R. V. COLLINS.

ELECTROMAGNETIC SWITCH.

APPLICATION FILED MAR. 16, 1908.

948,624.

Patented Feb. 8, 1910.

2 SHEETS--SHEET 1.

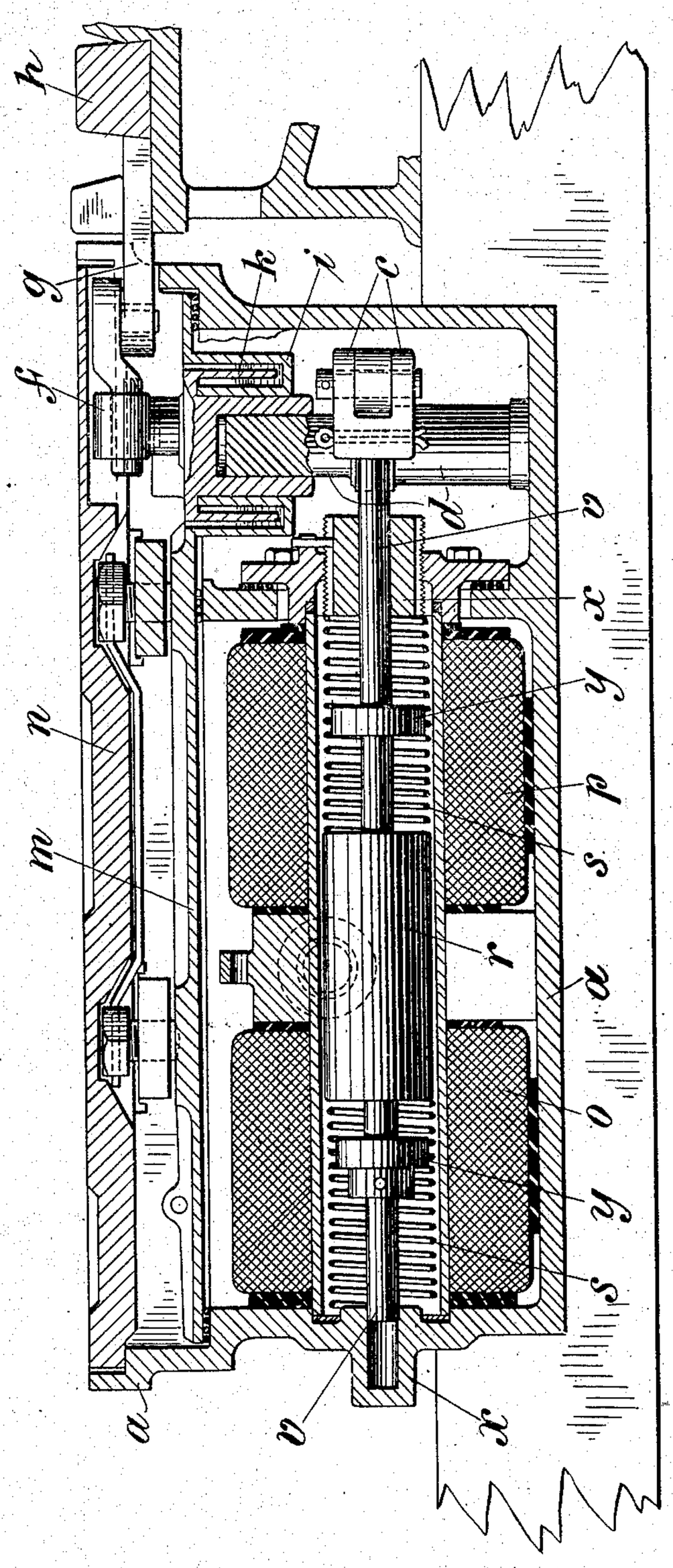

Fig. 1.

Witnesses
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2 SHEETS—SHEET 2.

Fig. 3.

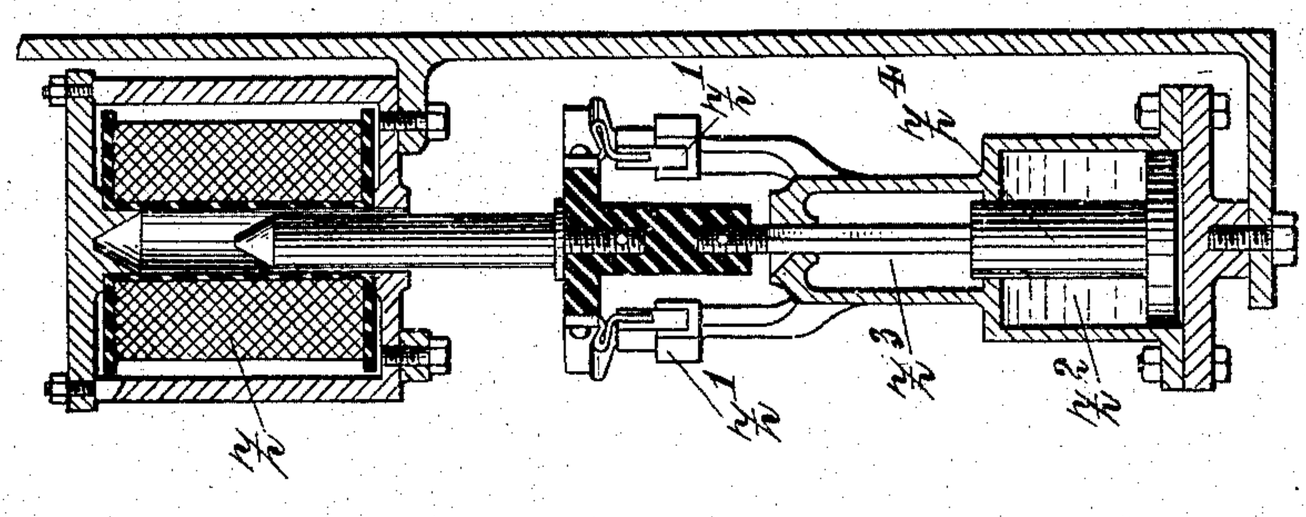
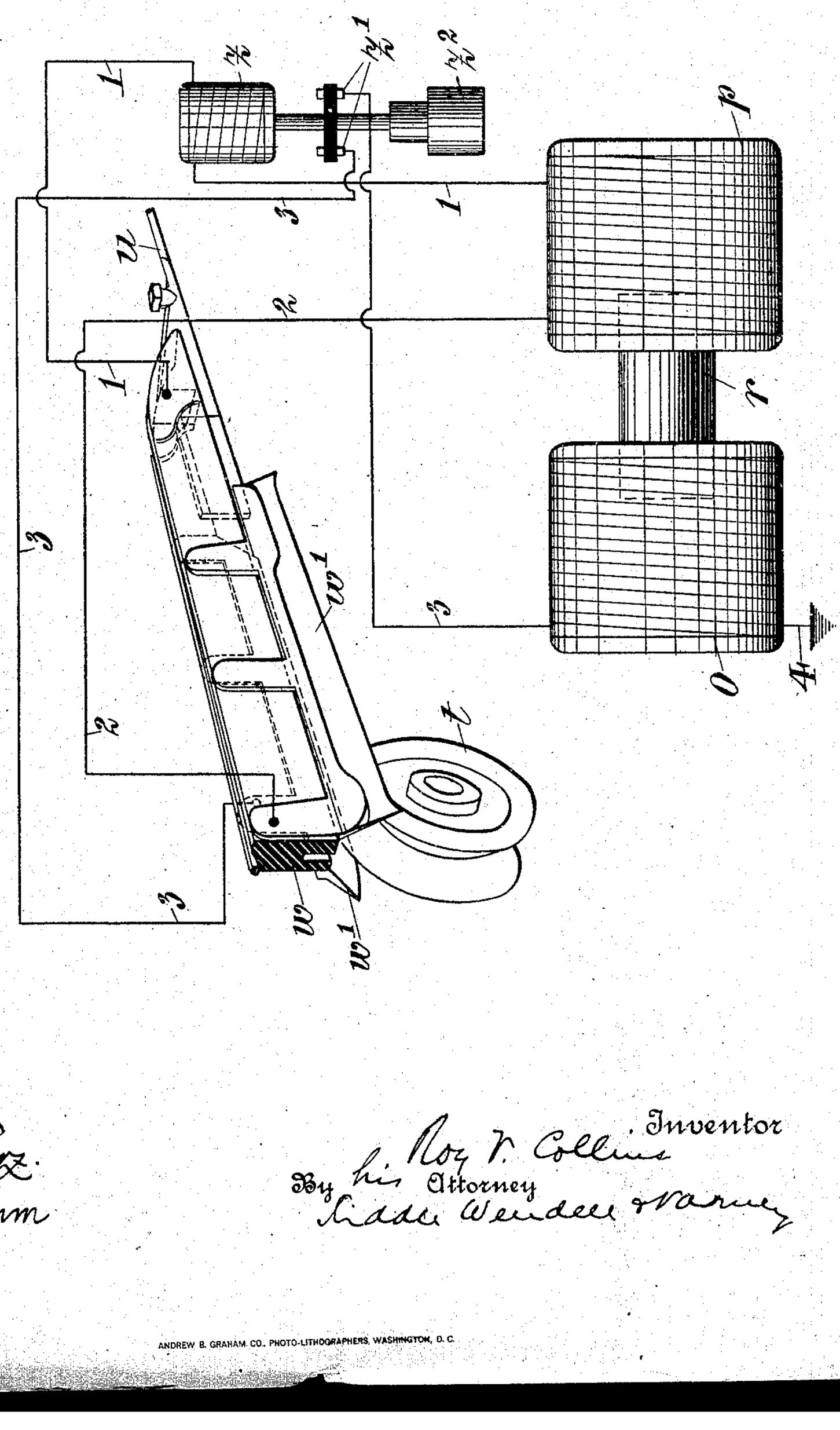


Fig. 2.



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UNITED STATES PATENT OFFICE.

ROY V. COLLINS, OF NEW YORK, N. Y., ASSIGNOR TO AMERICAN AUTOMATIC SWITCH COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

ELECTROMAGNETIC SWITCH.

948,624. Specification of Letters Patent. Patented Feb. 8, 1910.

Application filed March 16, 1908. Serial No. 421,445.

To all whom it may concern:

Be it known that I, ROY V. COLLINS, a citizen of the United States, and a resident of the borough of Manhattan, of the city of New York, in the county and State of New York, have invented certain new and useful Improvements in Electromagnetic Switches, of which the following is a specification, reference being had to the accompanying drawings, forming a part thereof.

The invention relates particularly to that type of switch in which two main electromagnets are employed, one for throwing the switch tongue in one direction and the other for throwing the switch tongue in the opposite direction. In such switches, a contact controlling device, or "circuit changer" as it is often referred to, is employed as a rule to direct the current into one magnet at one time and into the other magnet at another time whereby the switch tongue is moved in the particular direction desired; but such contact controlling devices make the mechanism more complex and are particularly objectionable on account of the arcing which they produce and which frequently burns out the contacts.

One object of the present invention is to do away entirely with such contact controlling devices or circuit changers in switches of this type. In accordance with the present improvements, this desideratum is accomplished by a novel arrangement of circuits and by winding the two magnets so that the same amount of current will develop a stronger field in one magnet than in the other magnet. Moreover, to this same end, the core of the magnets, through which the switch tongue is operated, is related to the two magnets and to the switch tongue in a different manner than as heretofore obtained in switches of this type. Such core, for instance, is given a certain freedom of movement, or, what is the same thing, is provided with a lost motion whereby it may be started to move by a comparatively slight pull but does not commence to do its work until it has moved well into the magnetic field of one or the other of the magnets.

In connection with the drawings, the construction and operation of the improved switch will be referred to presently more in detail. Also in connection with the drawings, the construction and operation of an improved dash-pot, which also forms a part of the present invention and may be used in connection with the improved switch, will be referred to further on.

In said drawings, Figure 1 is a view in central vertical section taken lengthwise through a box containing the improved switch mechanism; and, Fig. 2 is a diagrammatic view illustrating a plan of the wiring, a trolley wheel and part of the line contact breaker on the trolley wire being shown in perspective, and, Fig. 3 is a view in vertical section showing a dash pot which is used in the improved switch.

The improved switch mechanism, or the larger part thereof, is inclosed within a metallic box *a* provided with a cover *m*, which forms therewith a water tight seal, and with a top plate *n* which is preferably employed to cover the connections (indicated at *f*, *g*) which project from the box proper for operatively engaging the switch tongue indicated at *h*. The two main or operating magnets which a switch of this type embodies, are indicated by the letters *o* and *p* respectively and these magnets, through their common core and its associated connections, are adapted to turn a shaft *d* in both directions, which shaft communicates its movements through a suitable stuffing box, indicated at *i*, *k*, to the connections *f*, *g* and thence to the switch *h*, all as will be readily understood.

In accordance with the present improvements, one of these magnets, as *o*, is adapted to develop a stronger field than the other magnet *p* with the same amount of current, and for this purpose may be wound with a finer wire. In this way the common core *r*, which is normally held in a central position between the two magnets by some such means as springs *s* will, upon the energization of both magnets with the same current, be drawn toward the magnet *o*. In order that the same current shall energize both magnets, the latter are arranged in series relation with each other, as is indicated clearly in the diagram of Fig. 2.

It will be understood that the improved switch is designed to be employed princi-

pally upon electrically operated railway lines such as trolley lines in particular; and in the diagram of Fig. 2 a trolley wheel *t* is indicated which forms the terminal member for introducing power into the electrically operated mechanism, whatever it may be, from the trolley wire *u* or other conductor which delivers power thereto from a suitable source. In connection with the trolley wheel and trolley wire there is shown what is usually referred to as a line contact breaker which in the present case comprises an insulating block *w* over which the trolley wire *u* is bent and two contact members or plates *w'* on either side of the insulating plate *w* and adapted to be electrically connected or bridged by the trolley *t* as it passes underneath the line contact breaker.

When the trolley wheel bridges the two contact members *w'* but is not delivering current to the electric car or other electrically operated mechanism, it will be readily seen that precisely the same current will flow through the coils or magnets *o* and *p;* for the contact *l* connects the trolley wire or source of electric power supply with the magnet *p*, the conductor 2 connects the magnet *p* with one of the contact members *w'*, the trolley wheel bridges the two contact members *w'*, the conductor 3 connects the second contact member *w'* with the magnet *o* and the conductor 4 is a return from the magnet *o* back to the source of supply. When however, with the trolley wheel bridging the two contact members *w'*, current is delivered through the trolley wheel into the electrically operated mechanism, then it will be seen from the diagram of Fig. 2 that, while all of the current flows through the magnet *p*, it will divide thereafter, the larger portion passing through the trolley wheel *t* to the electrically operated mechanism and a very small portion (owing to the relatively high resistance of the finely wound magnet *o*) through the magnet *o*, which is thus in parallel with the electrically operated mechanism. Thus when current is being delivered to the electric car or other mechanism as the trolley wheel passes the line contact breaker the field of the magnet *p* will be the more powerful and will draw the core *r*, in its direction. It will be possible therefore for the motorman of the car or train to control the switch in the usual manner, that is by leaving the current on or off according as he may desire to move the switch tongue in one direction or the other, as he is approaching the same.

Referring again to Fig. 1 it will be seen that the core *r* is loosely mounted upon a rod *v* which is slidable in bearings *x* at either end of the mechanism and is operatively connected with an arm or arms *c* upon the shaft *d*. In this way the core, which as before stated is normally held in a central position between the two magnets by springs *s*, is enabled to move in either direction well into the field of one or the other of the magnets before beginning to move the switch tongue. Collars *y* are provided upon the rod *v* upon each side of the core so that at the proper point the core will effect the movement of the switch tongue. The advantage of providing lost motion between the core and switch tongue is to get the core well into the field of either one of the magnets before it is necessary for it to commence to do any work; otherwise, the initial pull upon the core might be too weak to move the core, switch tongue and the rest of the mechanism required to be operated.

In order that the current shall not flow too long a time through the magnet *o* which has the finer winding and therefore the higher resistance, as would be caused in case the trolley wheel *t* was stopped in the position indicated in Fig. 2, a circuit breaker *z* is provided so that the circuit through the coil *o* may be interrupted at the terminals *z'* of the circuit breaker. This circuit breaker preferably consists of a coil (indicated at *z*) the core of which is connected with a dash pot z^2 whereby it can only move very slowly and will therefore require a predetermined time before the circuit can be broken, thus enabling the trolley wheel to pass over the line contact breaker at a slow rate of speed, but sufficient to break the circuit nevertheless in case the trolley wheel is halted for any length of time while on the line contact breaker. In order to avoid the use of packing around the plunger of the dash pot, an auxiliary chamber z^3 is provided in addition to the cylinder z^4 of the dash pot, and the plunger is given a free working fit where it extends through the walls of the cylinder into the auxiliary chamber and where it leaves the auxiliary chamber. In this way, although some oil may escape into the auxiliary chamber from the cylinder, no oil will leak out of the apparatus, notwithstanding the fact that no packing is provided.

It will be noted that with the present arrangement each of the magnets *o* and *p* act as resistance for the other, which does away with the necessity of providing extra resistance as is commonly done in switches of this type.

Various changes may be made in the construction of the improved switch, some features of which may be embodied alone or in other combinations without avoiding the spirit of the invention.

I claim as my invention:—

1. The combination with electrically operated mechanism, of an electric switch having

two magnets arranged in series relation with each other, one of the magnets being adapted to be placed in parallel with said mechanism.

2. The combination with electrically operated mechanism and a circuit controller, of an electric switch having two magnets arranged in series relation with each other, said circuit controller being adapted to place said electrically operated mechanism and one of the magnets in parallel.

3. The combination with electrically operated mechanism having a terminal member to receive the power, and a circuit controller having two contact members which said terminal member is adapted to bridge, of an electric track-switch having a switch tongue and two magnets arranged in series relation with each other and with said two contact members, said magnets being operatively connected with the switch tongue.

4. The combination with electrically operated mechanism having a terminal member to receive the power, and a circuit controller having two contact members which said terminal member is adapted to bridge, of an electric track-switch having a switch tongue and two magnets one of which is adapted to develop a stronger field than the other, said magnets being arranged in series relation with each other and with said two contact members, and being operatively connected with the track switch tongue.

5. The combination with electrically operated mechanism having a terminal member to receive the power, and a circuit controller having two contact members which said terminal member is adapted to bridge, of an electric track-switch having a switch tongue and two magnets arranged in series relation with each other and with said two contact members, said magnets being operatively connected with the switch tongue.

6. The combination with electrically operated mechanism having a terminal member to receive the power, a circuit controller having two contact members which said terminal member is adapted to bridge and track-switch mechanism, of an electric switch having two magnets, each of which is operatively connected with the track-switch mechanism, a connection from a source of electric power to one of the magnets, a connection from said magnet to one of the contact members, a connection from the other contact member to the other magnet and a return connection from said other magnet back to the source of power.

7. The combination with electrically operated mechanism having a terminal member to receive the power, a circuit controller having two contact members which said terminal member is adapted to bridge, of an electric switch having two magnets one of which is adapted to develop a stronger field than the other, a circuit breaker, a connection from a source of electric power to said other magnet, a connection from said other magnet to one of the contact members, a connection from the other contact member to the terminal of the circuit breaker, a connection from the other terminal of the circuit breaker to said one of the magnets, and a return connection from said one of the magnets back to the source of power.

8. In an electric switch, the combination of a magnet for throwing the switch tongue in one direction, a magnet for throwing the switch tongue in the opposite direction, one of the magnets being adapted to develop a stronger field than the other, and means to break the circuit through said one of the magnets after it has been energized for a predetermined time.

9. In an electric switch, the combination of a magnet for throwing the switch tongue in one direction, a magnet for throwing the switch tongue in the opposite direction, said one of the magnets being adapted to develop a stronger field than the other, and a third magnet in series with the first two magnets to break the circuit through said one of the magnets after they have been energized for a predetermined time.

10. In an electric switch, the combination of two magnets, one for throwing the switch tongue in one direction and the other for throwing the switch tongue in the opposite direction, of a core movable between the magnets and a rod extending through the magnets for operative connection with the switch tongue and having collars thereon, the core being mounted loosely upon the rod between the collars.

11. In an electric switch, the combination of two magnets, one for throwing the switch tongue in one direction and the other for throwing the switch tongue in the opposite direction, of a core movable between the magnets, a member for operative connection with the switch tongue and with which the core has a loose connection, and means to keep the core normally central with respect to the magnets.

12. In an electric switch, the combination of two magnets for throwing the switch tongue in opposite directions and one of which has a finer winding than the other whereby it is adapted to develop a stronger field with the same amount of current, a core movable between the magnets and adapted to have operative connection with the switch tongue with a certain amount of lost motion, and means to maintain the core normally in a central position between the two magnets.

13. The combination with a magnet, of

a dash pot connected with the core thereof, the said dash pot having an auxiliary chamber into which the plunger thereof extends, whereby the packing around the plunger may be done away with.

14. The combination with a magnet, of a dash pot connected with the core thereof, the said dash pot having an auxiliary chamber through which the plunger thereof extends, the said plunger having a free working fit with the walls of the dash pot and the walls of the auxiliary chamber.

This specification signed and witnessed this 6th day of March, A. D., 1908.

ROY V. COLLINS.

Signed in the presence of—

LUCIUS E. VARNEY,

HOMER H. SNOW.