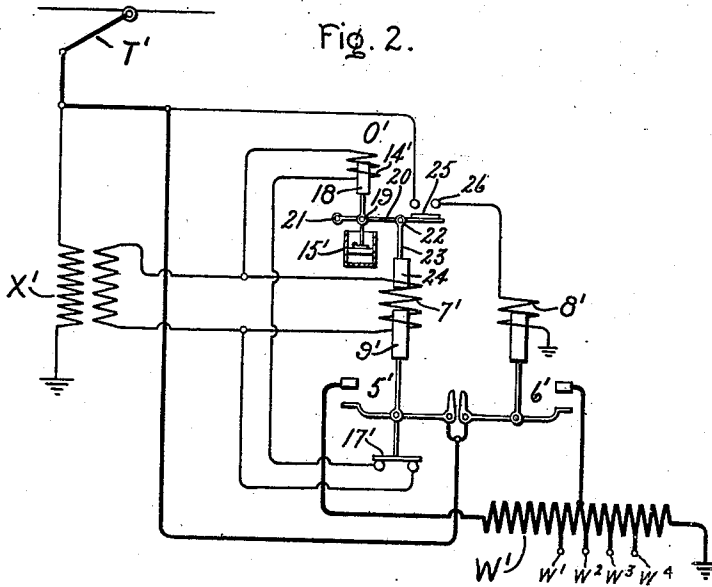
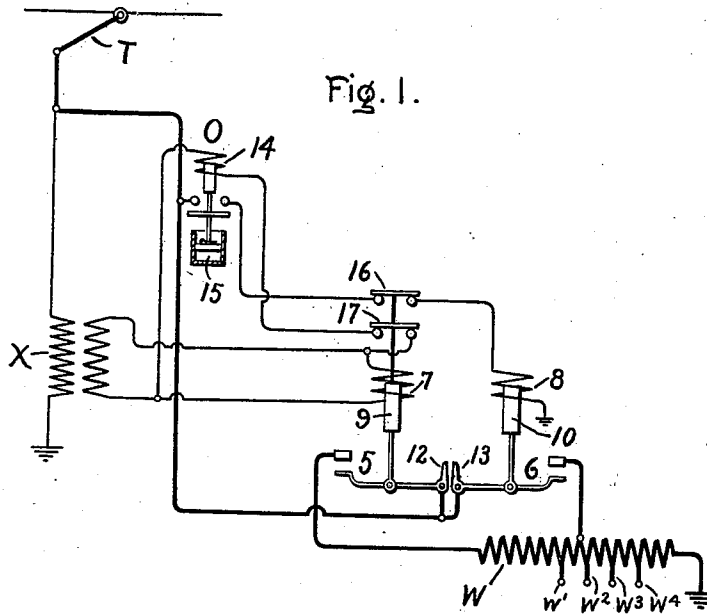


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HIGH AND LOW POTENTIAL SELECTIVE SWITCH SYSTEM.
APPLICATION FILED JULY 26, 1910.

991,556.

Patented May 9, 1911.



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HIGH AND LOW POTENTIAL SELECTIVE SWITCH SYSTEM.

991,556.

Specification of Letters Patent.

Patented May 9, 1911.

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To all whom it may concern:

Be it known that I, RAY STEARNS, a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in High and Low Potential Selective Switch Systems, of which the following is a specification.

My invention relates to selective switch systems, and particularly to a system intended for use on electrically driven cars adapted for operation on either high or low potential current.

It is a general object of my invention to provide a system of switches which will automatically make certain connections in the car circuits according as the car is upon a section of line energized by current at high potential or upon a section of line furnished with current at low potential.

To the above end, my invention comprises a high potential switch and a low potential switch, and means coöperating therewith such that the first switch will close only when the potential of the source is at the higher value and the latter switch will close only when said potential is at the lower value.

My invention will be fully understood from the following description taken in connection with the accompanying drawings, in which—

Figure 1 shows diagrammatically one form in which it may be embodied; and Fig. 2 shows diagrammatically a modified form similar to that of Fig. 1.

For the purposes of illustration I have shown my invention as embodied in a selective switch system for a railway car or locomotive intended for operation on either high potential or low potential alternating current. It is obvious, however, that my invention may be used in connection with direct current railway apparatus or in other connections with merely slight changes apparent to those skilled in this art.

Referring to Fig. 1, the source of current is indicated by the trolley T, coöperating with a trolley wire which, it is to be understood, is at some sections of line energized by high potential alternating current and at other sections by low potential alternating current. The main transformer or compensator of the car or locomotive is indicated at W, the different voltage taps being indicated

at w^1 , w^2 , w^3 , and w^4 . The motor and control circuits of the car are not shown since they have no bearing upon my invention. A high potential main switch is indicated at 5 and a low potential main switch at 6, these being diagrammatically shown as electro-magnetically operated by actuating coils 7 and 8 with which movable armatures 9 and 10 co-operate. As shown, the switches 5 and 6 are mechanically interlocked, so that both of them cannot be closed at the same time, this mechanical interlock being diagrammatically represented by the arms 12 and 13 which are integral respectively with the movable members of the switches 5 and 6 and which are so arranged that when either switch is closed the arm on that switch is moved into the path of the arm on the other switch and prevents said other switch from closing. A small transformer X furnishes current for energizing the actuating coil 7 of switch 5 and the actuating coil 14 of a normally open relay O which is rendered slow-closing by a dash-pot 15. The contacts of this relay O are located in the circuit of the actuating coil 8 of the main switch 6. The main switch 5 is provided with auxiliary switches 16 and 17 located, respectively, in the circuit of the actuating coil 8 of the switch 6 and the circuit of the actuating coil 14 of the relay O. In the system shown, the coil 8 receives current directly from the source but, of course, if desired, it might be energized from the transformer X. The actuating coil 7 of the switch 5 is energized by current proportional to the potential of the source and so arranged and proportioned that said switch will close only when the car is upon a high potential section of line. The relay O is so designed that it will close at the current supplied to it when the car is upon a section of line energized at any working potential; that is, this relay tends to close both on a high and on a low potential section. The actuating coil 8 of the switch 6 is capable of closing said switch when the car is upon a low potential section of line if the relay contacts and the auxiliary switch 16 are closed.

The mode of operation of the system of Fig. 1 is as follows: As shown, the various elements of the system are in the position which they assume when the trolley is dead. If now the trolley receives current at the high potential value upon which the car

sometimes operates, the transformer X will be energized and will furnish current to the actuating coil 7 of the switch 5 sufficient to cause said switch to close. At the same time that the coil 7 is energized, the actuating coil 14 of the relay O is also energized from the transformer X and said relay tends to close, being, however, retarded in its closing movement by the dash-pot 15. The switch 5 will close before the relay O has time to close its contacts, and said switch 5 in closing opens its auxiliary switches 16 and 17, thereby interrupting the circuit through the actuating coil 14 of the relay O and also opening the circuit of the actuating coil 8 of the switch 6, which, however, had not been completed at the contacts of the relay O. If desired, the auxiliary switch 16 might be omitted, although I prefer to use it as an extra precaution to insure that the low potential switch 6 can never be closed when the high potential switch 5 is closed, this being, however, also assured by the mechanical interlock between the switches 5 and 6. Closing of the switch 5 connects the main compensator W to the source and the car may be operated as desired. If, on the other hand, the potential applied at the trolley had been of the low value the voltage supplied by the transformer X would not have energized the actuating coil 7 of the switch 5 sufficiently to close said switch. The actuating coil 14 of the relay O, however, would have caused said relay to close under the retarding effect of the dash-pot 15 and, as soon as said relay O had closed its contacts, the circuit through the actuating coil 8 of the switch 6 would have been completed and said switch would have closed. After closing of said switch 6, the mechanical interlock between said switch and switch 5 of course positively prevents the latter switch from closing. The switch 6 in closing connects a low voltage tap on the compensator W to the trolley, and the car may be operated.

The system of Fig. 2 is very similar to that of Fig. 1, the principal difference being that the relay is magnetically held open by a connection with the high potential main switch, in the manner hereinafter described. In the system of Fig. 2 the trolley T', main compensator W', small transformer X' and low potential main switch 6' are exactly the same as in the system of Fig. 1. The relay O' has an actuating coil 14' with which a movable core or armature 18 coöperates, said core being pivotally connected at 19 to a lever 20 pivoted at 21. Said lever 20 is retarded in its counter-clockwise movement by a dash-pot 15'. Pivotally attached to said lever 20 at 22 is a rod 23, to the end of which is secured a core 24 arranged for movement within the field of the actuating coil 7' of the high potential main switch 5'. The lever 20 carries a contact member 25

which coöperates with fixed contacts 26 when said lever is moved to its upper position by the energization of the actuating coil 14' of the relay O'. These contacts 25 and 26 are the contacts of the relay O' and control the circuit of the actuating coil 8' of the switch 6'. The actuating coil 14' of the relay O' is connected to the secondary of the transformer X' through an auxiliary switch 17' opened by the main switch 5' in closing. The actuating coil 7' is so designed and the cores 9' and 24 are so arranged with relation to it, that when the car is upon a high potential section of line the core 24 will be held in the position shown and the lever 20 will be positively prevented from moving to close the contacts 25 and 26 of the relay. When, however, the car is on a low potential section of line the influence of the coil 7' on the core 24 will be insufficient to prevent coil 14' of the relay O' from moving the lever 20 and closing its contacts 25 and 26.

The mode of operation of the system of Fig. 2 is as follows: When the car is upon a high potential section of line the actuating coil 7' will be sufficiently energized to cause the switch 5' to close, an action which will take place before the relay O' can close its contacts owing to the retarding effect of the dash-pot 15' and the holding action of the core 24 which is attracted by the coil 7'. The switch 5' in closing opens the auxiliary switch 17', thereby deenergizing the actuating coil 14' of the relay O'. When the switch 5' closes, it connects the compensator W' to the source and the car can be operated. When, on the other hand, the car is upon a low potential section of line the energization of coil 7' is insufficient to close the switch 5' or to effectively hold the core 24 and the relay O' will gradually close its contacts 25 and 26. When this occurs, the actuating coil 8' of the switch 6' is energized and said switch will close, thereby connecting a low potential tap on the compensator W' to the source and permitting operation of the car.

Although I have shown in this application particular forms in which my invention may be embodied, it is, of course, obvious that many modifications may be made without departing from the spirit of the invention.

What I claim as new and desire to secure by Letters Patent of the United States, is,—

1. A selective switch system for electrically driven cars intended for operation on both high and low potential current comprising a high potential switch to be closed on high potential operation, a low potential switch to be closed on low potential operation, an actuating coil for said high potential switch receiving current proportional to the potential of the source and capable of closing said switch only when the potential of the source is at the high value, an actuat-

ing coil for the low potential switch receiving current from the source, and a slow-closing normally-open relay having its actuating coil connected to the source for controlling the circuit of the actuating coil of the low potential switch.

2. A selective switch system for electrically driven cars intended for operation on both high and low potential current comprising a high potential switch to be closed on high potential operation, a low potential switch to be closed on low potential operation, an actuating coil for said high potential switch receiving current proportional to the potential of the source and capable of closing said switch only when the potential of the source is at the high value, an actuating coil for the low potential switch receiving current from the source, a slow-closing normally - open relay having its actuating coil connected to the source for controlling the circuit of the actuating coil of the low potential switch, and a normally closed auxiliary switch opened by said high potential switch in closing for controlling the circuit of the actuating coil of said relay.

3. A selective switch system for electrically driven cars intended for operation on both high and low potential current comprising a high potential switch to be closed on high potential operation, a low potential switch to be closed on low potential operation, an actuating coil for said high potential switch receiving current proportional to the potential of the source, and capable of closing said switch only when the potential of the source is at the high value, an actuating coil for the low potential switch receiving current from the source, a slow-closing normally - open relay having its actuating coil connected to the source for controlling the circuit of the actuating coil of the low potential switch, and means magnetically operated by the actuating coil of the high potential switch for holding said relay open when the potential of the source is at the high value.

4. A selective switch system for electrically driven cars intended for operation on both high and low potential current comprising a high potential switch to be closed on high potential operation, a low potential switch to be closed on low potential operation, an actuating coil for said high potential switch receiving current proportional to the potential of the source and capable of closing said switch only when the potential of the source is at the high value, an actuating coil for the low potential switch receiving

current from the source, a slow-closing normally - open relay having its actuating coil connected to the source for controlling the circuit of the actuating coil of the low potential switch, an armature of magnetic material coöperating with the coil of the high potential switch, and a connection between said armature and said relay whereby the latter is held in its open position when the potential of the source is at the high value.

5. A selective switch system for electrically driven cars intended for operation on both high and low potential current comprising a high potential switch to be closed on high potential operation, a low potential switch to be closed on low potential operation, an interlock between said switches for preventing both being closed at the same time, an actuating coil for said high potential switch receiving current proportional to the potential of the source and capable of closing said switch only when the potential of the source is at the high value, an actuating coil for the low potential switch receiving current from the source, and a slow-closing normally-open relay having its actuating coil connected to the source for controlling the circuit of the actuating coil of the low potential switch.

6. A selective switch system for electrically driven cars intended for operation on both high and low potential current comprising a high potential switch to be closed on high potential operation, a low potential switch to be closed on low potential operation, an interlocking connection between said switches for preventing both being closed at the same time, an actuating coil for said high potential switch receiving current proportional to the potential of the source and capable of closing said switch only when the potential of the source is at the high value, an actuating coil for the low potential switch receiving current from the source, a slow-closing normally-open relay having its actuating coil connected to the source for controlling the circuit of the actuating coil of the low potential switch, and a normally closed auxiliary switch opened by said high potential switch in closing for controlling the circuit of the actuating coil of said relay.

In witness whereof, I have hereunto set my hand this 25th day of July, 1910.

RAY STEARNS.

Witnesses:

BENJAMIN B. HULL,
HELEN ORFORD.