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O. FRANK & P. J. McCaffrey.

ELECTRIC SWITCH FOR ELECTRIC RAILROAD CARS.

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Fig. 1.

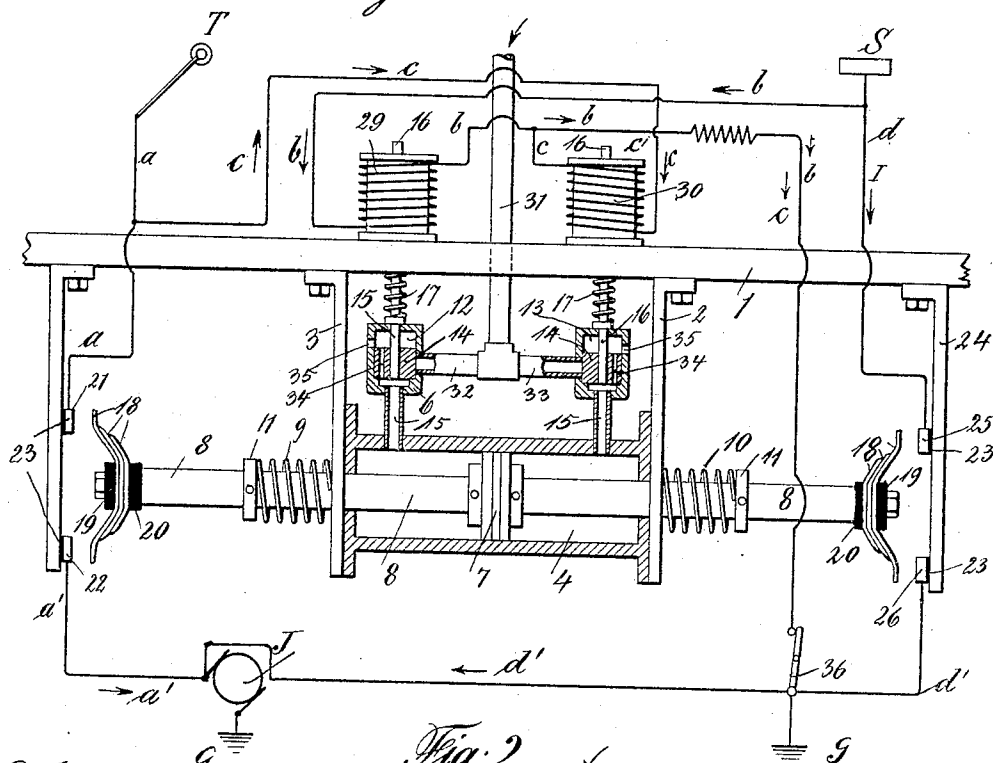
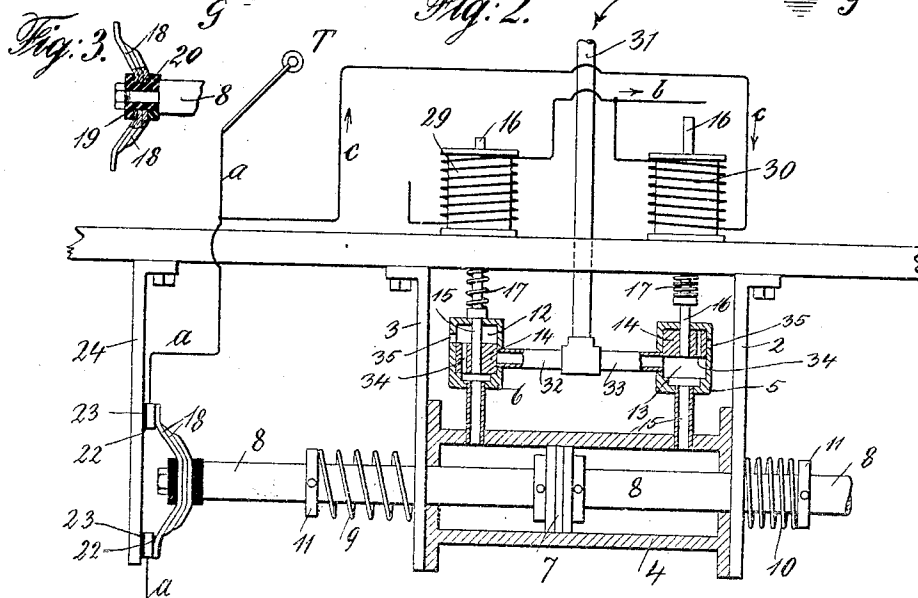


Fig. 2.



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ELECTRIC SWITCH FOR ELECTRIC-RAILROAD CARS.

No. 817,366.

Specification of Letters Patent.

Patented April 10, 1906.

Application filed April 1, 1905. Serial No. 253,209.

To all whom it may concern:

Be it known that we, OTTO FRANK and PETER J. McCAFFREY, citizens of the United States, and residents of Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Electric Switches for Electric-Railroad Cars, of which the following is a specification.

The present invention relates to an automatically-working electric switch for railroad cars, the driving power of which is transmitted partly through overhead wires, trolley, and pole, partly through underground conveying means or the so-called "third rail."

This switch has the object to automatically close an electric circuit leading from the pole and shoe, respectively, to incandescent lights of the cars or a motor therein, and thus to prevent at the points where the transmission of the driving power is changed from the overhead to the underground, or vice versa, the lights from becoming temporarily extinguished.

The present invention is based upon the same principle as that of our prior application, Serial No. 251,309, filed March 21, 1905, and differs from the said prior invention only in that here the compressed air contained in the air vessel of the air-brake apparatus is utilized for the operation of the switch, and electromagnets similar to those shown in our prior application are used to automatically open or close valves controlling an air-cylinder, in which a piston bearing upon its piston-rod the members of the switch is worked to and fro. Owing to this arrangement much less electric power is required to operate the valves than in the prior arrangement for the rod carrying the switch members, and besides the engagement of the contact-pieces on the piston-rod with the stationary contact-pieces arranged opposite thereto, as will be seen from the following detailed specification, is more positive and safe than in the said former arrangement.

Our invention is illustrated in the accompanying drawings, in which similar reference characters denote corresponding parts, and in which—

Figures 1 and 2 are diagrammatic views of the switch in open and one of its closed positions, respectively; and Fig. 3 is a sectional view of a detail part of the apparatus.

With reference to the drawings, 1 denotes

a bar attached at any convenient place to the car, and 2 3 are brackets fastened to said bar 1. These brackets are adapted to support an air-cylinder 4, having valves 5 6 arranged at the ends of the cylinder and adapted to control the inlet and outlet of compressed air. Working in said cylinder is a piston 7, mounted upon a piston-rod 8, which extends at both sides thereof longitudinally of the cylinder and projects outward through the side walls of the latter. The piston 7 has a suitable packing around its circumference to fit air-tight within the cylinder, and suitable packing means may serve to form an air-tight closure in the walls of the cylinder. Coil-springs 9 10 are mounted upon the piston-rod outside of the cylinder and at each end thereof to rest between collars 11 and the brackets 2 3, which springs have the function to keep the piston in normal position, in which the circuits feeding the incandescent lights or motor are broken.

The switch proper consists of contact-pieces arranged upon the free ends of the piston-rod at both sides of the cylinder and of corresponding stationary contact-pieces arranged opposite thereto and having electrical connections with the pole and shoe, respectively, and the incandescent light or motor and the ground. Instead of the arrangement shown in our prior application for the contact-pieces we find it advantageous to arrange the latter as follows: Shaped as car-springs and preferably made of phosphor-bronze are individual plate-springs 18, which are riveted together and provided with a central hole somewhat larger in diameter than the free ends of the piston-rod, which are preferably reduced in circumference, so that the free ends can loosely fit in the holes. To insulate the contact-springs 18 from the piston-rod, bushings 19, of fibrous material, mica, or the like, may be used, which bushings are adapted to fit in the holes of the plate-springs 18, so as to fill out the space between the latter and the ends of the piston-rod. A washer 20, of similar material, may fit on the top of said bushings 19, projecting outward from the holes of the plate-springs to insulate the latter from the shoulders formed on the piston-rod at its reduced ends, and screw-nuts may serve to tighten the attachment of the contact-pieces upon the piston-rod, Fig. 3. Opposite these latter contact-pieces are stationary contact-pieces 21 22 and 25 26, arranged and attached to sta-

tionary brackets 24 24 in a similar way as in our prior application. These contact-pieces 21 22 and 25 26 consist of metal blocks that are arranged opposite the free ends of the plate-springs 18 and are attached to the above stationary brackets 24, from which they may be insulated by washers 23, of any suitable insulating material.

The valves 5 6, controlling the inlet and outlet of the compressed air within the cylinder, consist of valve-boxes 12 13 and valve-bodies 14 14, working therein as pistons, the piston-rods 15 16 projecting outward from the valve-boxes and serving as armatures for electromagnets 29 30, which may be arranged at any suitable place longitudinally of the piston-valves 14 14. In the present arrangement we have shown the same attached to the bar 1. These electromagnets are energized by electric currents conveyed through wires *b c*, respectively, branched off from the wires *a d*, leading from the pole T and shoe S, respectively, and to the ground G.

The stationary contact-pieces 21 22 are connected by wires *a a'* with the pole T, incandescent light or motor J, and the ground G and the pieces 25 26 by corresponding wires *d d'* with the shoe S, incandescent light or motor J, and the ground G.

The compressed air is conveyed from the air vessel (not shown in the drawings) through a pipe 31 and branch pipes 32 33 into the air-valve boxes. The latter are provided with discharge openings or outlets 35 and the valve-bodies 14 with channels 34.

The mode of operation of the automatic switch will be easily understood. When the transmission of the driving power is changed from overhead to underground or third rail, the circuit on the pole side will be opened and on the shoe side closed, so that an electric current will pass from shoe S, branch wire C, winding of the electromagnet 29, thence into the ground G in the direction of the arrow. In consequence of this electric circuit the electromagnet 29 will be energized and will attract its armature, the valve-rod 17 of the valve 12, which in being raised will open the valve and permit the compressed air to enter, through pipes 31 32, the cylinder. This will instantaneously cause the piston to move to the right, whereby the contact-springs 18 on its rod will come in engagement or contact with the stationary contact-shoes 25 26 opposite thereto, and thus close the circuit leading to the incandescent light or motor. The air in front of the piston during the forward movement of the latter will be permitted to exit through the pipe 15, channel 34, and the outlet 35 of the valve 13. A similar but reverse effect takes place when the transmission of the driving power will be changed from underground or third rail to the overhead.

As in our prior application, we prefer to in-

close in the circuit of the electromagnets a knife-switch 36 or the like to permit the circuits to be opened, so as to enable any repairs and cleaning taking place without interfering with the inner parts of the apparatus.

Coil-springs 17, mounted upon the valve-rods 15 16, serve to return the valves forcibly into their normal position after the circuit of the respective electromagnet is broken or opened.

It will be understood that changes may be made with the various parts of the arrangement specified and shown without departing from the spirit of our present invention.

What we claim, and desire to secure by Letters Patent, is—

1. An electric switch for electric-railroad cars which are driven partly by overhead and partly by underground power, comprising an air-cylinder, a piston in the latter, a piston-rod projecting outward through both sides of the cylinder, electric contact-pieces mounted on the free ends of the piston-rod, stationary contact-pieces opposite thereto, electrically-operated valves controlling the inlet and outlet of the compressed air of the cylinder, pipe connections conveying the compressed air from a certain source into the valves, electric connections of the underground and overhead respectively with the stationary contact-pieces, electric connections of the latter with the incandescent light or motor and the ground, and electric means for the automatic operation of the valves, substantially and for the purpose as specified.

2. An electric switch for electric-railroad cars which are driven partly by overhead and partly by underground power, comprising an air-cylinder, a piston therein, a piston-rod projecting outward through both sides of the cylinder, electric contact-pieces upon the free ends of the piston-rod insulated from the latter, stationary contact-pieces opposite thereto, electrically-operated valves controlling the inlet and outlet of the compressed air of the cylinder, electromagnets arranged opposite the valves, the valve-rods being adapted to work as armatures in said electromagnets, electric connections of the electromagnets with the underground and overhead respectively and the ground, electric connections of the stationary contact-pieces with the underground and overhead respectively and the incandescent light or motor and the ground, and pipe connections conveying the compressed air from a certain source into the valves, substantially and for the purpose as specified.

3. An electric switch for electric-railroad cars which are driven partly by overhead and partly by underground power, comprising an air-cylinder, a piston therein, a piston-rod projecting outward through both sides of the cylinder, suitable packings for the piston and

the piston-rod, contact-springs upon the free ends of the piston-rod and means for insulating said contact-springs from the rod, stationary contact-shoes opposite the contact-springs, said shoes and springs being adapted when in engagement to close the circuit passing through the incandescent light or motor, electric connections of the stationary contact-pieces with the underground and overhead respectively and electric connections of said stationary contact-pieces with the incandescent light or motor and the ground, electrically-operated valves controlling the inlet and outlet of compressed air of the cylinder, pipe connections conveying the compressed air from a certain source to the valves, electric means for automatically operating the valves and means for the automatic discharge of the compressed air from the cylinder, substantially and for the purpose as specified.

4. An electric switch for electric-railroad cars which are driven partly by overhead and partly by underground power, comprising an air-cylinder, brackets supporting said air-cylinder from the car, a piston working in said air-cylinder, a piston-rod projecting inward through both sides of the cylinder, springs tending normally to press the piston inward, contact-springs upon the free ends of the piston-rod, insulating means for said contact-springs, brackets opposite the two ends of the cylinder, a pair of contact-shoes attached to each of said brackets, and means for insulating the contact-shoes from the latter, electrically-operated valves automatically controlling the inlet and outlet of the compressed air of the cylinder, electric means for operating the valves and electric connections for the stationary contact-shoes with the overhead and underground and electric connections for the same with the incandescent light or motor and ground, means for

conveying the compressed air from a certain source into the valves and means for the automatic discharge of the compressed air from the cylinder, substantially and for the purpose as specified.

5. An electric switch for electric-railroad cars which are driven partly by overhead and partly by underground power, comprising an air-cylinder, brackets supporting said air-cylinder from the car, a piston working in said air-cylinder, a piston-rod projecting inward through both sides of the cylinder, springs tending normally to press the piston inward, contact-springs upon the free ends of the piston-rod, insulating means for said contact-springs, brackets opposite the two ends of the cylinder, a pair of contact-shoes attached to each of said brackets, and means for insulating the contact-shoes from the latter, electrically-operated valves automatically controlling the inlet and outlet of the compressed air of the cylinder, electromagnets operating the air-valves, the valve-rods working as armatures in said electromagnets, springs tending normally to keep the valves closed, electric connections for the stationary contact-shoes with the overhead and underground and electric connections for the same with the incandescent light or motor, means for conveying the compressed air from a certain source into the valves and means for the automatic discharge of the compressed air from the cylinder, substantially and for the purpose as specified.

Signed at Brooklyn, in the county of Kings and State of New York, this 29th day of March, A. D. 1905.

OTTO FRANK.

PETER J. McCAFFREY.

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