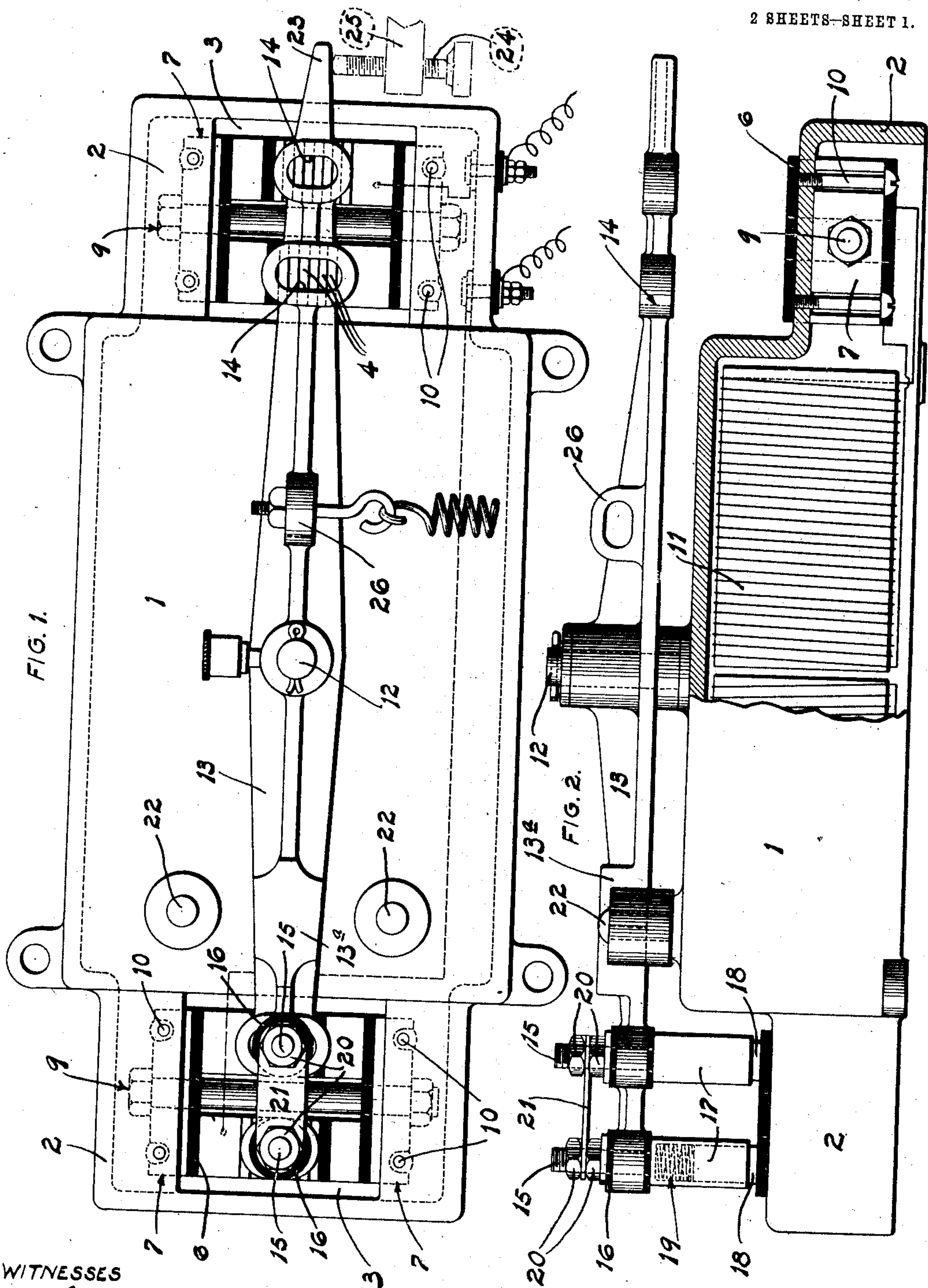


983,500.

Patented Feb. 7, 1911.

2 SHEETS-SHEET 1.



WITNESSES  
J. M. Janus.  
E. M. Harrington.

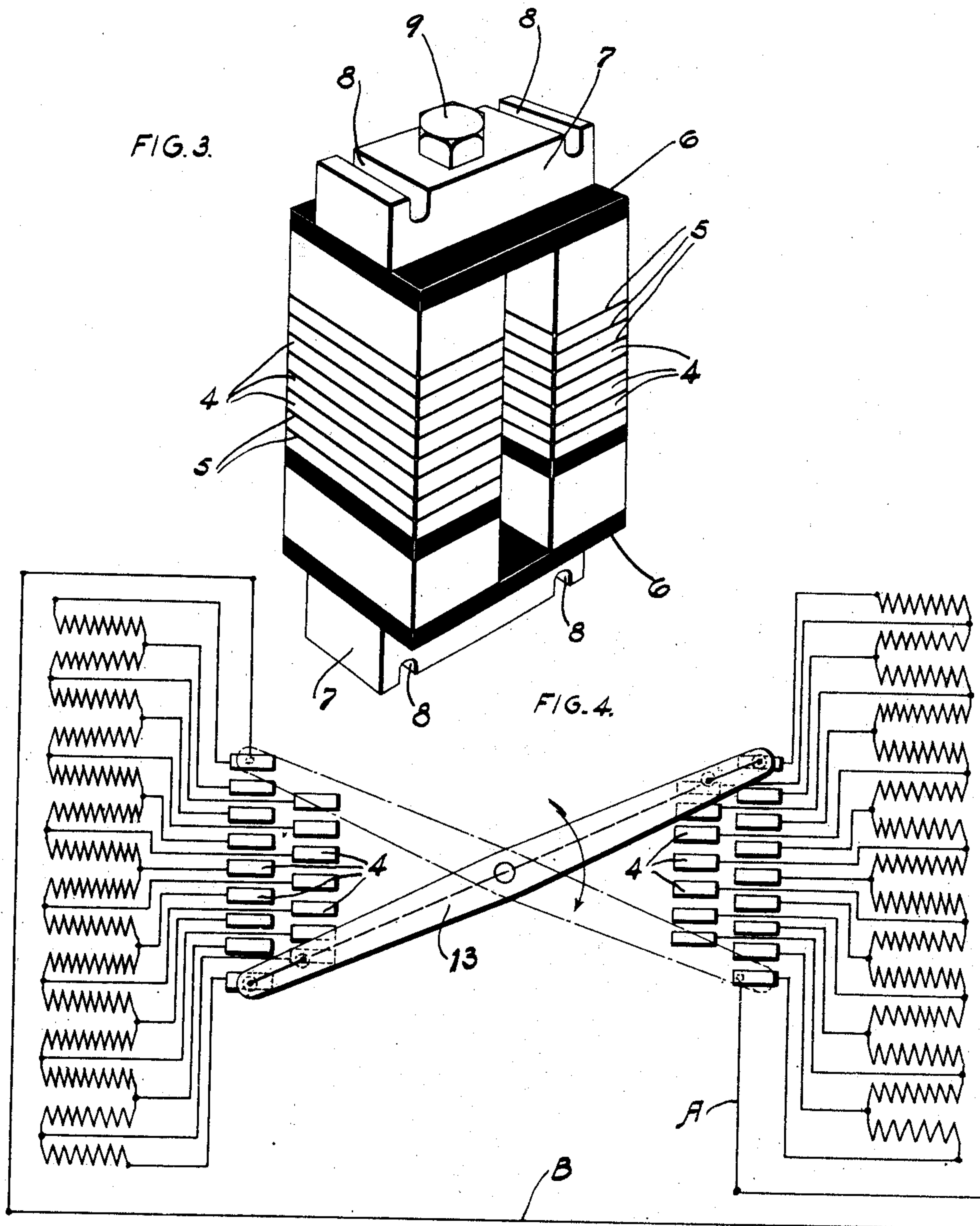
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H. K. KOUYOUMJIAN.  
ELECTRIC REGULATOR.  
APPLICATION FILED APR. 26, 1910.

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2 SHEETS—SHEET 2.



WITNESSES

*H. J. Janus.*  
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# UNITED STATES PATENT OFFICE.

HAROUTIUN K. KOUYOUMJIAN, OF ST. LOUIS, MISSOURI.

ELECTRIC REGULATOR.

983,500.

Specification of Letters Patent.

Patented Feb. 7, 1911.

Application filed April 26, 1910. Serial No. 557,678.

*To all whom it may concern:*

Be it known that I, HAROUTIUN K. KOUYOUMJIAN, a citizen of the United States, residing at St. Louis, Missouri, have invented a certain new and useful Improvement in Electric Regulators, of which the following is a full, clear, and exact description, 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, forming part of this specification, in which—

Figure 1 is a front elevation of a regulator of my improved construction. Fig. 2 is a side elevation of the regulator with a portion thereof in vertical section. Fig. 3 is a perspective view of one of the commutators forming a part of my improved regulator. Fig. 4 is a diagrammatic view showing the electrical connections between the resistance coils and the segments of the commutators.

My invention relates to an apparatus particularly adapted for regulating or varying the amount of current flowing through a line, the varying or regulating of said current being brought about by cutting in or out resistance coils, which are electrically connected with the segments or contact points of a series of commutators, and there being a movable arm arranged between said commutators and carrying brushes which contact with the segments or contact points of the commutators.

The principal objects of my invention are, first, to cheapen the cost and simplify the construction of electric regulators; second, to arrange the segments of the commutators so that the arm carrying the brushes which contact with said segments moves but a very short distance in shifting over the entire series of segments; third, to arrange a number of commutators, and a corresponding number of brushes in order to obtain a finer degree of regulation than is possible where a single brush traverses an arcuate row of contact points; and fourth, to connect the resistance coils and the segments of the commutators, and arrange said segments so that there will always be at least one or more sets of segments, and the corresponding resistance coils in service.

To the above purposes my invention con-

sists in certain novel features of construction hereinafter more fully described and claimed.

Referring by numerals to the accompanying drawings 1 designates a housing adapted to contain the resistance coils of the apparatus and formed on or fixed to the ends of this housing 1 are auxiliary housings 2, which are occupied by the commutators, and formed in the tops of these housings 2 are openings 3, through which project the upper portions of the commutators. Each commutator is made double, *i. e.*, it is made up of two sets or series of flat metal plates 4 arranged side by side with thin sheets of insulation 5 between said plates. The two sets or series of plates 4 are positioned between blocks or plates 6 of insulation, and applied to the outer faces of said blocks 6 are blocks 7 provided with grooves 8 in their outer faces. A bolt or screw 9 passes through the blocks 7 and 6 and between the two sets of plates 4, thus tying the blocks 7 together and rigidly holding the two sets or series of plates 4 in proper position. One of the commutators thus constructed is located in each housing 2 with the upper ends of the two sets of plates 4 projecting through the opening 3 and the commutator is rigidly held in the housing 2 by means of screws 10, which occupy the grooves 8 and are seated in the top of the housing 2.

Located within the housing 1 are the resistance coils 11, the same being connected in series with the segments or plates 4 as diagrammatically illustrated in Fig. 4. The terminal of one of the line wires A is connected to the first one of the plates on one side of the regulator, the terminal of the opposite line wire B being connected to the first plate or segment on the opposite side of the regulator.

Journaled upon a pin 12 which projects outward from the housing 1 is an arm or lever 13, which swings in a vertical plane, and formed through the ends of this arm immediately over the rows of plates 4 are transversely disposed slots 14. Passing through these slots 14 are pins 15, the same being insulated from the arm by means of disks or washers 16 of insulating material, and formed on or fixed to the inner ends of these pins are tubular housings 17, in which



are positioned brushes 18, the inner ends of which are adapted to contact with the segments or plates 4 of the commutators, and said brushes being normally forced outward by expansive coil springs 19 arranged within the housings 17 above said brushes. The outer ends of the pins 15 are threaded and receive nuts 20, which when tightened rigidly hold said ends and the brushes upon the ends of the arms, and the pins of each pair are electrically connected by means of a metallic plate 21. Lugs or pins 22 are positioned on the housing 1 adjacent one end thereof, and form stops to limit the swinging movement of the arm 13 in both directions. Formed on or fixed to one end of the arm 13 is an extension 23, which is adapted to engage against an adjustable stop 24 carried by a fixed member 25, and this stop regulates the swing of the arm 13 when the resistance coils are being cut out. A counter-balance weight 13<sup>a</sup> is formed on or fixed to the left hand portion of the arm 13 and normally maintains said arm in the position shown by solid lines in Fig. 4, with all the resistance coils cut in. Formed on the arm 13 is a ring 26 adapted to receive the connection from a mechanical appliance utilized for swinging the arm 13.

By referring to Fig. 4 it will be readily seen that when the arm 13 occupies the position shown by solid lines in Fig. 4 all the resistance coils 11 are in circuit with the line wires, and consequently the current passing from the line wire A through the apparatus is reduced in passing to the line wire B to a degree corresponding to the resistance offered by the entire set of resistance coils. When the arm 13 is moved in the direction indicated by the arrow in Fig. 4, the brushes 8 carried by the ends of the arm passing over the segments or plates 4 of the commutators cut out certain of the resistance coils correspondingly increasing the amount of current which passes from the line A through the apparatus into the line B, and when the arm 13 has been shifted to its limit of movement, or the position shown by dotted lines in Fig. 4 the full current is passing from the line A through the apparatus into the line B.

It will be readily understood that by dividing the two commutators into two parts, and arranging a corresponding number of brushes on the swinging arm a very fine degree of regulation or variance of the current can be accomplished, and the arm 13 is only shifted a very short distance as compared to an arm traveling over an arcuate row of contact points, as is the case in a majority of the regulators now in general use.

By providing a number of sets of segments, and arranging a corresponding number of brushes the liability of the device be-

coming inoperative is reduced to a minimum for should one or more brushes fail to make contact with the corresponding segments then the remaining brush or brushes will accomplish the work of regulation.

The slots 14 formed in the ends of the arms 13 permit the pins 15 carrying the brushes to be laterally adjusted, which adjustment is desirable where the plates or segments are close together, as is the case in the commutators used in my improved regulator.

A regulator of my improved construction is comparatively simple, can be cheaply manufactured, is easily assembled, can be readily taken apart for the purpose of repair, and provides simple means for obtaining a maximum variation or regulation of current with a comparatively short movement of the brush carrying arm.

I claim:

1. In a regulator of the class described, a housing, resistance elements therein, a plurality of rows of plates arranged at each end of the housing, and forming commutators which plates are connected in series with the resistance elements, an arm pivotally mounted on the housing, and laterally adjustable brushes carried by said arm and adapted to contact with the segments forming the commutators.

2. In a regulator of the class described, a pair of commutators, each made up of two sets of segments, resistance elements connected in series with said segments, an arm pivotally mounted between the commutators, there being slots formed in said arm, brush holders adjustably positioned in said slots, and brushes carried by said brush holders.

3. In a regulator of the class described, a pair of commutators, each made up of two sets of segments, resistance elements connected in series with said segments, an arm pivotally mounted between the commutators, a weight on said arm to one side of the pivot point thereof, there being slots formed in said arm, brush holders adjustably positioned in said slots, and brushes carried by said brush holders.

4. In a regulator of the class described, a pair of commutators, each comprising two sets of segments, resistance elements connected in series with said segments, an arm pivotally mounted between the commutators, the ends of which arm travel adjacent the faces of the segments forming said commutators, and each end of the arm being adapted to adjustably receive brushes.

5. In a regulator of the class described, a housing in which is formed a pair of openings, resistance elements within the housing, a pair of commutators made up of two sets of segments, the faces of which project through the openings in the housing, said

segments being connected in series with the  
resistance elements, an arm pivotally mount-  
ed on the housing between the commutators  
and brushes adjustably carried by the ends  
5 of the arm, which brushes contact with the  
segments forming the commutators.

In testimony whereof I hereunto affix my

signature in the presence of two witnesses,  
this 20th day of April, 1910.

HAROUTIUN K. KOUYOUMJIAN.

Witnesses:

M. P. SMITH,  
ALMA GEBHART.