and is provided with a nut 32. About the connecting rod 25, is placed a spiral spring 26 and the parts are so adjusted that when at rest, a considerable space intervenes between the under side of the nut 32 and the upper end of the spring 26. The said spring 26 is a very flexible one so that it is capable of being compressed somewhat by the weight of the connecting rod 25 and connected parts. When the core 21 is lifted by the action of the solenoid 20, it moves for a distance equal to the space intervening between the under side of the nut 32 and the end of the spring 26 before the connecting rod 25 is moved at all, so that the electrode is not moved by the first movement of the core which is the quickest before any considerable compression in the dash pot has taken place. When the core 21 is moved far enough to cause the spring 26 to contact with the nut 32, the connecting rod 25 begins to be moved up very slowly and steadily as part of the movement of the core 21 is taken up by the spring 26 and at this time the core 21 is moving more slowly and smoothly than at the beginning of its movement. It will be seen, therefore, that the movement imparted to the electrode is very gentle and smooth so that great uniformity of action is attained.

By the term fuse or fusing or fusible as applied to the strip 18 both in the specification and claims I mean to include either melting or softening due to the heat.

I claim as my invention:

1. In an arc lamp having a pair of downwardly converging electrodes, a flexible strip of fusible material, two downwardly-extending rods adjacent to and parallel with each other, the said rods being formed with longitudinal grooves in their adjacent sides in which said fusible strip is slidably held, means for guiding the lower end of the strip into contact with one of said electrodes at a point near the arc and means for supporting one of the electrodes by said fusible strip whereby said electrode is prevented from feeding until the end of the strip is sufficiently heated to cause it to yield at its lower end.

2. In an arc lamp having a pair of downwardly converging electrodes, a strip of fusible material, two downwardly extending rods adjacent to and parallel with each other, the said rods being formed with longitudinal grooves in their adjacent sides in which said fusible strip is slidably held, a guide below the lower ends of said rods by which the said fusible strip is guided and held in contact with one of the electrodes, said guide being composed of material which is non fusible except at a temperature much

higher than that at which the said strip is fusible.

3. In an arc lamp having a pair of downwardly converging electrodes, a strip of fusible material, two downwardly extending rods adjacent to and parallel with each other, the said rods being formed with longitudinal grooves in their adjacent sides in which said fusible strip is slidably held, means for guiding the lower end of the strip into contact with one of said electrodes at a point near the arc, holders for said electrodes at their upper ends, means for connecting said holders together, one of said holders having a projection which rests upon the top of said fusible strip whereby the said electrodes are allowed to feed only when and as the fusible strip feeds.

4. In an arc lamp having a pair of downwardly hanging electrodes, holders for the upper ends of said electrodes, means for tying together said holders so that the electrodes shall feed simultaneously, a strip of fusible material, a holder for said fusible strip in which the fusible strip is adapted to slide, means for guiding the lower end of the fusible strip into contact with one of said electrodes at a point near the arc by which contact said fusible strip is prevented from downward movement until the strip is fused by the heat of the electrode, the holder for said electrode having a projection which rests upon the upper end of the fusible strip whereby the electrodes are prevented from feeding until the fusible strip moves downward.

In testimony whereof I affix my signature, in presence of two witnesses.

CHARLES H. SPRAGUE.

Witnesses:

HERBERT T. WILKINSON,

GEORGE P. DIKE.

Correction in Letters Patent No. 967,684.

It is hereby certified that in Letters Patent No. 967,684, granted August 16, 1910, upon the application of Charles H. Sprague, of Newton, Massachusetts, for an improvement in "Arc-Lamps," an error appears in the printed specification requiring correction as follows: Page 2, line 54, strike out the words and reference-numeral "continues to pass through the solenoid 20" and insert the words and reference-numeral *electrode 12 is allowed to come into contact;* and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 26th day of March, A. D., 1912.

[SEAL.]

C. C. BILLINGS,

Acting Commissioner of Patents.