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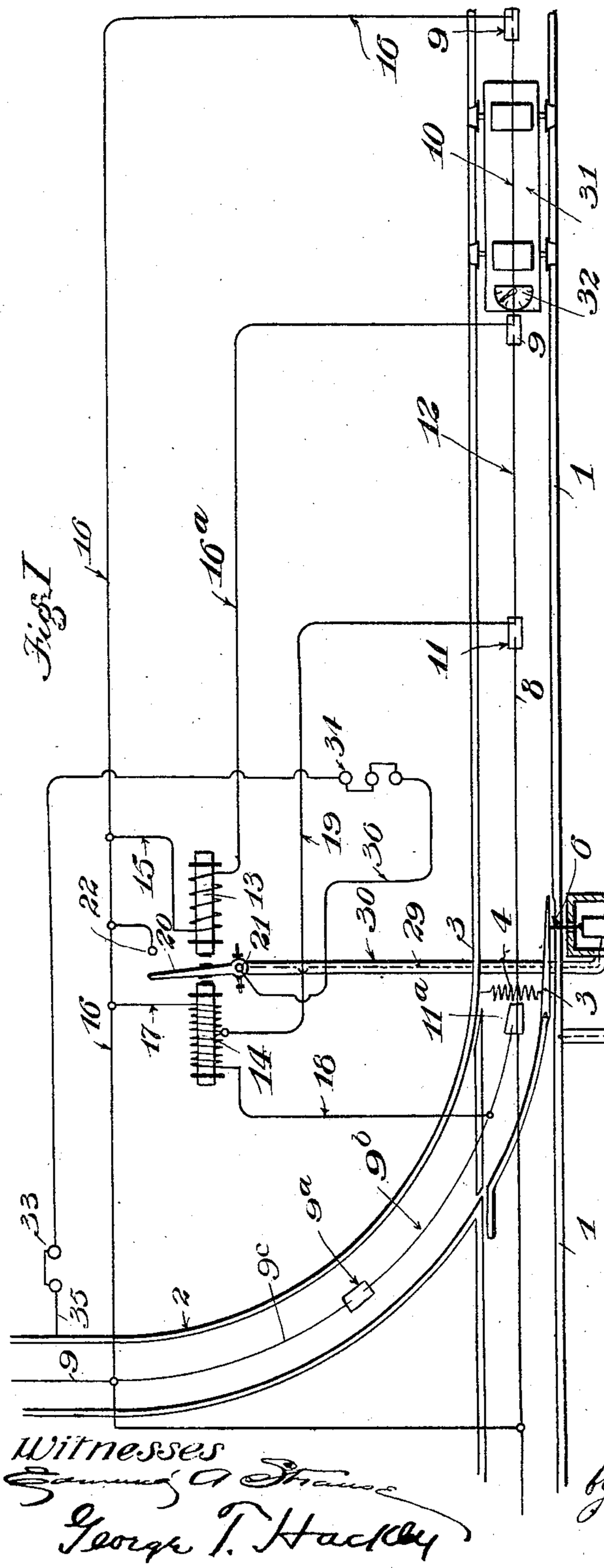
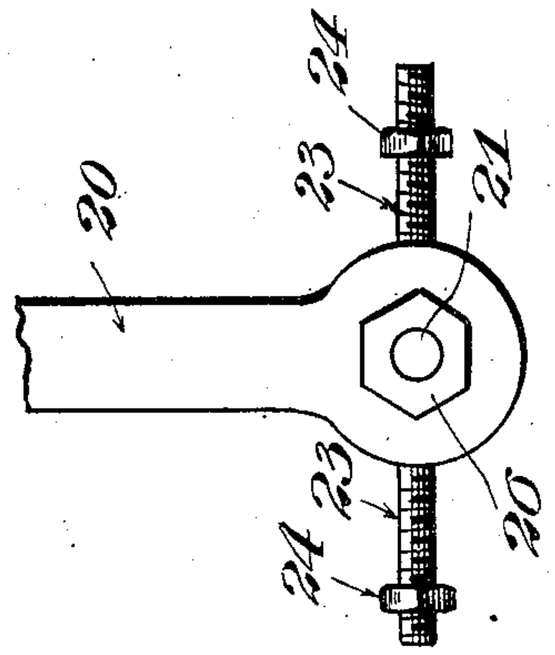
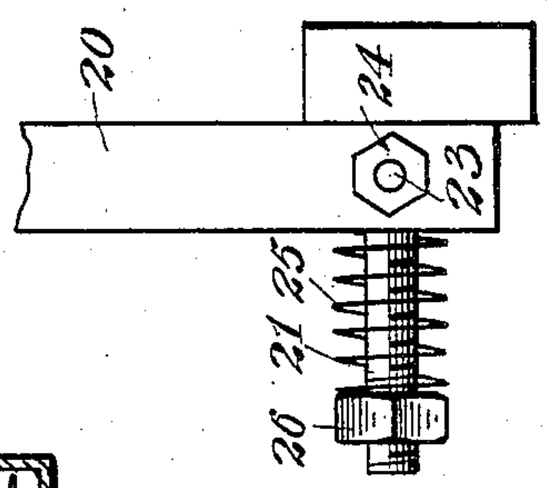
E. F. WINFIELD.

ELECTRIC RAILWAY SWITCH.

APPLICATION FILED JULY 7, 1903.







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UNITED STATES PATENT OFFICE.

EDWARD F. WINFIELD, OF LOS ANGELES, CALIFORNIA, ASSIGNOR TO JACOB BAUM, OF LOS ANGELES, CALIFORNIA, TRUSTEE.

ELECTRIC RAILWAY-SWITCH.

No. 855,601. Specification of Letters Patent. Patented June 4, 1907.

Application filed July 7, 1903. Serial No. 164,564.

To all whom it may concern:

Be it known that I, EDWARD F. WINFIELD, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented a new and useful Electric Railway-Switch, of which the following is a specification.

This invention relates to means for operating a railway switch, the operating means being controlled by a device on the car.

The invention is particularly designed to be used on electric railway systems either of the overhead trolley type or third rail systems, and the control of the means for operating the switch is preferably accomplished by the utilization of the regular car controller so that the motorman may operate the switch by the same lever with which he controls the speed of the car, thus insuring simplicity and facility of control, and eliminating accidents which might result from the confusion which might arise from the employment of a separate controlling lever on the car.

The mechanism forming the invention may be constructed at little expense over that of the ordinary lever operated switches. The simplicity of principle and construction of the device is such that there is little liability of its becoming deranged or inoperative.

One object of the invention is to provide means for opening and closing the switch which includes a safety device, insuring that when the switch is to be thrown and the car or cars are to take the switch, for a curve or cross-over for instance, the motorman must reduce the speed of the car or cars to an arbitrary point, which may be at any speed desired, before the switch will operate to allow the car or cars to take the curve thus preventing derailing or other accidents due to carelessly taking a curve at a higher speed than is consistent with safety.

Another object is to provide a construction which will allow the car or cars to be run with full current and high speed by the switch if desired, or which will permit of coasting the car or cars by the switch at any speed.

Another object is to provide a construction in which after the switch has been thrown and the car or cars have been shunted from the main track, the switch will be automatically restored to its normal position, and the switch operating mechanism will also be automatically restored to its normal position, as soon as the car or cars pass the switch. Thus cars which follow will take the straight track unless the motorman on each following car or cars throws the switch while the car or cars are on a certain block ahead of the switch.

The invention is shown and described as operating to keep the switch closed and give normally a straight track, but it could be arranged so that the switch would normally be thrown and cars would regularly take the switch unless the switch was thrown and such arrangement could readily be made by any one skilled in electrical mechanics.

Another object is to insure that the switch be thrown when the car or cars are on only a certain section of the track, the distance which this section lies from the switch being as desired.

Another object is to provide a safety block intermediate of the switch operating block and switch so that if the motorman after throwing the switch moves the controller above the switch throwing point, which would also raise the speed of the car or cars above the point which it should properly have when taking the switch, that the switch will be automatically opened and the car or cars will remain on the main track thus obviating derailment which might result from taking the switch at too high a speed.

Another object is to provide such a construction that after the switch has been closed by the motorman and the car or cars have passed on to the safety block beyond and the motorman while on the safety block has stopped the car or cars for any purpose, the switch will remain closed during the stoppage of the car or cars and will remain closed when the car or cars start unless the car or cars start with an operating current above the point at which the switch is arranged to be operated; in which case the switch will automatically open and remain so causing the car or cars to stay on the main track without taking the switch.

Another object is to provide means for operating a switch which has the fewest possible moving parts. In the embodiment shown there is only one movable part, namely the circuit closer.

The accompanying drawings illustrate the invention, and referring to the same:—

Figure I is a diagram of the track and branch track provided with a switch. A car is shown approaching the switch and the switch operating mechanism and electrical connections therefor are shown diagrammatically. Fig. II is a plan view of the lower part of the controlling armature. Fig. III is a side elevation of what is shown in Fig. II.

1 designates the main track.

2 designates the branch track which joins the main track with the usual frogs.

3 designates the pivoted switch tongue which may be held normally closed by any suitable means such for instance as a spring 4.

5 designates a solenoid the armature of which is connected by a rod 6 with the tongue 3. The solenoid 5 may preferably be inclosed by a suitable waterproof case 7.

8 designates the main trolley wire and 9^c designates the branch trolley wire. At a point removed a suitable distance from the switch the trolley wire 8 is provided with insulators 9 between which lies what will be termed an operating block 10. Intermediate the operating block 10 and the switch lies another insulator 11, and between the insulator 11 and the adjacent insulator 9 lies what will be termed a safety block 12.

13 designates an operating magnet.

14 designates a release magnet.

9^a is an insulator in branch 9^c forming a block 9^b between insulators 9^a and 11^a. The strength of the magnet 14 when energized through circuit formed by wires 17 and 18 is greater than the strength of the magnet 13, in this embodiment it is shown as being twice the strength, the magnet 14 having twice the number of turns of wire with which magnet 13 is provided.

One lead 15, from the magnet 13 is attached to a wire 16 which connects with the main trolley wire at a point beyond the first insulator 9. The other lead 16^a of the magnet 13 is connected with the section of trolley wire in the operating block 10. One lead 17 of the release magnet 14 is connected with the wire 16, the other lead 18 of the release magnet 14 being connected with the branch trolley wire 9^b. A wire 19 leads from the middle turn of magnet 14 to the section of trolley wire in safety block 12.

20 designates a circuit closing armature pivoted at 21 and adapted to be attracted by either the operating magnet or release magnet.

22 designates a stationary contact connected with wire 16, the circuit closing armature 20 being movable into electrical connection with the contact 22 by the operating magnet 13 and being movable out of electrical connection with contact 22 by the release magnet 14.

The circuit closing armature 20 may be provided with threaded studs 23 which projects oppositely from its hub and which respectively carry weights 24 threaded on the studs and which may be adjusted to secure a proper balance of the circuit closing armature 20. The armature 20 is designed to remain normally inert in either position into which it may be tilted, and in order to insure its inaction except when attracted by a certain amount of energy, a compression spring 25 is arranged between a nut 26 on the pivot 21, and the hub. A frictional drag is thus obtained which is sufficient to prevent movement of the armature 20 in either direction, except when either the release magnet or the operating magnet is receiving current over its circuit with the controller at or above the fifth point.

One lead 27 of the solenoid 5 is connected with the track 1 as shown being preferably run through a conduit 28. The other lead 29 of the solenoid 5 is connected to the armature 20 being preferably incased in a conduit 30.

31 designates a car on the track.

32 designates the car controller.

In describing the operation it will be remembered that the operating magnet 13 is wound so that with average load and average speed, when the car controller is on or above the fifth bar the amount of current which passes through the car and over the circuit through the operating magnet 13 will be sufficient to energize the operating magnet 13 enough to attract the armature 20, and when the controller is at any point under the fifth bar the current through the car will not be sufficient to energize the operating magnet 13 enough to attract the armature 20. And the release magnet 14 is so wound that with average load and average speed, when the car controller is on or above the fifth point the amount of current which passes through the car and over the circuit through one half the number of turns of the release magnet 14 will be sufficient to energize it enough to attract the armature 20, and when the controller is at any point under the fifth the current through half the number of turns of the magnet will not be sufficient to attract the armature 20. After a car has passed the switch the armature 20 stands in the position shown in the drawing which is its normal position. When the car approaches the switch, and the motorman desires to throw the switch to shunt the car from the main track he places the controller at the fifth bar and as soon as the car reaches the block 10 a circuit is formed through wire 16^a through the operating magnet 13 and thence through wire 15 to wire 16 and thence to the main circuit, energizing the operating magnet which attracts the armature 20. As armature 20 is brought into connection with contact 22, a circuit is formed from armature 20 through wire 29 to

solenoid 5 thence through wire 27 to track, then through wire 16 to contact 22 and to armature. As solenoid 5 then operates it draws the tongue 3 closed so that when the car arrives at the switch it will be shunted. Immediately after the switch has been thrown by reason of the controller having been placed on the fifth bar, the motorman places the controller below the fifth bar so as to reduce the speed of the car before passing on to the switch. The controller should be kept below the fifth bar while the car is traversing block 12 for the reason to be shortly described. As soon as the car moves onto the block 12 the circuit through operating magnet 13 is broken and a circuit is formed through wire 19 and through half the turns of release magnet 14, through wire 17 to wire 16, through wire 16 to the trolley wire and through the car to track but the armature 20 stays in the position into which it had been thrown because the controller is below the fifth bar and the energy of the release magnet 14 at this time is not sufficient to attract the armature 20 and the armature 20 is thus held against contact 22 by reason of its inertia and also by reason of the frictional drag produced by spring 25 as before explained. As soon as the car or cars pass from the block 12 the circuit through magnet 14 is broken and the armature 20 still remains inert and the switch remains closed and the car goes on to the branch. As soon as the car or cars pass the switch and move onto the block 9^b a circuit is formed through wire 18 and through all of the turns of magnet 14 through wire 17 and through wire 16 to trolley wire which fully energizes magnet 14 and the inertia and frictional drag of the armature 20 are overcome and the latter is drawn back into the position shown in the diagram breaking the connection with the contact 22 which results in deënergizing the solenoid 5 so that the spring 4 restores the tongue 3 to normal position as shown leaving a clear track. As soon as the car or cars have passed beyond the insulator 9^a, the circuit through magnet 14 is broken and the magnet is deënergized but the inertia of the armature 20 together with its frictional drag holds it in the position shown leaving the main track clear.

It is obvious the apparatus may be so adjusted that the motorman must put the controller to at least the fifth bar with average load and average speed to secure enough current to energize the magnet 13 and that the armature will be thrown against contact 22 with the controller at any point above the fifth bar while the car is on block 10 and reversely thrown if the controller is above the fifth bar at any point on block 12. Assuming that the motorman has thrown the controller to the fifth bar and above; as the car enters block 10 the switch is thrown as explained but as soon as the car leaves block 10 magnet 13 is deënergized and magnet 14 is energized sufficiently to draw over the armature 20 as the controller is now at or above the fifth bar, which breaks the circuit through the solenoid and the switch is opened and the car goes down the main track. By making block 12 of considerable length, and extending the same nearly to the switch, if the track is level it will be impossible for the car to take the switch at a high speed, because if the controller is put above the fifth notch for even a few feet on said block it will adjust the switch so as to leave the main track clear. When a car is shunted onto a switch it is usually brought to a stop soon after. It is necessary, therefore, in such cases that the magnet 14 be provided with a sufficient number of coils to operate armature 20 without placing the controller so far as the fifth bar. For this reason the strength of magnet 14, when energized through wires 17 and 18, is greater than that of magnet 13. When the switch has been opened and the car enters the block 12 with the controller at any point under the fifth, the magnet 14 is not energized sufficiently to draw over the armature 20 and the switch remains open so that the car is properly shunted. But as soon as the car gets beyond insulator 11 the full number of turns of magnet 14 are energized and the switch is released by the solenoid and drawn back by the spring 4. If it is desired to run the car down the maintrack with the controller at or above the fifth point and proportionate speed of the car, the switch will be thrown automatically as before described so that the car would take the curve but for the fact that as soon as the car gets onto the block 12 the switch is thrown back automatically by the magnet 14. If the motorman has made a mistake and thrown the switch when he intended to take the straight track he can rectify it by throwing the controller to or above the fifth notch after passing block 10 which will cause the switch to be restored and give a straight track.

In the foregoing it has been assumed that under average conditions the amount of energy imparted to magnet 13 sufficient to operate the armature 20 is obtained with the controller at the fifth bar or above, but it is obvious that the magnet 13 could be wound to operate with the controller at a lower point, the magnet 14 of course being wound proportionately. If desired the blocks could be formed in the track instead of in the trolley wire as shown and such arrangement may readily be made by anyone skilled in the art.

In order to provide signals to enable the motorman to know what position the switch is in two sets of lamps 33 and 34 are provided. The two sets may be connected in series. A wire 35 leading from lamps 33 to

the branch track and a wire 36 leading from the lamps 34 to the armature 20. Thus when the armature 20 is in connection with the contact 22 a circuit is completed through the lamps and at such time the switch is as before explained closed.

What I claim is:

1. In combination, a track, a switch therefor, a car, electro-magnetic means for closing said switch, means for causing said electro-magnetic means to close said switch when the car is a definite point from said switch, and means intermediate of said point and the switch for causing said switch to open when the car takes more than a definite amount of the electric current.

2. In combination, a track, a switch therefor, a car, electro-magnetic means for closing said switch, means for opening said switch, means for causing said electro-magnetic means to close said switch when the car is a definite point from said switch, and means intermediate of said point and the switch causing said switch to open when the car takes more than a definite amount of the electric current, and means for operating said switch after the car has passed the switch.

3. In combination, a track, a switch therefor, a car, electro-magnetic means for closing said switch, means for causing said electro-magnetic means to close said switch when the car is a definite point from said switch and means intermediate of said point and the switch for causing said switch to open when the car takes more than a definite amount of the electric current, and means for automatically opening said switch after the car has passed the switch.

4. In combination, a track, a switch therefor, a car, magnetic means for closing said switch, an electric circuit embracing said magnetic means, a circuit closer in said circuit, a magnet for closing said circuit closer, a magnet for opening said circuit closer, means adapted to be operated by the controller for exciting the first named magnet, means for automatically de-energizing said first named magnet and means for automatically energizing the second named magnet.

5. In combination, a track, a switch therefor, a car, magnetic means for closing said switch an electric circuit embracing said magnetic means, a circuit closer in said circuit, an operating magnet for closing said circuit closer, means adapted to be operated by the controller for energizing the operating magnet when the car is at a definite point from said switch, and automatic means for energizing the release magnet when the car is at another definite point from said switch.

6. In combination, a track, a switch therefor, a car, a main circuit, insulators in the main circuit forming an operating block therein, a solenoid for closing said switch, a shunt from the main circuit through the solenoid, a circuit closer for the shunt circuit, an operating magnet for the circuit closer in circuit with the operating block, a release magnet for the circuit closer in circuit with the main circuit, a safety block in the main circuit intermediate the operating block and switch, the release magnet being stronger than the operating magnet and a section of the release magnet of equal strength with the operating magnet being in series with the safety block.

7. In combination, a track, a switch therefor, a car, a main circuit, insulators in the main circuit forming an operating block therein, a solenoid for said switch, a shunt from the main circuit through the solenoid, a circuit closer for the shunt circuit, an operating magnet for the circuit closer in circuit with the operating block, a release magnet for the circuit closer in circuit with the main circuit, a safety block in the main circuit intermediate the operating block and switch, the release magnet being stronger than the operating magnet and a section of the release magnet of equal strength with the operating magnet being in series with the operating block, a branch circuit from the main circuit embracing a greater number of turns of the release magnet than are in the operating magnet.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, at Los Angeles, in the county of Los Angeles, and State of California, this 25th day of June, 1903.

EDWARD F. WINFIELD.

Witnesses:
GEORGE T. HACKLEY,
W. S. CAMPBELL.