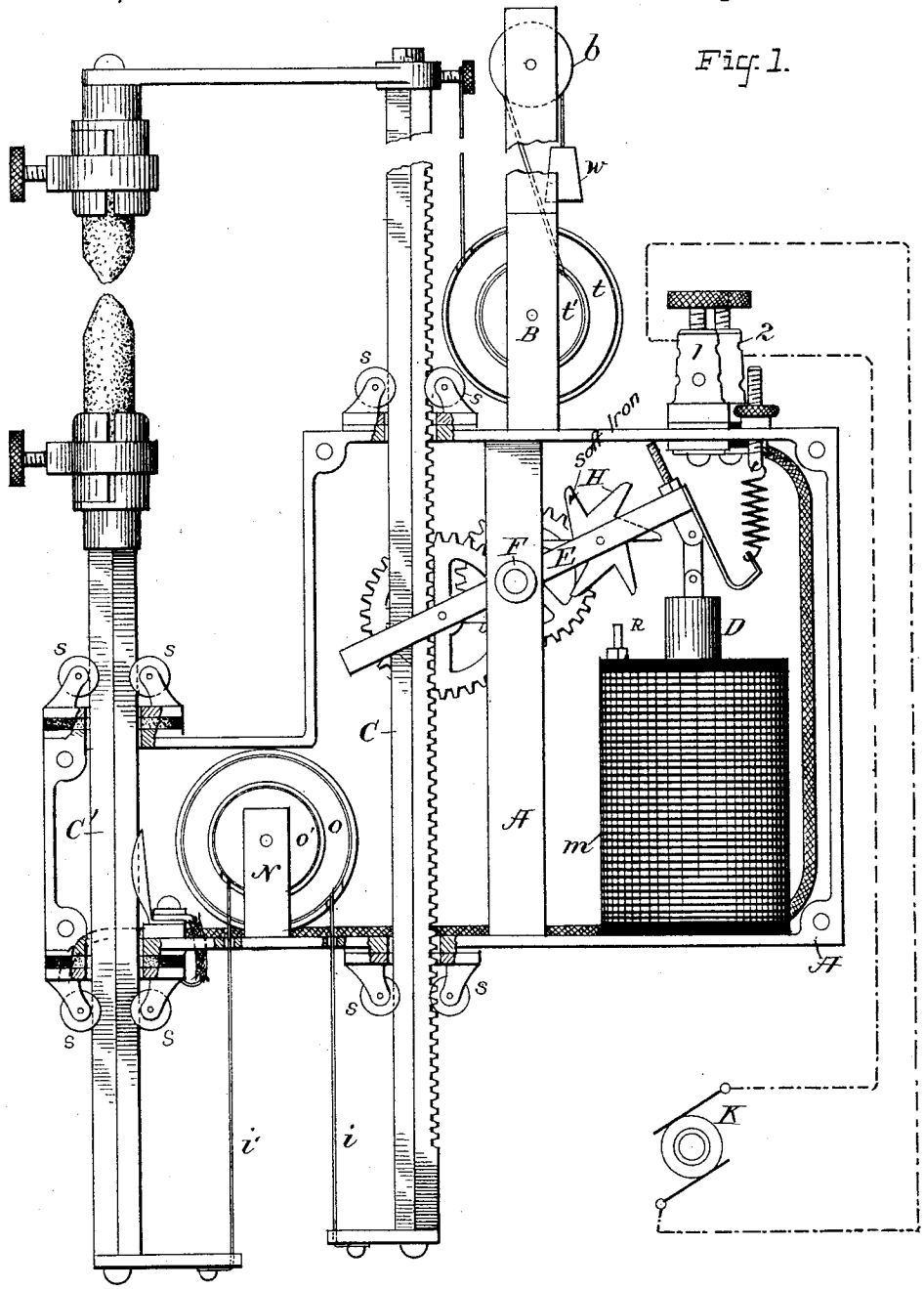
(No Model.) 2 Sheets—Sheet 1.

B. B. WARD.

ELECTRIC ARC LAMP.

No. 458,876. Patented Sept. 1, 1891.

Fig. 1.



ATTEST:

J. H. Hurdle

J. Richard Scott.

INVENTOR:

Barton B. Ward

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

(No Model.) 2 Sheets—Sheet 2.

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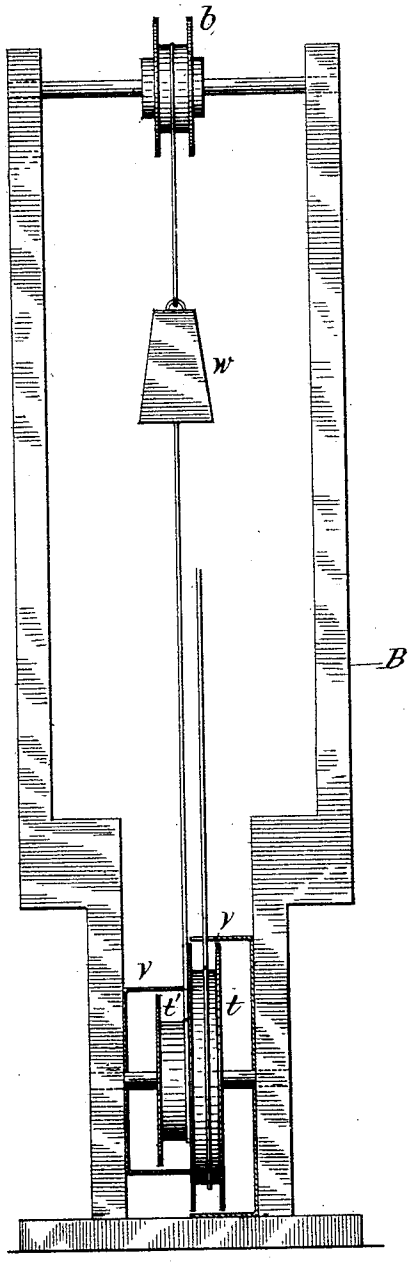
Fig. 2.



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INVENTOR:

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UNITED STATES PATENT OFFICE.

BARTON BREWER WARD, OF NEW YORK, N. Y., ASSIGNOR TO THE SCOTT ELECTRICAL MANUFACTURING COMPANY, OF NEW JERSEY.

ELECTRIC-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 458,876, dated September 1, 1891.

Application filed January 30, 1890. Serial No. 338,687. (No model.)

To all whom it may concern:

Be it known that I, BARTON BREWER WARD, a citizen of the Dominion of Canada, residing at the city of New York, State of New York, have invented certain new and useful Improvements in Electric-Arc Lamps, of which the following is a specification.

My invention relates to improvements in electric focusing arc lamps adapted to be used in conjunction with a parabolic reflector of a search-light; and the objects of my improvements are, first, to provide an automatic focusing light in which there will be uniformity in the feed of the carbons at all angular positions from below a horizontal to a vertical position, and, second, to reduce the friction of the rods carrying the carbons. I attain these objects by the mechanism illustrated in the accompanying drawings, in which—

Figure 1 is a side elevation of the entire lamp, showing part section. Fig. 2 is an end plan of the mechanism that furnishes the power to feed the carbons together.

Similar letters refer to similar parts in the different views.

In Fig. 1 the frame A, through which the carbon-rods C and C′ pass and are guided and held in position by the anti-friction wheels S, with the power weight-supporting frame B, constitutes the frame-work of the lamp. The rod or rack C, carrying the positive carbon, has a motion downward or toward the base of the lamp, while the rod C′, carrying the negative carbon, has a motion in the opposite direction, and the proportion with which the rods feed the carbon toward each other is controlled by the cords *i* and *i′*, attached to their lower ends and passing over the pulleys *o* and *o′*, which are rigidly fastened together on the same shaft and supported by the frame N, fastened in the base of the lamp and in which the shaft is free to turn, the cord *i*, attached to the rack C, passing over the larger wheel *o*, and the cord *i′*, attached to the rod C′, passing over the smaller wheel *o′*, and as rack C is moved downward its cord is wound off wheel *o*, while the cord *i′* of rod C′ is wound on *o′* by the motion of C′ while traveling toward the base of the lamp.

To accomplish the purpose of my invention it is necessary to have the rod C′ solid or extra weight (not shown) added to it, so that its weight with its carbon will be related to the weight of the rack C with its carbon, so that the two rods will form a balance while in a vertical position. The weight of the rod and attached carbons being balanced against one another, as described, there will be no difference in the tendency of the carbons to feed toward one another when the lamp is upright and when it is tilted over to an angular position, as there would be if the weight of one of said rods were depended upon to feed the carbons or if one of them were heavier than the other, so as to have a tendency either to feed or to separate them. As the weight of the racks or rods and the carbons is balanced, it is also obvious that there will be no difference in the power required to separate them in different angular positions of the lamp.

Now it will be seen that means must be provided to feed the carbons together, as they stand still, so far as gravity is concerned. This I accomplish by the use of some supplemental force or power, such as that of a weight W, applied so as to tend to cause the carbons to bridge one another. The weight W and the intermediate mechanism connecting the same with the carbon-rod C are mounted in a frame B, secured to the lamp-frame A behind the rack-rod C. The power of the weight W is communicated to the rack C in a manner to force the same down toward the opposite or lower carbon through wheels *t*, *t′*, and *b*, which are mounted in the frame B and have cords attached to them, the cord of *t* being fastened, as shown, at or near the top of the rod C, while the cord of *t′* passes over wheel *b* to the weight W. The wheels *t* and *t′* are set in the frame B and secured to a shaft in the same manner as *o* and *o′*, the third wheel *b* being an idler, over which the cord carrying the weight W passes, the function of weight W being in all positions of the lamp to cause the carbon-rods to feed together, forming a continual strain downward on rack C.

The purpose of making the wheels *t* and *t′* of different diameters is to reduce the total distance which the weight W travels. The proportion in any case is adapted to the space allowed in the cylinder of the search-light or purpose used.

One of the purposes of this invention is to adapt the lamp to feed the carbons together and maintain the arc in the proper focus while

the light is being projected in a vertical or horizontal line. It has been shown how the lamp will feed while in a vertical position, allowing the rods carrying the carbons to be balanced and power supplied to feed them together from other sources than gravity of the rods. Now we will imagine the lamp turned in a horizontal position with the carbon points uppermost. In this position it will be seen the weight of the lower rod is subtracted, also the weight of the upper rod, as is also the weight of the magnet-core; but more friction is added to the rods in moving toward each other. This friction is about equal to the weight of the magnet-core while in a vertical position, and to further reduce this friction the grooved wheels S are made to entirely support and guide the square rods, thus reducing the friction to a minimum. The weight W, while the lamp is in a horizontal position, is free to swing out and maintain the same strain as when in a vertical position.

In Fig. 2 the construction of the frame B and the arrangement of the cord in relation to the wheels and their construction are more fully shown, the wheels *t* and *t'* being in every way like *o* and *o'*, each wheel having its own cord and provided with a cap *v* to hold the cord in place should it be suddenly slackened. The lamp is provided with a magnet *m*, around which the current passes on its way to the arc from generator K, entering at binding-post 1, thence around the magnet to the frame of the lamp, to the rack C, and across the arc to the negative rod C', which is insulated from the frame of the lamp, and from the rod C' it passes by a wire to the binding-post 2 and back to the generator. As the current passes through magnet *m* it attracts its core D, which is attached by a link to the frame E, carrying a train of gearing and pivoted to the lamp-frame A at F. This train of gearing at its minimum-speed end engages with rack C, while its maximum-speed end is provided with a coarse toothed wheel H, made of magnetic metal. This wheel is placed in near proximity to core D and is attracted in proportion to the magnetic strength of core D, which varies in proportion to the resistance of the arc or current strength of magnet *m*. On the top of magnet *m* is a little piece R to lock wheel H. The purpose of using the magnetism of wheel H is to reduce its motion at the time of feeding the carbons together. The frame E is so pivoted at F that as current is turned on the lamp the core D is in a position to be attracted by magnet M, which motion is transmitted through frame E and its gearing, raising rack C and lowering rod C', causing the proper separation at the carbon points, and as the resistance increases at the arc and less current passes the core D will recede and decrease in magnetic strength and allow wheel H to unlock and revolve in a direction to allow the rods C and C' to feed together.

It is obvious that in place of the special form or construction of gear train and releasing devices for permitting a feed of the carbon-rods or for moving the rods in a direction to separate the carbon any other form of carbon-separating and feed-regulating devices might be used without changing the operation of the other parts of the apparatus, and I do not therefore limit myself to the special carbon-separating and feed-regulating devices described and shown.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The combination, with the carbon-carrying rods in a focusing arc lamp, of a weight W, hung from the cord which passes over a pulley-wheel, and intermediate mechanism between the cord and upper-carbon rod, whereby the latter may be fed downward by the upward pull of the cord.

2. The combination, with the two carbon-carrying rods C C' for a focusing arc lamp, of intermediate mechanism for producing the proper relative movement of said rods, and a supplemental weight W, suspended from a cord passing over a wheel and properly connected to one of said rods for causing the two carbons to feed together when released from the regulating mechanism.

3. The combination, in a focusing arc lamp, of a feed-regulating magnet, a frame carrying feed-regulating mechanism engaging with the carbon-carrying rod, a supplemental feeding-weight W, suspended from a cord passing over a pulley, and intermediate mechanism for reducing the travel of the weight as compared with the carbon-carrying rod.

4. The combination, in an electric focusing arc lamp, of a frame A, a magnet having a core D suspended from said frame, the connected carbon-carrying rods C C', one of which gears with the wheel-work carried by the frame which supports the magnet-core, wheels *o o'*, the cords *i i'*, connecting with the carbon-carrying rods, weight W, wheels *t t'*, and cords connecting with the weight W and with the carbon-carrying rods C, as and for the purpose described.

5. The combination, in an electric focusing arc lamp, of two carbon-carriers, intermediate mechanism for producing the proper relative movement of the same, a frame carrying wheels *t*, *t'*, and *b*, the weight connected to a cord passing over the wheel *b* and attached to wheel *t'*, and a second cord connected at one end to one of the carbon-carriers and attached at its other to the wheel *t*, as and for the purpose described.

6. In an electric-arc lamp, a toothed wheel H, of magnetic material, connected to the feed-gear train and mounted in position near the lamp-magnet, as and for the purpose described.

BARTON BREWER WARD.

Witnesses:
J. GRAHAM SCOTT,
THOS. I. MCLEOD.