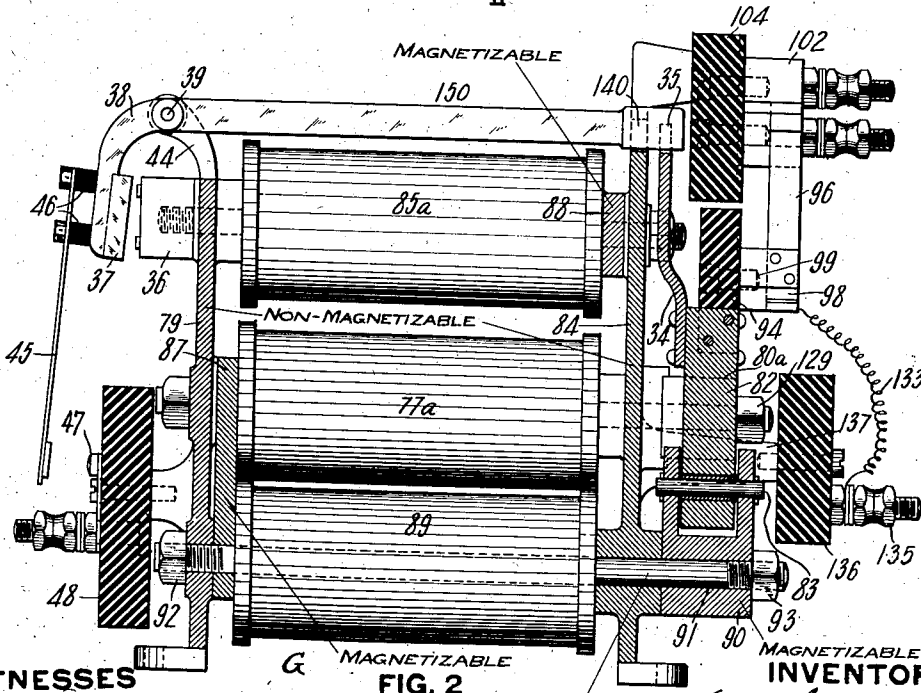
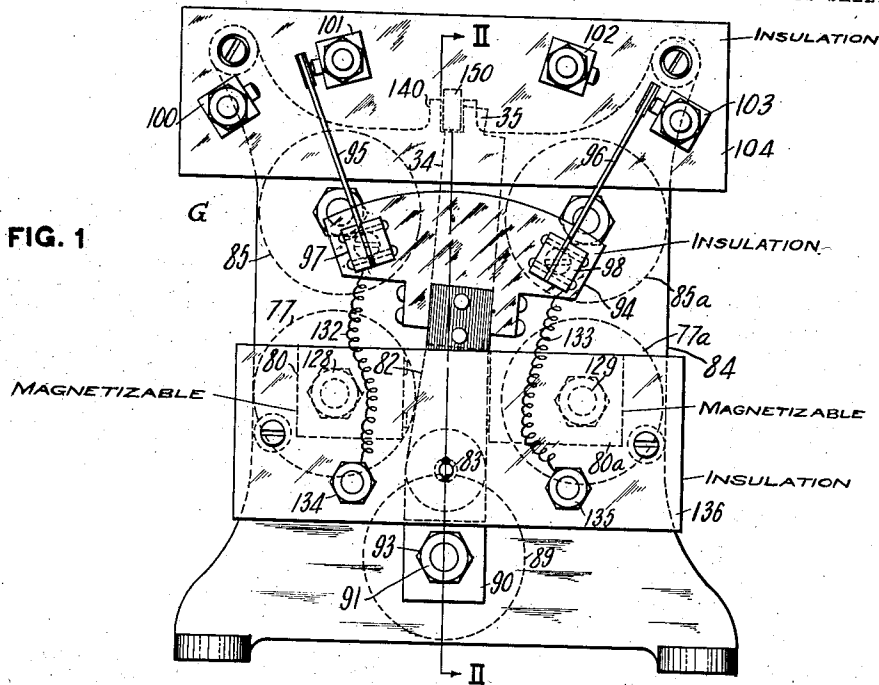


F. J. ACKERMAN.
CIRCUIT CONTROLLING DEVICE.
APPLICATION FILED DEC. 9, 1913.

1,131,982.

Patented Mar. 16, 1915.

2 SHEETS—SHEET 1.



WITNESSES

C. T. Holman
A. L. Vensell

PERMANENT
MAGNET

INVENTOR

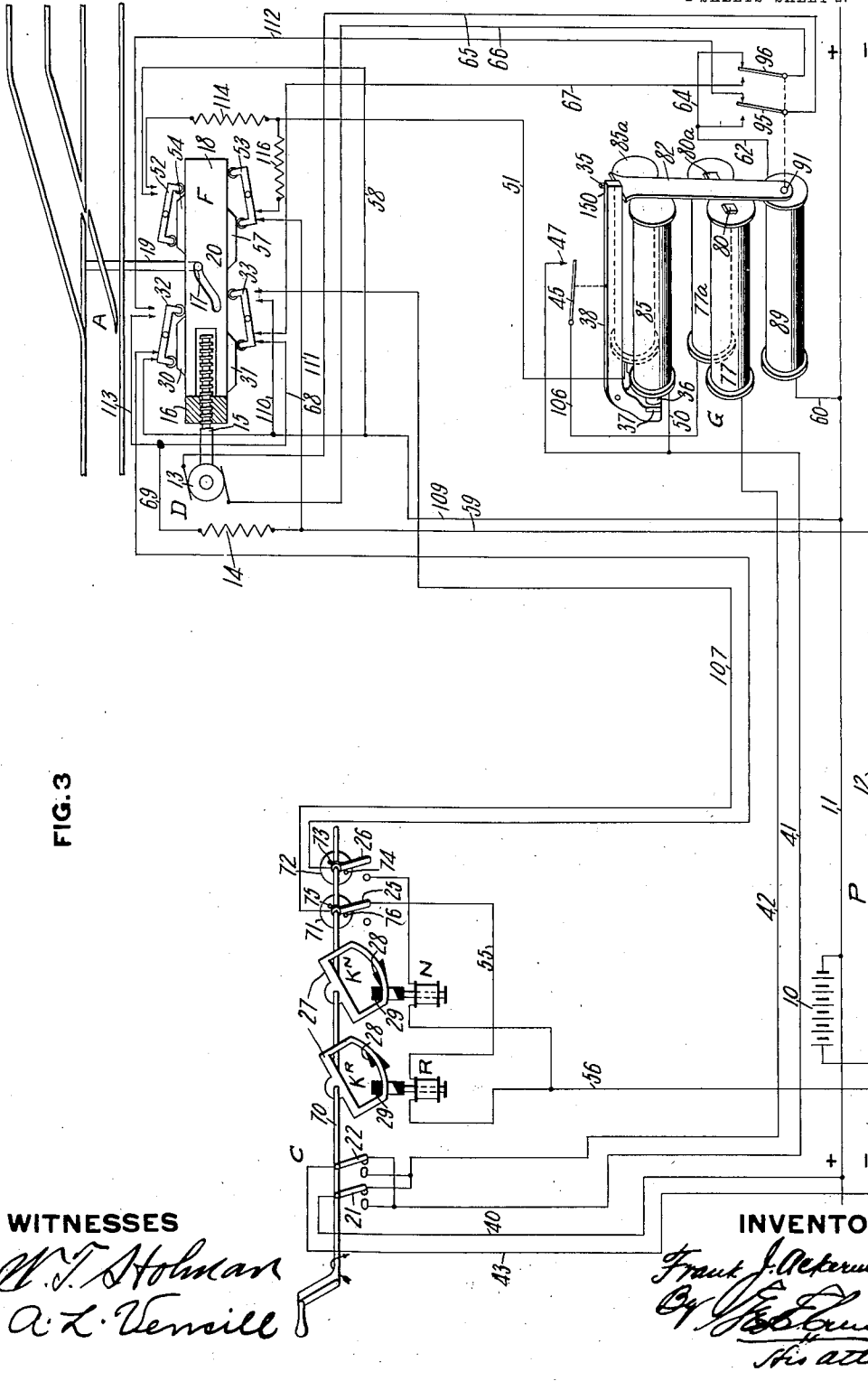
Frank J. Ackerman
By *W. E. Bruce*
Att'y.

F. J. ACKERMAN.
CIRCUIT CONTROLLING DEVICE.
APPLICATION FILED DEC. 9, 1913.

1,131,982.

Patented Mar. 16, 1915.

2 SHEETS-SHEET 2.



WITNESSES

W. T. Holman
A. L. Versell

INVENTOR

Frank J. Ackerman
By J. E. Lane
his atty.

UNITED STATES PATENT OFFICE.

FRANK J. ACKERMAN, OF PITTSBURGH, PENNSYLVANIA, ASSIGNOR TO THE UNION SWITCH & SIGNAL COMPANY, OF SWISSVALE, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

CIRCUIT-CONTROLLING DEVICE.

1,131,982.

Specification of Letters Patent.

Patented Mar. 16, 1915.

Original application filed November 11, 1912, Serial No. 730,543. Divided and this application filed December 9, 1913. Serial No. 805,543.

To all whom it may concern:

Be it known that I, FRANK J. ACKERMAN, a citizen of the United States, residing at Pittsburgh, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Circuit-Controlling Devices, of which the following is a specification.

My invention relates to circuit controlling devices. Devices embodying my invention are particularly adapted for the control of railway traffic controlling devices, but their adaptation is not thus limited.

The present application is a division of my co-pending application filed November 11, 1912, Serial No. 730,543, for Railway traffic controlling apparatus.

I will describe one form of circuit controlling device embodying my invention, showing its application to one form of railway traffic controlling apparatus, and will then point out the novel features thereof in claims.

In the accompanying drawings, Figure 1 is a view showing in end elevation one form of circuit controlling device embodying my invention. Fig. 2 is a sectional view on the line II-II of Fig. 1. Fig. 3 is a diagrammatic view showing a railway traffic controlling device and one form of controlling apparatus and circuits therefor including the circuit controlling device shown in Figs. 1 and 2.

Similar reference characters refer to similar parts in each of the several views.

Referring first to Figs. 1 and 2, the device here shown comprises a polarized relay having magnets 77 and 77^a, and a neutral relay having magnets 85 and 85^a. The cores of these magnets are all mounted in front and back plates 84 and 79 of non-magnetic material. The magnet cores of the polarized relay are connected by a soft iron back-strap 87 interposed between the back plate 79 and the magnet spools; and the magnet cores of the neutral relay are similarly connected by a soft iron back-strap 88 interposed between the front plate 84 and the magnet spools. The magnet cores of the polarized relay are provided with pole-pieces 80 and 80^a which are mounted on the cores and are held in place by nuts 128 and 129. A polarized armature 82 is pivotally mounted on a pin 83 carried in a soft iron head 90, and is ar-

anged to oscillate between the pole-pieces 80 and 80^a. The armature 82 is polarized in any suitable manner; as here shown, this polarization is accomplished by means of a permanent magnet 91 mounted in the plates 84 and 79 and passing through the head 90. The back strap 87 extends downwardly and surrounds the permanent magnet 91, as shown in Fig. 2, and this magnet and the head 90 are held in place by nuts 92 and 93 screwed upon the threaded ends of the magnet 91. Mounted upon the upper end of armature 82 is a bracket 94 of insulating material which carries contact fingers 95 and 96. Although I have herein shown only two fingers 95 and 96, it is understood that any desired number of fingers may be operated by the polarized armature 82. The fingers 95 and 96 are riveted in slots in suitable blocks 97 and 98 secured to the bracket 94 by screws 99. The upper ends of these fingers engage with contacts 100, 101, 102 and 103 which are mounted in a suitable block 104 of insulating material carried by upwardly reaching arms of front plate 84. It will be seen that when the armature 82 rests against pole-piece 80^a (the position shown in Fig. 1), fingers 95 and 96 engage respectively with contacts 101 and 103; and that when the armature 82 is reversed in position so that it rests against pole-piece 80, fingers 95 and 96 will engage respectively with contacts 100 and 102. Contact fingers 95 and 96 are electrically connected, by means of wires 132 and 133 respectively, with terminal posts 134 and 135 respectively, which posts are mounted in a block 136 of insulating material carried by arms 137 projecting forwardly from front plate 84. Secured to the armature 82 is an upwardly extending locking segment 34, the upper edge of which is provided with a dog 35 by means of which the armature may be mechanically locked in either of its extreme positions, that is, against either of the pole-pieces 80 or 80^a, as hereinafter explained.

The magnets 85 and 85^a of the neutral relay are provided with pole-pieces 36 (only one of which is shown) located at the opposite end of the magnet from the pole-pieces 80 and 80^a of the polarized relay. These pole-pieces 36 act upon a neutral armature 37 carried on the vertical arm of a bent lever 38, which lever is pivoted at 39 to suitable

arms 44 extending upwardly from the back plate 79. Mounted upon this lever 38 by means of insulating studs 46 are one or more contact fingers, one only of which, 45, appears in the accompanying drawings, and the lower end of which co-acts with a contact block 47 mounted on a block 48 of insulating material, which latter is supported by suitable lugs on the back plate 79. Contact 45—47 is closed when the relay 85—85^a is energized and open when the relay is de-energized. A horizontal arm 150 of lever 38 extends along the top of the device and co-acts with the dog 35 to control the movements of armature 82. This arm 150 is guided to move vertically by a suitable slot in a lug 140 formed on the upper edge of the front plate 84. When relay 85—85^a is de-energized, the end of arm 150 rests by gravity in the bottom of the slot in lug 140 and on one side or the other of the dog 35, so that the armature 82 is then locked in whichever position it occupies. But when the relay 85 is energized thereby attracting armature 37, the arm 150 is raised sufficiently to allow dog 35 to pass under it, and the polarized armature 82 may then be reversed.

The permanent magnet 91 is provided with a winding 89 for the purpose of maintaining and reinforcing the flux of this magnet. This winding may be energized at times in a manner such as will hereinafter appear.

Referring now to Fig. 3, A designates a railway switch which is actuated by an electric motor D through the medium of a suitable actuating mechanism F. P designates power mains comprising wires 11 and 12, which mains are supplied with current from a battery 10, and from which mains current is supplied to the motor D by means of a suitable operating circuit. This operating circuit is controlled directly by a circuit controlling device G, which device is the same as that shown in Figs. 1 and 2 and hereinbefore described. This device G is preferably located adjacent the switch A and is provided with a control circuit which includes contacts operated by a manually operated lever C, usually one of a plurality of levers in an interlocking machine.

The switch operating mechanism F which I have here shown may be briefly described as follows: Operatively connected with the armature 13 of motor D is a screw 15 which co-acts with a longitudinally movable nut 16. This nut is rigidly connected with a plate 18 provided with a cam slot 20, which latter co-acts with a roller 17; this roller drives a bar 19 connected with the movable rails of a switch A. The plate 18 carries four cams 30, 31, 54 and 57, which actuate respectively circuit controlling contacts 32, 33, 52 and 53 for purposes hereinafter explained.

The lever C is of a usual and well known type comprising an oscillating shaft 70

which operates contacts 21, 22, 25 and 26. The contacts 21 and 22 constitute a pole-changer for reversing the direction of current in the polarized relay windings of the circuit controlling device G as hereinafter explained. The movements of the shaft 70 are as usual governed by return indication devices K^N and K^R, each of which comprises a segment 27 fixed on the shaft 70 and provided with a dog 28 which engages with a latch 29 operatively connected with the armature of an electromagnet N or R. Each of these electromagnets is provided with a separate indication circuit extending from the lever C to the switch A, which circuits are explained hereinafter. The contacts 25 and 26, which serve to control these indication circuits, are not moved during the first portion of the movement of the shaft 70 up to the point at which it is stopped by the dogs 28 but during the remainder of the movement of the shaft the contacts 25 and 26 are reversed in position. This operation of contacts 25 and 26 is obtained, as here shown, by mounting the contacts loosely on the shaft 70, and by moving them by pins 73, 74, 75 and 76 carried by disks 71 and 72 fastened to the shaft 70.

The control circuit for the windings of polarized relay 77—77^a is as follows: from positive main 11 through wire 40, contact 21, wire 42, windings 77 and 77^a, wire 106, contact 45—47, wire 41, contact 22, wire 43, to negative main 12. It will be seen that this circuit includes contact 45—47 which is operated by the neutral magnet 85—85^a, and that therefore this circuit is closed only when the neutral magnet is energized. It will be seen also that this control circuit includes the pole-changing contacts 21 and 22, and that, therefore, the direction of current through the polarized relay windings depends on the position of lever C.

The windings 85 and 85^a of the neutral relay are connected in series, and are provided with terminals 50 and 51. Terminal 50 is connected with control wire 41, and terminal 51 is connected with either the positive or the negative power main 11 or 12 by contacts 52ⁿ and 53. When contact 53 is closed, as shown in the drawing, this terminal 51 is connected with the negative main 12 through resistance 116, contact 53 and wires 111 and 59. When the switch A is reversed so that contact 53 is open and contact 52 is closed, the terminal 51 will be connected with the positive main 11 through resistance 114, contact 52 and wires 58 and 109. It will be seen, therefore, that relay 85—85^a will be energized or not according as its two terminals are connected with power mains of different polarity or with the same power main.

In Fig. 3 I have shown the switch A in what I shall herein term the "normal" po-

sition, and the other parts in the positions corresponding to this position of the switch. With the parts in such positions, both terminals of neutral relay 85—85^a are connected with the negative main 12, hence this relay is deenergized and is consuming no current; contact 45 is therefore open, so that the control circuit for the polarized relay is open and this relay is therefore consuming no current. When it is desired to move switch A to its other position, which I will herein term the "reverse" position, the shaft 70 of lever C is rotated in the direction of the arrow until the dog 28 of indication device K^R engages latch 29. This movement reverses the position of pole-changing contacts 21 and 22, thereby connecting wires 41 and 42 with the positive and negative mains 11 and 12 respectively. Terminal 50 of neutral relay 85—85^a, being connected with wire 41, is now connected with the positive main 11; and since the other terminal 51 of this relay is connected with the negative main 12, current now flows through windings 85 and 85^a so that the neutral relay is energized thereby raising the arm 150 out of the path of dog 35 and closing contact 45. The closing of contact 45 closes the circuit through the windings of polarized relay 77—77^a, and since the pole-changing contacts 21 and 22 are reversed, the current flowing through the polarized relay is now in such direction as to reverse of armature 82 reverses contacts 95 and 96, the position of armature 82. The reversal so that operating current is supplied to the motor D through the following circuit—from positive main 11 through wire 60, winding 89, wire 62, contact 95, wire 65, motor armature 13, wire 66, contact 96, wire 67, contact 33, wires 68 and 69, motor field winding 14, wire 59 to negative main 12. This current passes through winding 89 in such direction as to reinforce the flux of the permanent magnet 91, thereby assuring that the flux of this magnet shall be maintained. Winding 89 is preferably of low resistance so that it will not greatly reduce the motor current. The motor D is operated by this current in such direction as to actuate the mechanism F to move switch A to the "reverse" position. As soon as the motor has moved the plate 18 a short distance, contact 52 is closed, so that terminal 51 of the neutral relay is then connected with both the positive and negative power mains through contacts 52 and 53 respectively, but this does not deenergize the neutral relay 85—85^a. A circuit is then closed from positive main 11 through wires 109 and 58, contact 52, resistance 114, resistance 116, contact 53, and wires 111 and 59 to negative main 12, but the current in this circuit is small owing to resistances 114 and 116, hence this circuit does no harm. When the movement

of the switch A to the reverse position has been completed and the switch rails have been locked by the end portion of cam slot 20, contact 33 is reversed in position by dog 31, thereby opening the motor operating circuit; at the same time contact 53 is reversed by dog 57, thereby disconnecting terminal 51 from the negative main 12 and leaving it connected only with the positive main 11 through contact 52. Both terminals of the neutral relay windings are then connected with the positive main 11, so that no current flows through these windings and the relay therefore opens. Lever 38 falls, thereby locking polarized armature 82 in the position which it now occupies and opening contact 45 which opens the control circuit of the polarized relay so that this relay then becomes deenergized. It will be seen therefore that as soon as a movement of the switch has been completed, the consumption of current by the controlling device G ceases. The reversal of contact 33 closes an indication circuit through magnet R as follows—from positive power main 11 through wires 109 and 110, contact 33, wire 107, contact 25, wire 55, magnet R and wire 56, to negative power main 12. Current in this circuit energizes magnet R which raises its armature, thereby raising latch 29 out of the path of dog 28, so that the movement of the lever C may then be continued to the end of the stroke. During this last portion of the movement of the lever, contact 25 is reversed thereby opening the circuit of magnet R, and contact 26 is also reversed thereby closing at that point the circuit for magnet N, so that the circuit for this magnet may be closed at the switch after the latter has again been moved to its normal position.

The movement of switch A from its reverse position to its normal position would be similar to that just described. For such movement the direction of the control current through the polarized relay winding is again reversed by contacts 21 and 22, and contacts 95 and 96 are then moved back to the position shown in the drawing. A motor operating circuit is then closed through motor D as follows—from positive power main 11 through wire 60, winding 89, wires 62 and 64, contact 96, wire 66, motor armature 13, wire 65, contact 95, wire 112, contact 32, wires 113 and 69, field winding 14, wire 59 to negative power main 12. This current passes through armature 13 in the opposite direction to that hereinbefore described so that the motor operates in the proper direction to move the switch A to its normal position. After such movement has been completed, indication magnet N is energized in a manner similar to that hereinbefore explained for magnet R, and the movement of the lever C can then be completed.

One important feature of a circuit controlling device embodying my invention is that no current is consumed thereby except when the switch A is being moved. But in spite of this, if the lever 38 is raised by hand and the polarized armature shifted to energize the motor to move the switch A to the position opposite to that corresponding to the position of the control lever C, then when the parts are left to themselves the circuit controlling device G will automatically operate to bring the switch back to the position corresponding to the position of the control lever. For example, referring to Fig. 3, with the parts in the positions shown, if lever 38 is raised by hand and the armature 82 shifted to the opposite position, contacts 95 and 96 will close the motor circuit and the switch A will be moved toward the reverse position. If after the switch operating mechanism has been moved far enough to close contact 52, the parts are left to themselves, the neutral relay 85—85^a will be energized because its terminal 50 is connected with negative main 12 and its other terminal 51 is then connected with positive main 11. Hence, armature 82 will be unlocked and the direction of current through the polarized winding is such that this armature will be returned to the position shown in the drawing, thereby shifting contacts 95 and 96 to cause the motor to return the switch to the normal position.

Although I have herein shown and described only one form of circuit controlling device embodying my invention, it is understood that various changes and modifications may be made therein within the scope of the appended claims without departing from the spirit and scope of my invention.

Having thus described my invention, what I claim is:

1. In combination, a polarized relay comprising a polarized armature, an electro-

magnet and a neutral armature controlled thereby, and means controlled by said neutral armature for mechanically locking the polarized armature when the electromagnet is deenergized and for unlocking the polarized armature when the electromagnet is energized.

2. In combination, a polarized relay comprising a polarized armature, an electromagnet and a neutral armature controlled thereby, and means controlled by said neutral armature for mechanically locking the polarized armature.

3. In combination, a polarized relay comprising a polarized armature, a locking segment having a locking dog carried by said armature, an electromagnet and a neutral armature controlled thereby, and a member secured to said neutral armature and adapted to co-act with the dog to lock the polarized armature.

4. In combination, a polarized relay comprising a polarized armature adapted to occupy one position or another according to the direction of current through the relay winding, an electromagnet, and an armature controlled thereby and adapted to lock the polarized armature in either of its two said positions.

5. In combination, a relay comprising a winding and a polarized armature, an electromagnet and a neutral armature controlled thereby, means controlled by said neutral armature for mechanically locking the polarized armature, and a contact controlled by said neutral armature for controlling the supply of current to said winding.

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

FRANK J. ACKERMAN.

Witnesses:

V. H. RAGLAND,
F. W. EPPS.