(No Model.) 2 Sheets—Sheet 1.

J. A. SEAVERNS.

ELECTRIC ARC LAMP.

No. 554,542. Patented Feb. 11, 1896.

Fig. 5.

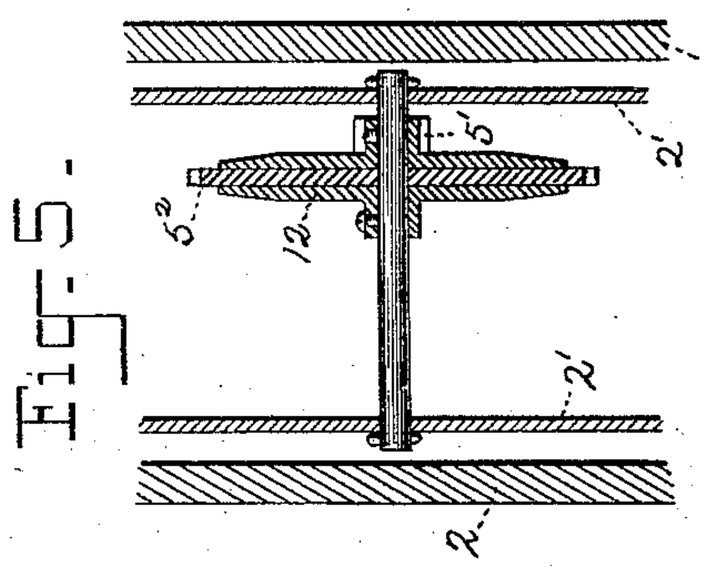

Fig. 1.

Witnesses.

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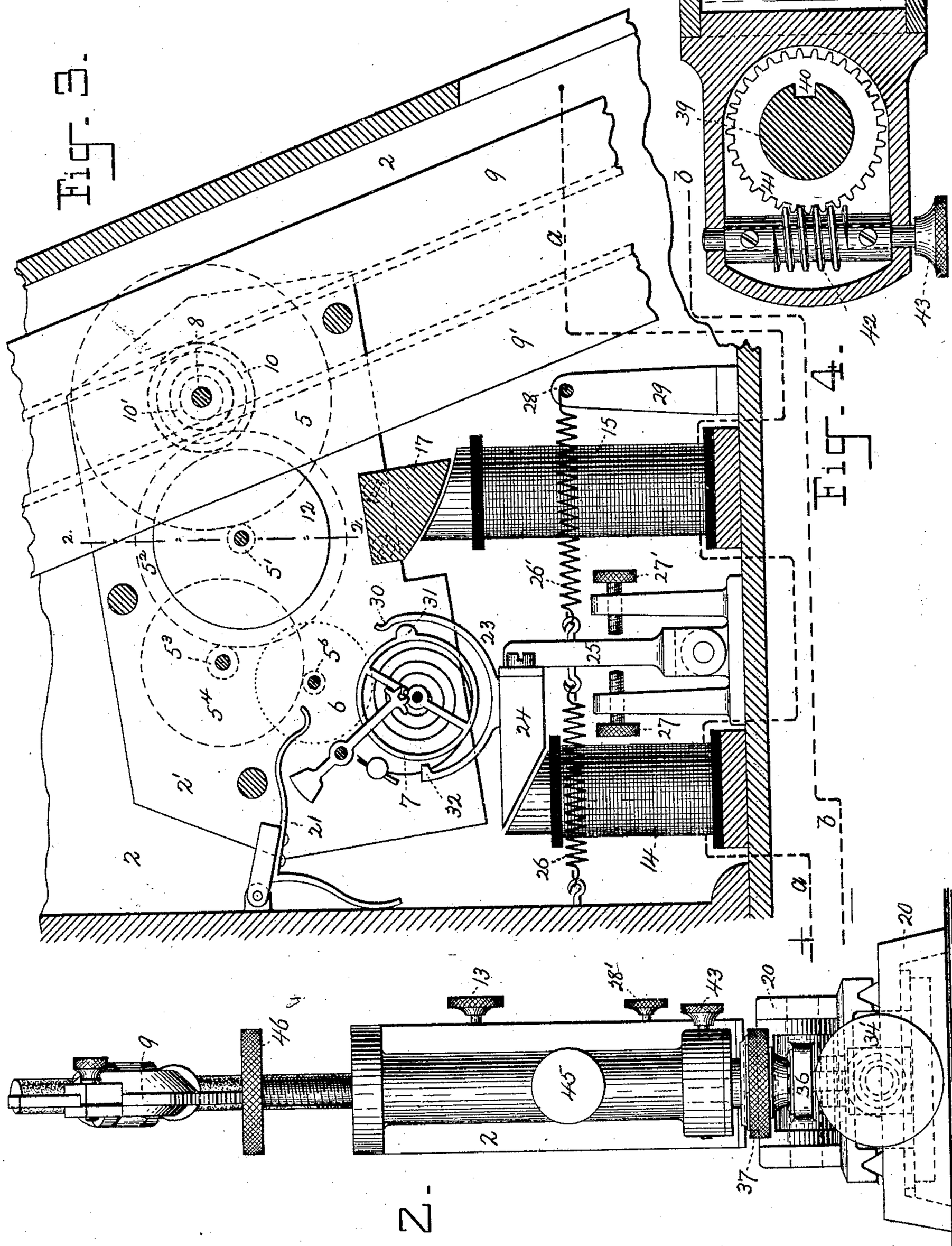

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UNITED STATES PATENT OFFICE.

JOHN A. SEAVERNS, OF BOSTON, MASSACHUSETTS.

ELECTRIC-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 554,542, dated February 11, 1896.

Application filed March 14, 1895. Serial No. 541,650. (No model.)

To all whom it may concern:

Be it known that I, JOHN A. SEAVERNS, a citizen of the United States, residing at Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Electric-Arc Lamps; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to figures and letters of reference marked thereon, which form a part of this specification.

This invention relates to arc lamps, particularly such as are designed for projection, and where a positive feed is of the most essential importance in order to maintain a steady light.

My improvements are embodied primarily in two carbon-holders which are fed forward by a clock mechanism. This clock mechanism, it is to be understood, is to be adjusted with regard to its rate of running in such manner that, providing the electric current is constant and the carbon homogeneous throughout, an electric arc of a uniform length shall be continuously maintained; but because these two conditions—the uniformity of the current and the homogeneity of the carbon—never coexist I have provided a controller. In this device is embodied the second portion of my invention, whereby a coil, through which the supply-current to the lamp is caused to pass, serves to change the regular predetermined rate of said clock mechanism, and, as a consequence, either cause said rate to be accelerated or be retarded in conformity with the then existing conditions, such as may occur through variations in the strength of the current or in the rate of impairment of the carbons, in order that the arc shall be continuously maintained. Thirdly, in dividing the train of the clock mechanism into two groups of parts which shall not have positive connection, and, further, that said two trains shall be united by some friction device. Fourthly, in weighting the balance-wheel, whereby the feeding mechanism is always in readiness to operate.

Other features and prominent characteristics will be hereinafter fully shown and described.

The drawings represent, in Figure 1, a longitudinal vertical sectional elevation of an electric-arc lamp embodying my invention. Fig. 2 is a rear end elevation. Fig. 3 is an enlarged side view in part. Fig. 4 is a horizontal section on line 1 1 in Fig. 1. Fig. 5 is an enlarged section on line 2 2 in Fig. 3.

The prominent features of this lamp comprise a closed metallic box 2 suitably mounted on a movable support 20. In said box is secured a casing 2′ to contain the train of an ordinary timepiece, while two obliquely-disposed carbon-holders 3 3′ externally disposed receive the carbons 4 4′, respectively positive and negative. The train of the timepiece is indicated at 5 5′ 5^2 5^3 5^4 5^6, while the escapement-wheel is at 6 and the balance-wheel at 7. The arbor 8 carries the mainspring and likewise serves as the pivot for the casing 2′ of the clock mechanism which oscillates thereupon, but within the box 2 at certain designated times, either when the lamp is lighted or extinguished. The feed movement of the carbon-holders may be effected manually or otherwise by means of two toothed racks 9 9′ in parallelism, which intermesh with two pinions 10 10′ affixed upon the arbor 8, the diameter of said pinions being so proportioned that the increased impairment or waste of the positive carbon with respect to the negative carbon in direct current (this being equal in alternating current) is compensated for and the arc is maintained relatively at a fixed point.

In the trimming of the lamp or in the act of renewing the carbons it is to be understood that the holders have necessarily approached. Hence they must be separated; but in order so to do, with the ordinary train arrangement of a clock, the same lapse of time would be required to separate them as was required for their approach. Hence the train is subdivided into two groups of parts which are interconnected only by friction-disks 12 12, (see Fig. 5,) but as the separation of the carbon-holders reverses the rotation of the arbor 8 the spring is necessarily rewound in part. Thus in the act of pushing the carbon-holders apart the spring of the clock mechanism is

automatically recoiled, while the gear-wheel 5^2, loose upon its shaft, is allowed to slip between the disks, and since said wheel now is stationary no disturbance or breaking of that portion of the train which contains the escapement can occur. The spring can be so wound and positioned with respect to the carbon-holders that only the central portion of said spring is actively employed, and thus a more uniform rate of movement is produced. A head 13 is attached exteriorly to the arbor for easy manipulation and control of the carbon-holders manually, if so desired. Moreover, upon the bottom of the casing 2 are disposed two series coils 14 15, both in the main feed-line, and these are suitably insulated from the lamp structure. It will further be seen that the lower-carbon holder is likewise insulated at 16. Hence the main feed-wire *a* may be attached at any convenient spot on the lamp structure, while the wire *b* for the outgoing current is made fast to the negative-carbon holder.

The upper end of the series coil 15 in the present instance is curved, which curve is preferably concentric with the lower end of a soft-iron plate 17, pendent from the bottom of the clock-casing 2′; but these adjacent surfaces may be flat if desired. Thus when the current enters the coil the entire casing 2′ is rocked, being pulled down by the action of the armature against the tension of the counterbalance-spring 18. This oscillation is sufficient to separate the carbons slightly, or such a distance as is necessary to establish an arc, while coincident with the rocking movement of the casing and timepiece a coil 19, connected in shunt, has lifted the stop-lever 21, and the train, under the impetus of the coiled mainspring, is now free to move at a predetermined rate of speed and will hereafter automatically maintain a constant length of arc, or such an arc as would be required for a perfectly constant current and carbons which are homogeneous throughout; but as these ideal conditions cannot continue, since the current varies, while the density of the carbons differs from time to time, I have provided a controller 23, in the shape of mechanism which is governed in its activity by the aid of a series coil 14, before mentioned. This controller is intended to serve to accelerate or retard the normal rate of the timepiece at certain moments when such feed (due to the then existing relations which may continue between the current and the carbons, or both the current and the carbons) shall exceed or lack the proper amount. To carry out this part of my invention I have affixed an armature 24 rigidly to a rocking post 25, the position of said post being accurately adjusted by springs 26 26′ or otherwise, while adjustable stops 27 27′ prevent excessive movement in either direction. One end of the spring 26′ is made fast to a rod 28, revoluble in an upright 29, while a head 28′, exteriorly of the box, enables the rod to be rotated, thereby controlling the tension of the springs 26 26′.

In order to cause the action of the current which passes through the series coil 14 to influence the oscillations of the balance-wheel, and thereby directly serve to control said balance-wheel and thus govern the timepiece in creating more or less feed movement to the carbon-holders, I have furnished the controller with a curved medium or element upon the armature 24, one end, 30, of said medium being flexible and is adapted to wipe against or contact with some portion of the balance-wheel. In the present instance this part of the wheel is in the shape of a boss 31. The opposite end, 32, is hooked inwardly in order that said end may engage at proper occasions with the boss 31. The contact of this medium at either end with the balance-wheel may depend upon the strength of the current or upon the density of the carbons singly or upon both these conditions jointly. Thus it will be understood that in case of rapid impairment of the carbons with a normal current, in which event the arc would become too great, or should the current be reduced suddenly under either or both such conditions, the feed must be increased when the springs serve to move the controller from the series coil, with the result that the hooked end 32 is thrust within the path of the boss on the balance-wheels. The oscillations of the latter are thus shortened and the rate of the timepiece is accelerated. Conversely under opposite conditions, or shortening of the arc, the controller is advanced over the series coil with the result that the spring end 30 is caused to wipe the boss and thus create more or less friction, in some instances merely causing a retardation, at other times a brief cessation, in the movement of the balance-wheel. In this way the normal-rate movement of the clock-train is retarded.

To provide universal adjustment for the various operating parts which comprise the lamp structure, as likewise to enable the position of the arc to be located in any desired spot accurately, the following instrumentalities are grouped and co-operate: Sliding movement of the support 20 in horizontal paths to and fro is produced by the screw-threaded rod 34, located in the base proper or standard 35. Vertical rocking adjustment is accomplished by the aid of the lever-arm 36 and adjusting-screw 37, the central point of oscillation being the pivot 38. Lateral or horizontal oscillations are obtained about the shaft or column 39, which is made fast to the support 20. This column is longitudinally splined at 40 (see Fig. 4) and is equipped with a worm-gear 41, the relative position of which remains unchanged, while a worm 42, operated by a hand-wheel 43, controls axial movement of the columns. This spline-and-groove connection is to enable the raising or lowering of the lamp structure in right-line paths of

travel—that is, to enable the gear 41 to slide upon the column—while the operation of the worm 42 compels the lamp structure to swing bodily with it.

In raising the lamp structure the set-screw 45 is relaxed, when the lamp and its various operating parts are caused to slide upward by turning the lifting-screw 46. The set-screw 45 is again made fast, and thereby prevents accidental movements.

In the operation of shutting off the current and extinguishing the light, cessation of the current through the series coil 15 releases the armature 17, when the spring 18 lifts the casing 2′, which rocks upon its arbor, causing by this slight movement a feed action which again brings the carbons in contact or very nearly so. Absence of current also renders the shunt-coil 19 inoperative, and the stop-lever 21 heretofore held from engagement with the escape-wheel now drops by gravity and the entire clock mechanism is brought to a standstill. At the same time the series coil 14 which actuates the controller 23 is likewise rendered inactive and the spring 26′ pulls the post 25 against the adjusting-pin 27′. The position of the boss 31 on the balance-wheel is so arranged that the said wheel is in readiness to start at any point in any portion of an oscillation. Hence when release of the stop-lever occurs positive movement of the balance-wheel takes place and the train is in motion.

In the drawings, Fig. 1, the lamp structure and the various co-operating elements are in their normal inactive positions prior to the admission of the current.

In Fig. 3 the casing containing the clock mechanism is in a depressed position and the balance-wheel is brought within the controller to permit the latter to govern its movement during the admission of the current.

What I claim is—

1. In an arc lamp the combination with carbon-holders, and a clock mechanism adjusted for a predetermined rate, whereby the holders are caused to advance toward each other, of a coil adapted to govern the clock mechanism and cause an acceleration or retardation of its normal rate, whereby the arc may be continuously maintained, substantially as and for purposes explained.

2. In an arc lamp the combination with carbon-holders, a clock mechanism having a predetermined rate to advance said holders together, and an oscillating frame adapted to rock at stated times, of a series coil, and a controller governed by said coil whereby the normal rate of the clock mechanism is accelerated or retarded, substantially as stated.

3. The combination with two carbon-holders, clock mechanism suitably mounted and adjusted to a predetermined rate, a balance-wheel and two toothed racks which carry said holders, of differential toothed gears operated by the clock-train to produce different feed-travel in the carbon-holders, a series coil, and mechanism from said coil to the balance-wheel, whereby the predetermined rate of the clock mechanism is caused to vary, substantially as specified.

4. In combination with a suitable standard, and carbon-holders movably attached, a rocking frame mounted therein, and clock mechanism with a weighted balance-wheel in the frame, a series coil adapted to rock said frame and temporarily retract the carbons by the agency of the clock-train upon admission of the current through the series coil, substantially as described.

5. In an arc lamp, the combination with two carbon-holders, a timepiece adjusted to a predetermined rate of speed, and a balance-wheel in said clock provided with a boss, of a series coil, and a controller governed by the current through the said coil, whereby said controller is caused to accelerate or retard the movements of the balance-wheel, substantially as set forth.

6. In an electric-arc lamp, a timepiece adjusted to a predetermined rate of speed, two carbon-holders actuated by said timepiece, and a weighted balance-wheel on said timepiece, combined with a controller having a friction end and a stop end respectively to retard or accelerate said balance-wheel, and a series coil adapted to govern the controller with respect to the balance-wheel, substantially as specified.

7. In an arc lamp, the combination with two carbon-holders, an oscillating frame adapted to rock at stated times, a series coil, and a controller governed by said coil, of a clock-train, and a weighted balance-wheel, said clock-train comprising two portions frictionally united, whereby the carbon-holders may be separated without operating the balance-wheel of the train, substantially as described.

8. In an electric-arc-lamp structure, two carbon-holders, a series coil, a controller governed by said coil, and a rocking frame, combined with a clock mechanism located in said frame, a weighted balance-wheel therefor, and means to cause said frame to swing, whereby the balance-wheel and the controller are permitted to engage at stated intervals, substantially as herein set forth.

9. In an arc lamp, two carbon-holders, a timepiece to actuate the holders, a controller to engage the balance-wheel, and a series coil which governs the controller, combined with a second series coil adapted to bring the controller and balance-wheel together to enable them to co-operate, and a stop-lever operated by a short circuit to stop or start the mechanism, substantially as stated.

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

JOHN A. SEAVERNS.

Witnesses:

EBENEZER ADAMS,

HENRY E. LODGE.