No. 675,033. Patented May 28, 1901.

C. A. M. BÖRNER.

ELECTRIC ARC LAMP.

(Application filed July 24, 1900.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

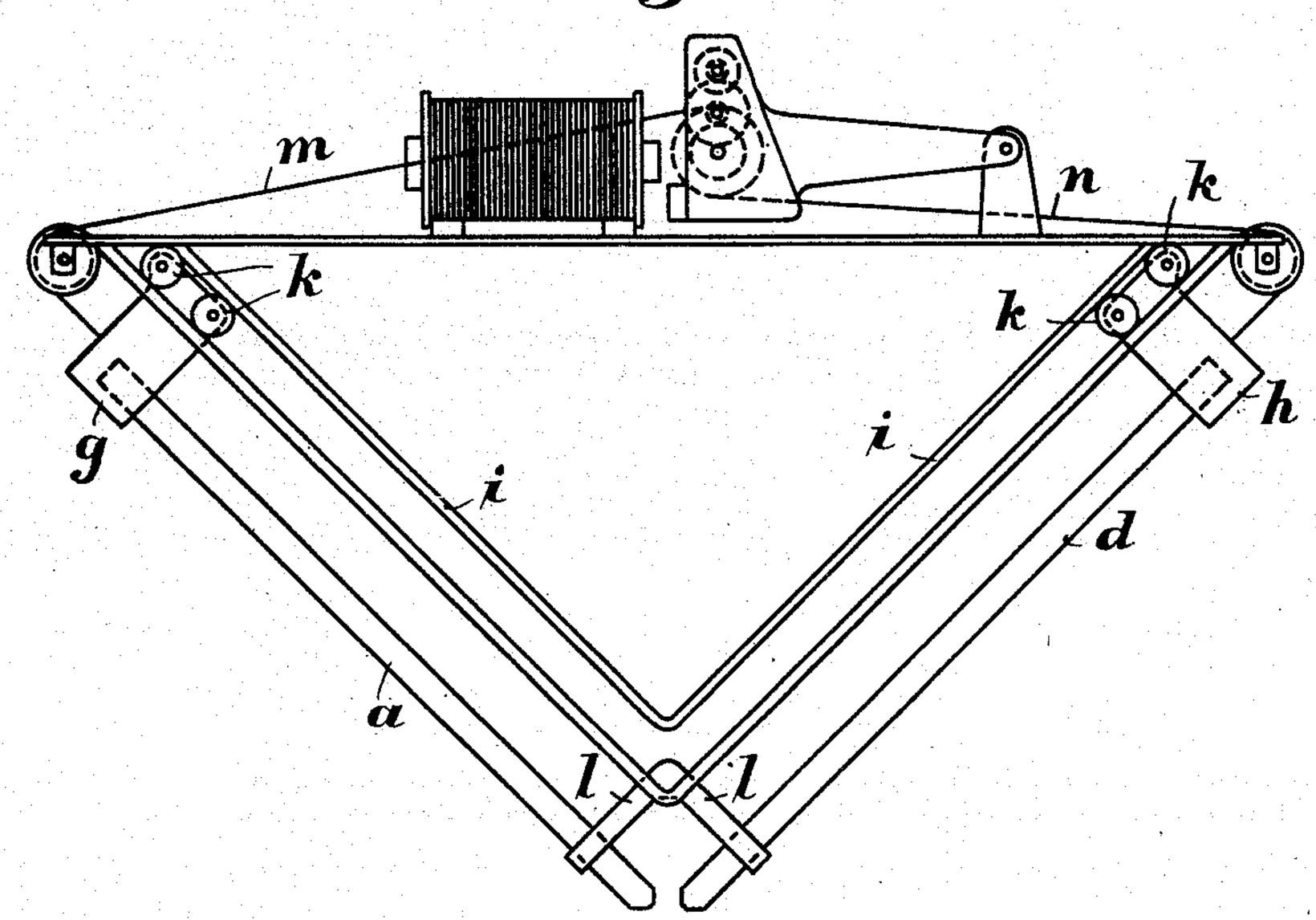

Fig. 2.

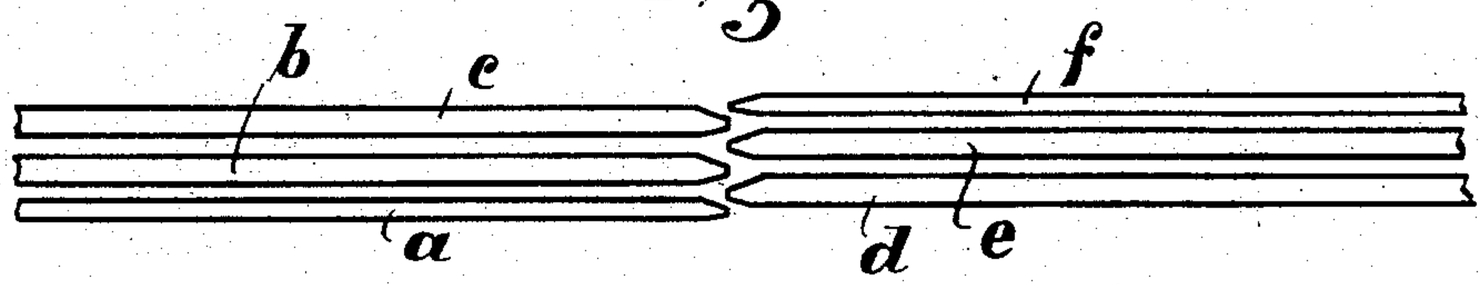

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Fig. 3.

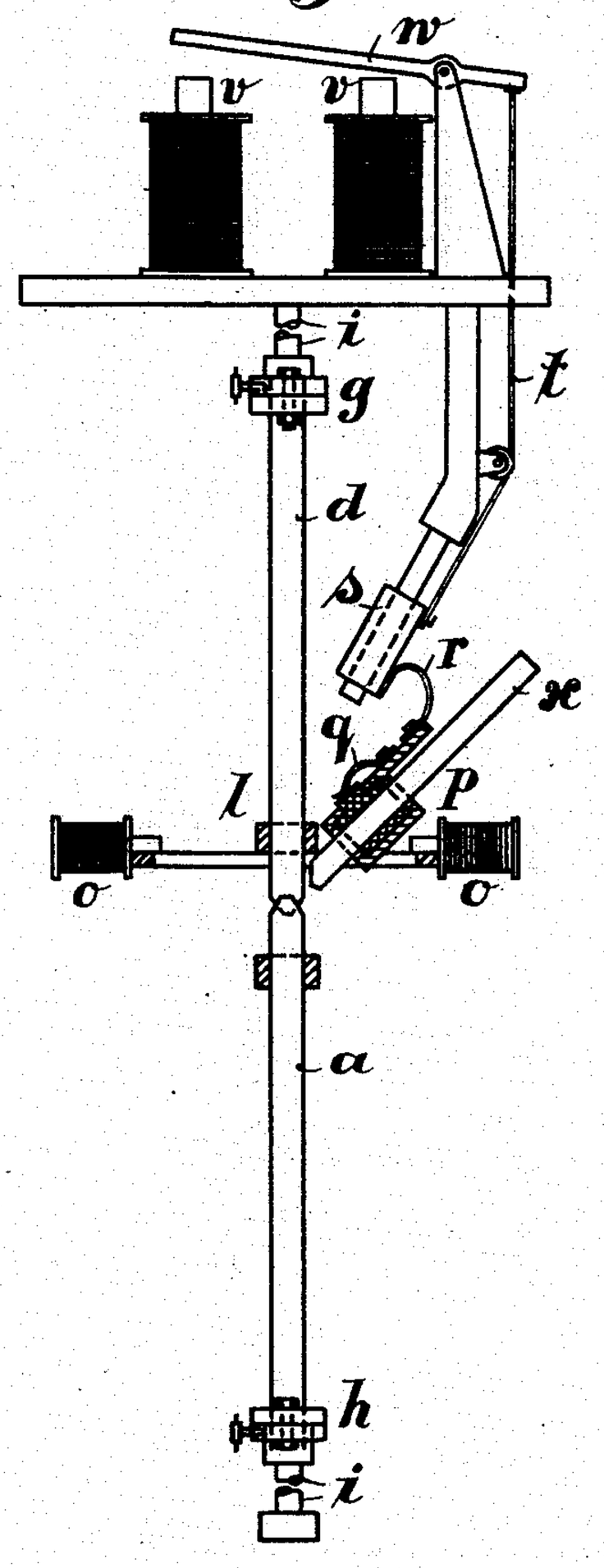
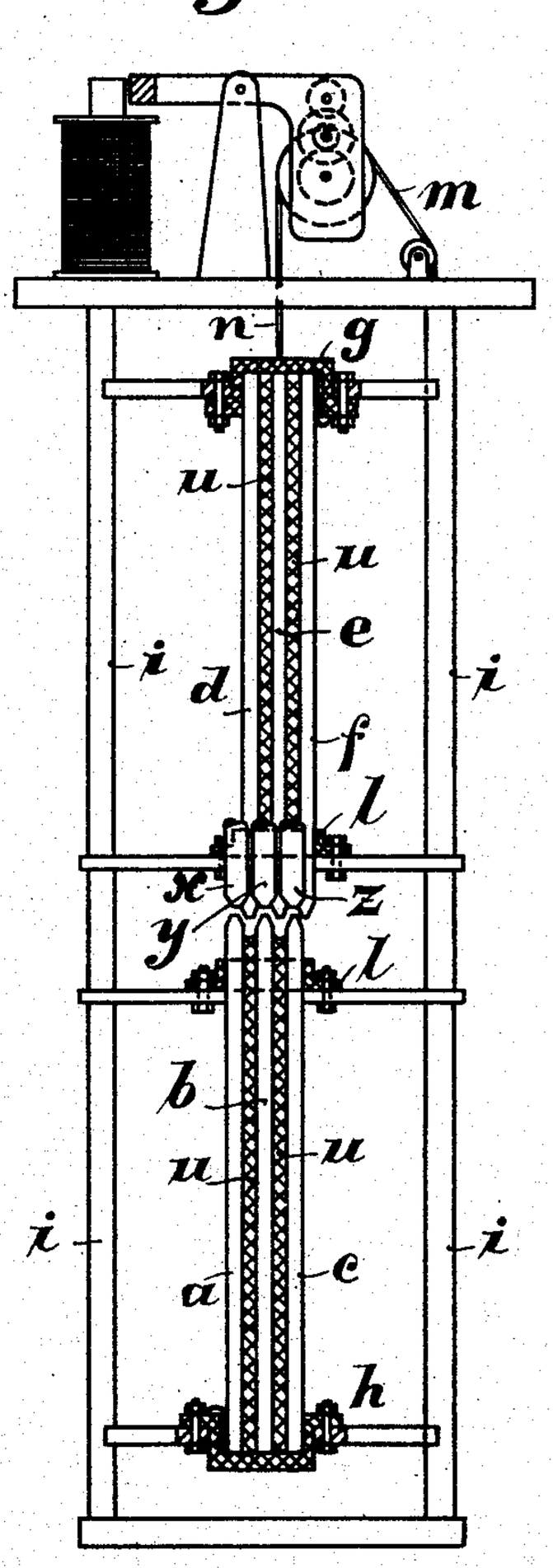


Fig. 4.



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UNITED STATES PATENT OFFICE.

CURT ARTHUR MAX BÖRNER, OF BERLIN, GERMANY.

ELECTRIC-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 675,033, dated May 28, 1901.

Application filed July 24, 1900. Serial No. 24,683. (No model.)

To all whom it may concern:

Be it known that I, CURT ARTHUR MAX BÖRNER, engineer, a subject of the King of Prussia, German Emperor, residing at the city of Berlin, in the Kingdom of Prussia, German Empire, have invented certain new and useful Improvements in Electric-Arc Lamps, of which the following is a full, clear, and exact description.

The present invention relates to an electric-arc lamp designed for high voltage.

The novelty consists in the arrangement of two rows of carbons placed unsymmetrically opposite one another, which carbons after a small portion has been consumed can slide past one another and between which the electric arc runs zigzag, the current entering at the outermost carbon at one side of one row and passing out again at the opposite side at the outermost carbon. Moreover, all the carbons are controlled by a single regulating apparatus which adjusts the distance between the points according to the rate of consumption of the carbons. In order to strike the arc, there may also be employed, according to the present invention, a third row of carbons which make contact in the zigzag line between the two rows of incandescent carbons and after causing incandescence are withdrawn automatically. These ignition-carbons are insulated and placed singly in spring-holders. They then first touch the incandescent carbons of one row and then when moved farther they touch the incandescent carbons of the other row. The current passing zigzag through the incandescent carbons then excites an electromagnet which withdraws the ignition-carbons after the arc has been struck.

In order that the ignition-carbons can be moved forward as they are consumed, they are adjustably arranged in their holders.

Two forms of construction of the new lamp are illustrated in the accompanying drawings, in which—

Figure 1 shows the arc-lamp with the two rows of carbons set at right angles to one another. Fig. 2 illustrates the respective positions of the carbons in plan view. Fig. 3 shows in side elevation an arc-lamp with the rows of carbons arranged vertically one above the other provided with a row of igniting-carbons. Fig. 4 is a front elevation of Fig. 3, in which for the better comprehension only the tips of the ignition-carbons are shown.

In the arc-lamp illustrated in Fig. 1 the various carbons *a b c d e f* are arranged in two rows, so that the carbons of one row alternate with those of the other row. Owing to this arrangement the carbons after a small part has been consumed can slip past one another as far as they are not held fast in their position. The two rows of carbons are inclined at about right angles and inserted in the carbon-holders *g* and *h*, so that the single carbons may be slightly retractable in order to form the contact more securely. The carbon-holders are guided on the rails *i* and preferably provided with friction-rollers *k*. For more safely guiding the ends which are turned toward the electric arc the bridges *l*, of fireproof insulating material, are fixed on the rails *i*. The carbon-holders *g* and *h* are suspended by the cords *m* and *n*, which are gradually unwound from a roller of the regulating apparatus during the burning of the lamp. The regulating device is actuated in the usual manner by means of an electromagnet, the current strength of which varies according to the potential prevailing in the voltaic arc. The current enters at the outermost carbon *a* at one side of the one row and passes out again at the opposite side at the outermost carbon *f*. The single carbons of each row are separated from one another either by air or by a suitable insulating material, so that the arc is always forced to run zigzag between the separate carbons. For greater intensity of current it is advisable to employ a deflecting-magnet, which continuously drives the voltaic arc toward the points of the carbons. Only one regulating device is necessary for the two rows of carbons. Even when the carbons are consumed unequally the lamp cannot become extinguished. A carbon-point which is not consumed in the same time as the others is burned most at the place where it is nearest to the other carbon-points. Consequently it can be moved forward equally with the others, only in this case a portion of the carbon-point may not be immediately consumed; but it cannot, as the carbons alternate with each other, prevent the advance of the carbons and will soon fall off. For the

same reason there can never be too great a length of arc, so that the arc cannot be interrupted.

In the arc-lamp illustrated in Figs. 3 and 4 the rows of carbons are arranged vertically one above the other and inserted in holders *g* and *h*, of insulating material, which holders are carried in the usual manner by rails *i*. At some distance from the arc are arranged the guides *l*, fixed to the rails *i*, made of fireproof insulating material. The carbon-holders *g* and *h* are suspended by cords *m* and *n*, which are raised or lowered according to the consumption of the carbons. The deflecting-magnets *o* tend to force the voltaic arc downward, and consequently prevent the arc from striking upward, owing to the draft of air. The igniting-carbons *x y z* are inclined at an angle of about forty-five degrees to the upper carbons. Each igniting-carbon is inserted in a holder *p*, coated with insulating material, so that the spring *q*, pressing on the insulating mass, firmly holds the carbon and allows of the adjustment in case of need of any single carbon. The holder *p* is attached by the spring *r* to the socket *s*, which can be moved by means of a flexible cord *t* in a direction which is inclined at about thirty degrees to the upper row of carbons. As long as the magnet *v* does not attract its armature *w* (formed as a lever) the carbons *x y z* are in contact with the carbons *d e f*. Owing to their spring-support the igniting-carbons *x y z* can slide along the carbons *d e f* until they also make contact with the carbons *a b c*. As soon as the current now flows zigzag from the carbon *a* to the carbon *f*, or vice versa, the magnet *w* attracts its armature so that the igniting-carbons *x y z* are withdrawn. As at the same time the two rows of the incandescent carbons are drawn apart, the striking of the arc is positively assured. In consequence of the igniting device described above the single carbons *a b c* need no longer bridge over the gaps of the carbons *d e f*. The gaps can therefore be larger than the opposite carbons, whereby a possible burning fast of the carbons is prevented.

The arc-lamps described are shown merely by way of example and can of course be modified in various ways without departing from the principle of the present invention. Instead of the cords employed and the regulating device illustrated any other suitable transmission and regulating means can be employed. The number of the carbons arranged in each row can be varied according to requirement. Furthermore, the carbons can be placed horizontally or inclined at any desired angle. The igniting device illustrated in Fig. 3 likewise admits of various modifications. As the ignition-carbon naturally undergoes very little wear it will therefore only require to be renewed at proportionately long periods, while the incandescent carbons, which frequently have to be replaced in the present invention, can be easily inserted and require no greater care than in the ordinary arc-lamps.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In an arc-lamp for high-tension currents, the combination of positive and negative electrodes, each consisting of a plurality of carbon pencils insulated and separated from each other in parallel rows, the pencil-points when fed together occupying a staggered relation, and an electric circuit including in series the outermost pencil on one side and the outermost pencil on the opposite side.

2. In an arc-lamp for high-tension currents, the combination of positive and negative electrodes each consisting of a plurality of carbon pencils insulated and separated from each other in parallel rows, the pencil-points when fed together occupying a staggered relation, an electric regulator operating one or both electrodes, and an electric circuit including in series the outermost pencil on one side and the outermost pencil on the opposite side.

3. In an arc-lamp for high-tension currents, the combination of positive and negative electrodes, each consisting of a plurality of carbon pencils insulated and separated from each other in parallel rows, the electrodes being normally separated, the pencil-points thereof occupying a staggered relation, means for striking the arc, and an electric circuit including in series the outermost pencil on one side and the outermost pencil on the opposite side.

In witness whereof I have hereuntò set my hand in presence of two witnesses.

CURT ARTHUR MAX BÖRNER.

Witnesses:
PAUL ZATTLASCH,
RICHARD BARZ.