

No. 712,523.

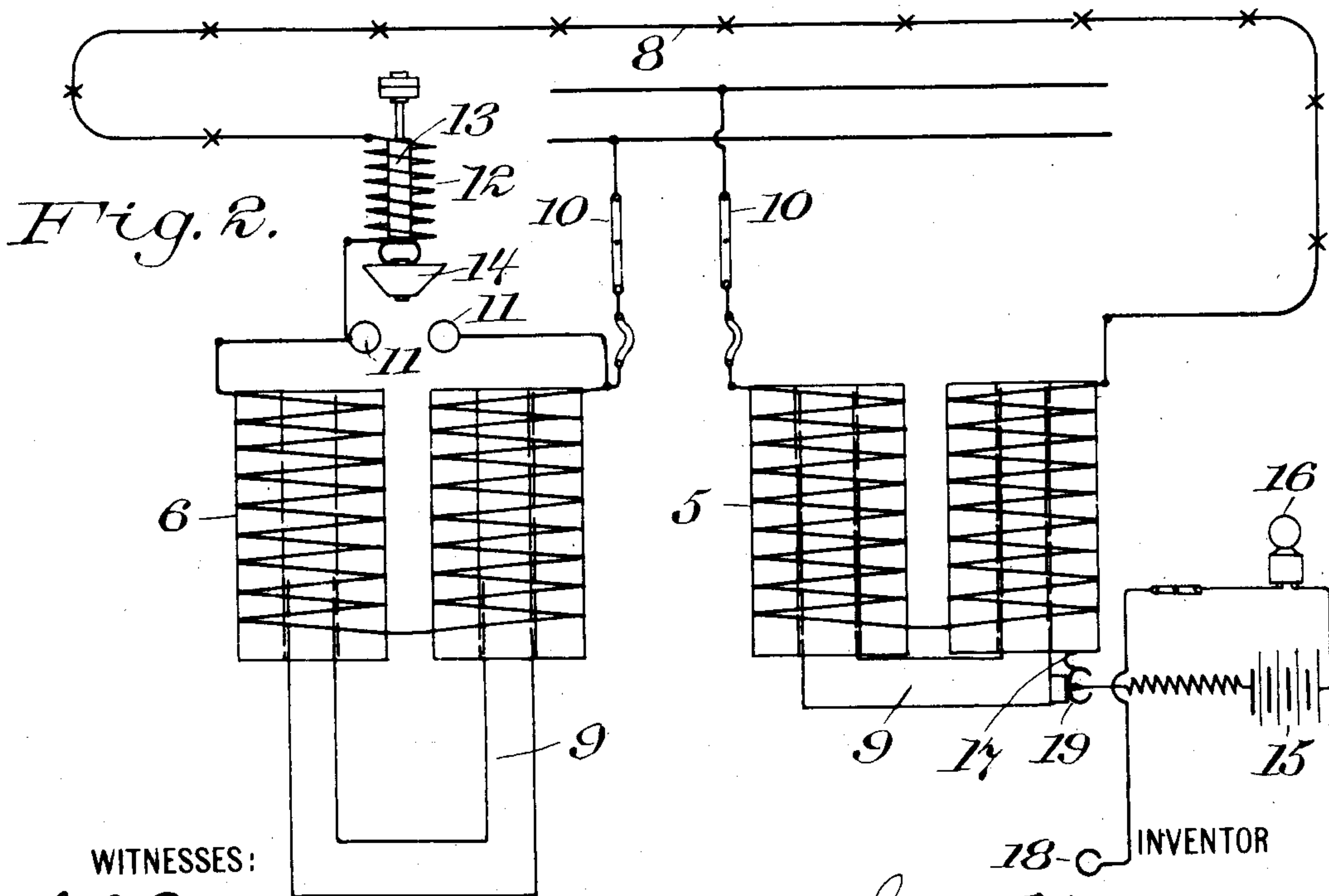
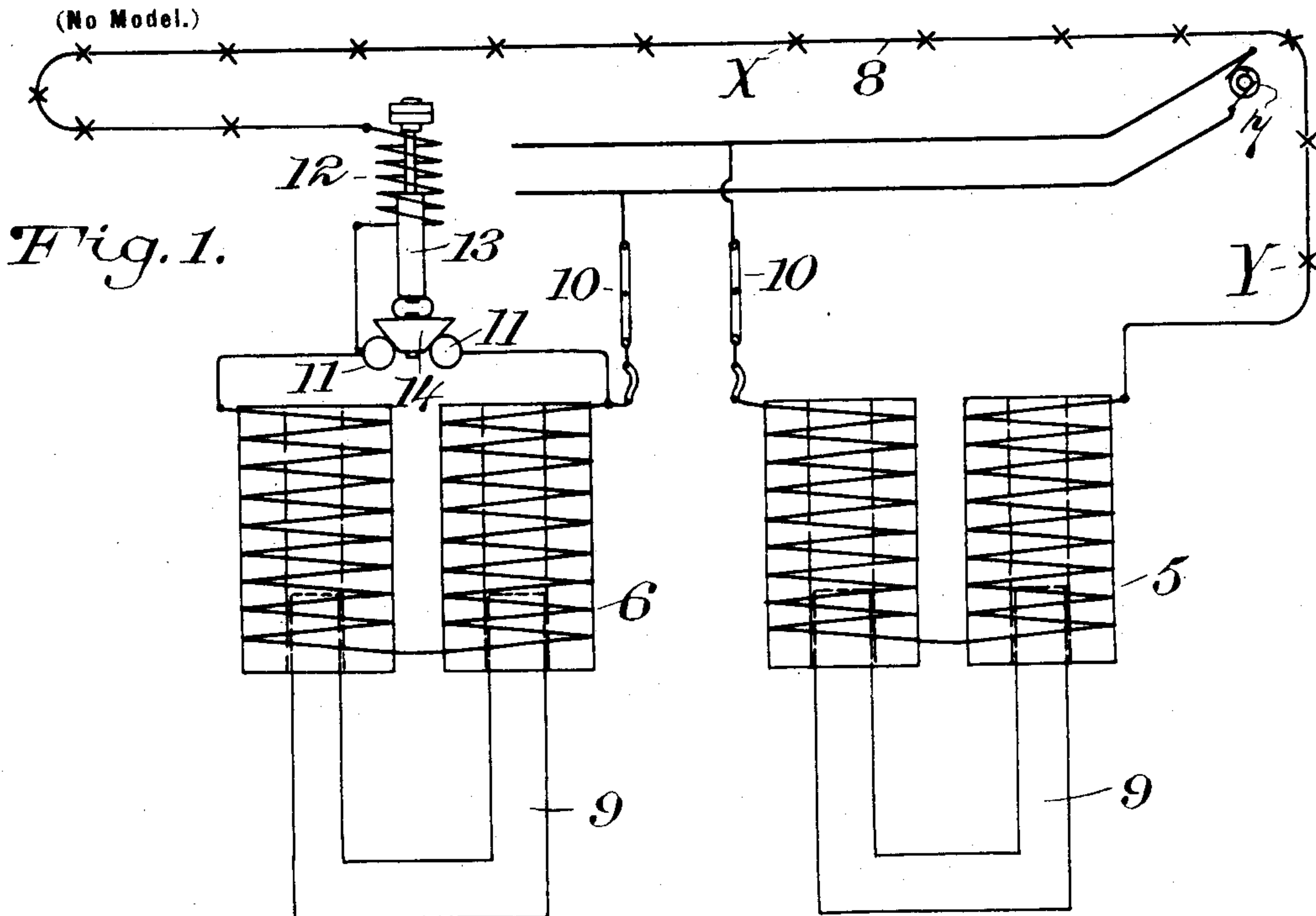
Patented Nov. 4, 1902.

J. H. HALLBERG.

REGULATOR FOR ALTERNATING SERIES ARC LIGHT SYSTEMS.

(Application filed Jan. 29, 1902.)

(No Model.)



WITNESSES:

J. E. Pearson  
C. E. Stecher

INVENTOR

J. H. Hallberg  
BY  
W. H. Benjamin  
ATTORNEY

# UNITED STATES PATENT OFFICE.

JOSEF HENRIK HALLBERG, OF NEW YORK, N. Y., ASSIGNOR TO GENERAL INCANDESCENT ARC LIGHT COMPANY, OF NEW YORK, N. Y., A CORPORATION.

## REGULATOR FOR ALTERNATING SERIES ARC-LIGHT SYSTEMS.

SPECIFICATION forming part of Letters Patent No. 712,523, dated November 4, 1902.

Application filed January 29, 1902. Serial No. 91,735. (No model.)

*To all whom it may concern:*

Be it known that I, JOSEF HENRIK HALLBERG, a citizen of the United States, residing at New York city, county and State of New York, have invented certain new and useful  
5 Improvements in Regulators for Alternating Series Arc-Light Systems, of which the following is a specification.

My invention relates to a device adapted to  
10 be connected in series with the generator and the arc-lights of an alternating series arc-light system and which has for its purpose to maintain the current on the line constant irrespective of the number of lamps in operation.  
15 tion.

A further object of my invention is to increase the safety and economy of such a system by dividing the regulating apparatus into two or more parts and providing means  
20 whereby one of such parts will be operative to effect the regulation required within certain predetermined limits and both parts operative should such limits be exceeded or the condition of the circuit make it necessary.

The accompanying drawings will serve to illustrate my invention, and in which similar numerals indicate like parts.

Figure 1 shows the relation of the parts with but one of the regulating devices operative.  
30 Fig. 2 shows the relation of the parts with both of the regulating devices operative.

The diagrams are intended to be merely figurative, and therefore do not show the means employed for counterbalancing the  
35 weight and regulating the movement of the magnet-cores.

In the drawings, 5 6 indicate two pairs of solenoidal magnets in series with an alternating generator 7 and arc-lamps 8 or other  
40 similar devices. Each of these magnets is provided with a core or armature 9, which core, it will be understood, will be drawn more or less within the solenoids 5 6 should the resistance of the line-circuit be decreased by  
45 cutting out one or more lamps or other equivalent device and by such movement of the core introduce an impedance upon the line-circuit equal to the resistance of the lamps or other devices cut out of the circuit.

The solenoids 5 and 6 are arranged, through  
50 the switches 10, to be connected in circuit and in series with the generator 7 and lamps 8. The solenoid 6, however, has its terminals also connected to the contact-terminals 11, over which is mounted a device consisting of a solenoidal magnet 12 in series in the  
55 main line with the generator, lamps, and solenoidal magnets and is moved with an armature 13, carrying a contact 14, adapted to coact with the contacts 11, and which device when in the position shown in Fig. 1  
60 serves to form a by-pass for the line-circuit around the solenoid 6.

In Fig. 2 there is shown a device for indicating a short circuit in the system, which  
65 consists of a source of electrical energy 15, bell 16, contacts 17 and 18, and contact 19, carried by the core 9.

The operation of the device is as follows:  
Under ordinary conditions of load the contact device carried by the armature 13 will  
70 bridge the contacts 11 and cut the solenoid 6 out of circuit, leaving the solenoid 5 in circuit. When the condition of the circuit is such that regulation cannot be effected by the action of  
75 the solenoid 5, then the magnet 12 attracts its core 13 and cuts into the circuit the solenoid 6. The magnet 12 is so proportioned that it will not attract its armature for small variations in load, but will hold its armature  
80 13 in the upper position when the armature has risen so far within the magnet as to be surrounded by a number of coils of the magnet. Should a ground occur on the line, which  
85 would include, for instance, the lamps between X and Y, this portion of the load will be cut out and the current will rise in the solenoid 5 and the core 9, which will take the  
90 position shown in Fig. 2, and should the impedance created by such solenoid or the resistance impressed by such solenoid not be sufficient to reduce the current in the main line to the normal the magnet 12 will attract  
95 its core 13 and cut the solenoid 6 into the circuit, which will bring the current to its normal value. Should the series circuit be opened from any cause, the armature 9 of the magnet 5 will drop to the position shown in



Fig. 1, which will close the circuit through the bell 16 and indicate such fact to the attendant.

It will be understood by those skilled in the art that by dividing the regulator the power factor and efficiency of the system will be increased.

Having thus described my invention, I claim—

1. A regulator for alternating series arc-light systems, comprising a device, a portion of which is responsive to any increase in current upon the line within predetermined limits, and a portion of which is only responsive to a current in excess of such limits, and which device will act when energized to introduce an impedance upon the line proportional to any decrease in load.

2. A regulator for alternating series arc-light systems, comprising a device normally responsive to an increase of current upon the line and which will act when energized to introduce an impedance upon the line proportional to any decrease of load, a second similarly-acting device normally irresponsive, and means for cutting said second device into the circuit when the current upon the line exceeds a predetermined amount.

3. A regulator for alternating series arc-light systems, comprising a solenoidal magnet permanently in series with the line, a movable core for said magnet, a second solenoidal magnet adapted to be connected in

series with the line but normally out of circuit, a movable core for said magnet, both of said magnets adapted when energized to introduce an impedance upon or withdraw an impedance from the line, and means for cutting said second-named magnet into circuit when the current upon the line exceeds a predetermined amount.

4. A regulator for alternating series arc-light systems, comprising a solenoidal magnet provided with a movable core permanently in series with the line, a second solenoidal magnet provided with a movable core in series with the line but normally out of circuit, a by-pass around said magnet, a third solenoidal magnet in series with the line provided with a movable core, and means carried by said core for opening said by-pass.

5. In an alternating series arc-light system, the combination of a generator, a number of arc-lights in series, a regulating device in series, a second regulating device in series but normally out of circuit, and means for cutting said second regulating device into circuit when the current exceeds a predetermined amount.

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

JOSEF HENRIK HALLBERG.

Witnesses:

J. E. PEARSON,

C. E. STECHER.