No. 684,342. Patented Oct. 8, 1901.

M. H. BAKER.

REGULATING DEVICE FOR ARC LAMP CIRCUITS.

(Application filed Mar. 12, 1900. Renewed Mar. 9, 1901.)

(No Model.)

Fig. 1

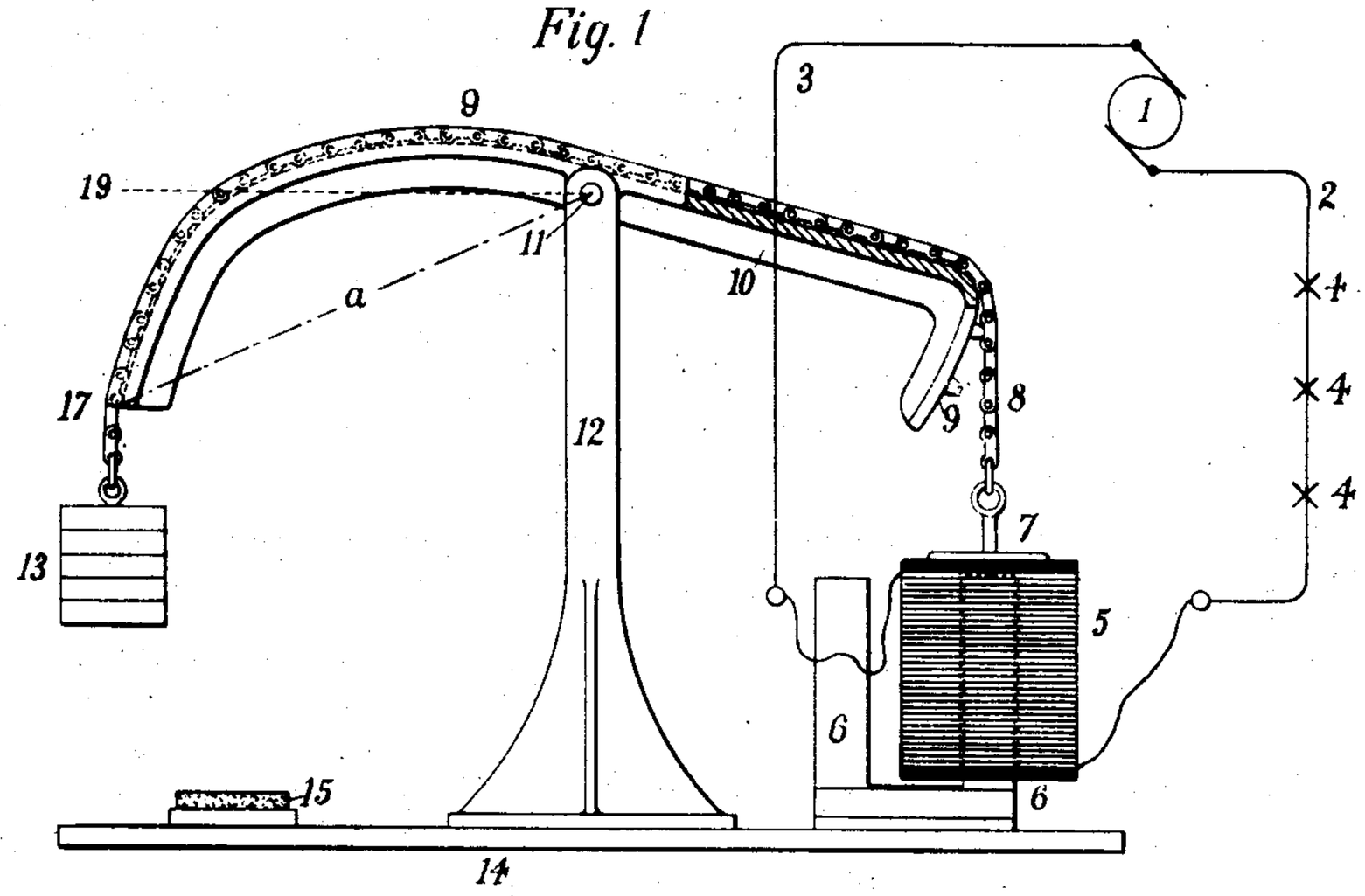
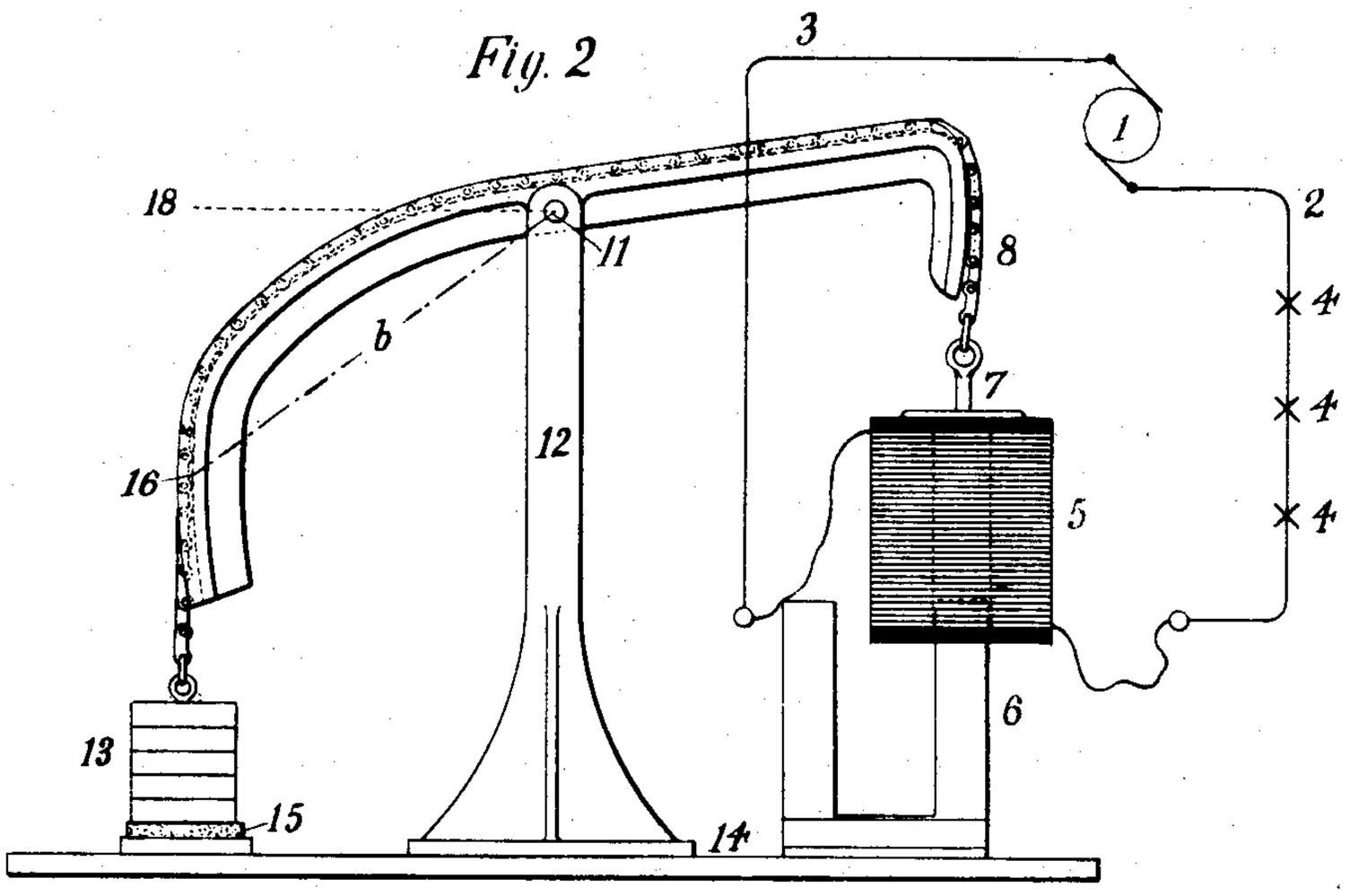


Fig. 2



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UNITED STATES PATENT OFFICE.

MALCOLM H. BAKER, OF NEW YORK, N. Y., ASSIGNOR TO THE MANHATTAN GENERAL CONSTRUCTION COMPANY, OF SAME PLACE.

REGULATING DEVICE FOR ARC-LAMP CIRCUITS.

SPECIFICATION forming part of Letters Patent No. 684,342, dated October 8, 1901.

Application filed March 12, 1900. Renewed March 9, 1901. Serial No. 50,533. (No model.)

To all whom it may concern:

Be it known that I, MALCOLM H. BAKER, a citizen of the United States, and a resident of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Regulating Devices for Arc-Lamp Circuits, of which the following is a specification.

My invention relates to improvements in regulators for circuits containing alternating-current arc-lamps arranged in series. Heretofore the regulation of this class of devices has been accomplished through the medium of very complicated and expensive apparatus. By means of my present invention all complication is avoided and the regulation of a current in an alternating-current arc-lamp series circuit is made certain and effective by the use of very simple mechanism having few parts and very little liable to get out of order.

My invention relates, broadly, to automatically varying the reactance in a circuit such as described to compensate for changes in the resistance of the circuit due to the cutting in or out of lamps or to any other cause.

Otherwise expressed, my invention relates to automatically varying the value of a variable reactance in the circuit in accordance with changes of resistance in the said circuit in such a manner as to maintain the current practically constant.

In carrying out my invention I include in the circuit in series with the lamps a reactance device consisting of a coil of wire so placed as to have a free relative movement with respect to a laminated core inside the coil. It is well understood that the current passing through a coil having such a relation to a magnetic core is more or less choked or impeded, according to the relative position which the coil and the core occupy, the choking or impeding effect increasing with the farther and farther insertion of the core within the coil and decreasing with the gradual withdrawal of the core from the coil. The relative movements of the coil and the core may be brought about by variations of the magnetic pull due to variations of the current passing through the coil. If now a force could be discovered which would automatically vary the choking effect produced in the coil in correspondence with variations in the resistance of the circuit, which force should oppose and vary with the magnetic pull of the said coil, the value of the current traversing the coil might be made practically independent of the resistance of the circuit, so that a constant current could be maintained irrespective of the number of lamps in the circuit. I have discovered that such a force can be supplied mechanically in several ways. In the present instance I make use of a sprocket-chain connected at one end to the moving part of my regulating reactance-coil and at the other end to a weight or counterbalance, the arrangement being such that the sprocket-chain engages with sprocket-teeth formed within a groove upon a pivoted lever having a "critical curve," whereby the effect of the weight may be caused to counterbalance the magnetic pull of the coil with approximately mathematical exactness. As the pull of the magnet decreases, owing to the switching in of lamps into the main circuit, the moving part of the reactance device is gradually lifted, causing the magnetic pull to be decreased. During this movement the effect of the weight is correspondingly decreased, owing to the fact that as the weighted end of the lever descends a practical shortening of that arm of the lever takes place by reason of the special curve given to this arm of the lever. In this way the increasing effect of the magnetic pull of the reactance-coil as the coil and the core approach each other more and more intimately is counteracted by the increasing effect of the weight during the progress of this operation, it being understood that the parts are so connected as to cause the weight to be lifted while the core and the coil are approaching each other and to descend as the coil and the core are relatively separated.

I have illustrated my invention in the accompanying drawings, in which—

Figure 1 shows my apparatus connected up with a single group of lamps, the position of the parts being that which they occupy at minimum load; and Fig. 2 is a similar view showing the position of the parts when the circuit is fully loaded.

In the drawings, 1 is a suitable source of alternating current, and 2 and 3 are mains leading therefrom. The lamps are shown at 4 4

and the regulating or reactance coil appears at 5. The coil 5 is represented as surrounding one leg of a laminated iron core 6, of horseshoe shape, and its top is connected by a suitable eyebolt 7 to one end of a sprocket-chain 8. This chain coöperates with sprocket-teeth 9 9, set within a groove in a lever 10, the said lever being supported upon a pivot 11 in the upper end of a standard or pedestal 12.

To the remote end of the chain 8 is connected a weight 13. The described parts are mounted upon a suitable base 14, which also carries a cushion 15, of rubber or other cushioning material, the object of which is to receive the weight 13 without shock when the latter is dropped to its lowermost position. When the weight is in the described position, the movable part of the reactance device is in its most elevated position. (See Fig. 2.) This represents the position of the parts at maximum load. Should one or more lamps now be cut out of the circuit and the resistance of the main circuit be thereby decreased, the coil of the reactance device exercises a stronger pull upon the core and these two parts approach each other, at the same time leaving the weight 13 at a higher position. Meanwhile the pull of the magnet has been constantly increasing, and it will also be noted that the effectiveness of the weight has also been increasing by virtue of the fact that the effective length of the lever-arm to which the weight is connected has been gradually growing. Comparing Figs. 1 and 2, in this respect it will be seen that in Fig. 2 the length of this arm of the lever is practically from the pivot 11 to the point 16, whereas in Fig. 1 the corresponding length of the lever extends from the pivot 11 to the point 17. To make the comparison more exact, the horizontal distances may be taken in the first instance from the pivot 11 to a point 18 in a vertical line above the point 16 and in the second instance from the pivot 11 to a point 19 in a vertical line above the point 17. The effect of the weight accordingly increases as the pull of the coil increases, and if the curve of the outer arm of the lever 10 be properly selected an exact counterbalance can be maintained throughout the entire excursion of the reactance coil or core, as the case may be, and of the weight 13.

As intimated, the chain 8 may be attached to the core 6 instead of to the coil 5. The action would be the same in either case.

While I have selected a sprocket-chain combined with sprocket-teeth upon the pivoted lever as a convenient means for transmitting the motion, I may substitute for this combination of devices any means whereby a flexible cord or similar device attached at one end to the moving part of the reactance-coil and at the other to the weight should be so joined to the pivoted lever near a central portion thereof as to avoid longitudinal slipping.

The curve at the right-hand end of the lever 10 is an arc of a circle drawn from the middle of the pivot 11 as a center. This curve is not essential to the operation of the device and may be dispensed with.

The particular shape of the core of the reactance device may be varied. Moreover, my apparatus may be applied to a single series of arc-lamps or a number of them may be combined with several series of lamps.

The invention claimed is—

1. In a system of electrical distribution, a regulating reactance-coil having a moving part adapted to vary the choking effect in said coil, a flexible cord or chain connected to the said moving part and also connected at its opposite end to a suitable counterweight, in combination with a pivoted lever to which the said cord or chain is connected, the said lever being provided with a "critical curve" whereby the effect of the weight corresponds to the varying magnetic pull of the reactance-coil.

2. In a system of electrical distribution, a regulating reactance-coil having a moving part adapted to vary the choking effects of the said coil, a sprocket-chain connected at one end to the moving part and at the other to a counterweight, in combination with a pivoted lever having sprocket-teeth with which the chain engages, the said lever being provided with a "critical curve" whereby the effect of the counterweight is caused to correspond to the varying magnetic pull of the reactance-coil.

3. In an electric-lighting system, a regulating reactance-coil having a moving part adapted to vary the choking effect in the said coil, a number of arc-lamps in series with the said coil, and a flexible cord or weight connected at one end to the moving part of the reactance device and at the other to a suitable counterweight, in combination with a pivoted lever on which the flexible cord or chain rests in the direction of the length of the said lever, the lever being provided with a "critical curve" whereby the effective length of the lever-arm with which the weight is connected is automatically varied in the same ratio as the magnetic pull of the reactance-coil varies.

4. In a system of electrical distribution, a regulating reactance-coil having a moving part adapted to vary the choking effect in said coil, a flexible cord or chain connected to the said moving part and also connected at its opposite end to a suitable counterweight, in combination with a mechanical device to which the said cord or chain is connected, the said mechanical device being provided with a "critical curve" whereby the effect of the weight corresponds to the varying magnetic pull of the reactance-coil.

Signed at New York, in the county of New York and State of New York, this 16th day of February, A. D. 1900.

MALCOLM H. BAKER.

Witnesses:

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