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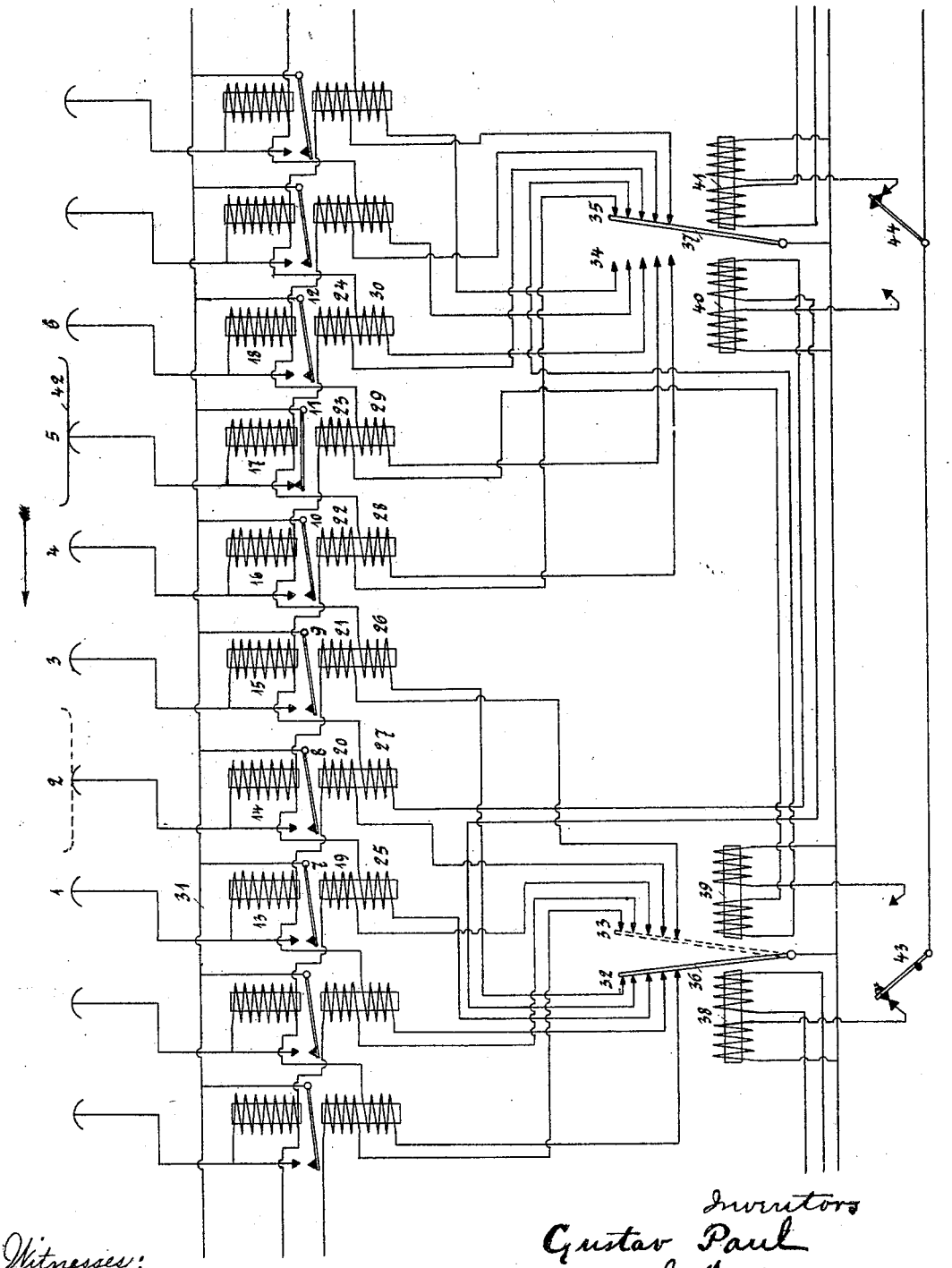
G. PAUL & H. WRIGGERS.

SURFACE CONTACT RAILWAY SYSTEM.

(Application filed Aug. 11, 1899.)

(No Model.)



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UNITED STATES PATENT OFFICE.

GUSTAV PAUL, OF MUNICH, AND HEINRICH WRIGGERS, OF AUGSBURG, GERMANY.

SURFACE-CONTACT RAILWAY SYSTEM.

SPECIFICATION forming part of Letters Patent No. 646,626, dated April 3, 1900.

Application filed August 11, 1899. Serial No. 726,872. (No model.)

To all whom it may concern:

Be it known that we, GUSTAV PAUL, residing at Munich, and HEINRICH WRIGGERS, residing at Augsburg, in the Kingdom of Bavaria, German Empire, electrical engineers, subjects of the German Emperor, have invented a new and useful Improvement in Surface-Contact Railway Systems, of which the following is a specification.

Our present invention relates to improvements in surface-contact railway systems with sectional conductors and relays in which the sectional conductors are switched on and off by means of relays controlled by the passing vehicle and in which the relays may be reversed in groups, according to the direction in which the vehicle is desired to move, this reversal being effected either by hand or automatically.

The accompanying diagram represents a system embodying the present invention and serves to explain the same.

Referring to the drawing, each surface contact or sectional conductor 1 2 3 is connected by means of wires with a controlling apparatus, a series of which is inclosed in the known manner in suitable chambers constructed at intervals along the line. Such a controlling apparatus chiefly comprises a contact-lever, (7 to 12,) adapted to connect the surface contact with the feeder-main 31 and two exciting-coils or controlling-magnets, one of which (13 to 18) serves to lift the contact-lever, while the other (19 to 24) serves to draw it off. In each section the lifting coil (or coils) for making contact is connected with the draw-off coil or contact-breaking coil of the immediately-preceding and of the immediately-succeeding relay. Each draw-off magnet has two windings. One of them (19 to 24) is connected with the contact-making winding of the relay lying in front and the other (25 to 30) is connected with the contact-making winding of the relay lying at the rear. For instance, the contact-making coil 16, belonging to the sectional conductor 4, is connected with the upper draw-off coil 23 of the section 5 and with lower draw-off coil 27 of the section 3, and the upper draw-off coil 22 of the section 4 is connected with the contact-making coil 15 of the section 3 in front, while the lower draw-off coil 28 is connected with the contact-making coil 17 of the section 5 at the rear. The coils of the draw-off magnets are connected in groups with contact-pieces 32 and 33 or 34 and 35, arranged symmetrically to each other and adapted to be closed by means of levers 36 37, acting simultaneously on all the contacts situated on the same side, which levers can be reversed, according to the direction in which the vehicle is desired to move, by means of electromagnets (38 to 41) situated near the end of the group of relays.

To explain the working of the system described above, we will assume that the contact bar, shoe, or current-collector 42 of the car is situated on the contact-stud 5 and that it is desired to run in the direction indicated by the arrow. For the first starting of the car the current of an accumulator mounted on the car is employed in the well-known manner. This battery-current flows through the shoe 42, contact-stud 5, magnet-coil 17, magnet-coil 24, and the corresponding contact of the group 35 into the switch-lever 37, and thence to the return-rail or the earth. The coil 17 is thereby caused to attract the contact-lever 11, so as to connect the feeder-main 31 with the sectional conductor 5, and the carriage may commence to run in the direction of the arrow. As soon as the contact-shoe 42 touches the contact-stud situated immediately in front of the carriage (in the direction in which the latter runs) the relay belonging to that stud will be excited, so as to close the circuit, while the draw-off coil belonging to the section which has just been left by the shoe, but is still covered by the carriage, is excited by a shunt of the apparatus in front, so as to draw off the contact-lever and switch off the sectional conductor.

It should be observed that for the direction of running indicated by the arrow the multiple-switch levers 36 and 37 touch the series of contacts 33 and 35, respectively. The reversal takes place automatically, no matter in which direction the carriage is running, as soon as the contact-shoe has touched the last, or, if required, the last but one, of the contact-

studs or sectional conductors belonging to a group and connected with the relay of the said group.

Supposing the carriage stands with its shoe on contact-stud 5 and runs in the direction of the arrow—that is, to the left—it will next touch the contact-stud 4 and close the circuit which reverses the multiple-switch lever 36; but the current continues to flow through the switch-lever 37 of the preceding group. It is only when the shoe arrives on contact-stud 2 that the working current will flow through the multiple-switch lever 36, situated under the same.

When the carriage is once running in a given direction which it has to maintain, the reversal of the multiple-switch lever or of the group of sectional conductors belonging to the same takes place automatically, as mentioned above. If, however, it be desired to change the direction when the carriage is in motion—for instance, in case of an accident—the multiple-switch levers are reversed by hand by turning suitable switches 43 44, arranged at convenient distances along the line of rails and adapted to control the electromagnets 38 to 41, which for this purpose are provided with double windings, as shown by the drawing.

Having thus described our invention, what we claim, and desire to secure by Letters Patent of the United States, is—

1. In a surface-contact and relay system of electric railways or tramways of the type described, controlling apparatus for each surface-contact consisting of a lever for making and breaking the working circuit; two separate exciting-coils for operating said lever and circuit connections so arranged that the draw-on or circuit-closing coil of each relay is situated in a shunt of the working circuit and connected with the draw-off or circuit-breaking coil of the immediately-preceding and the immediately-succeeding controlling apparatus, said draw-off magnets having double windings connected at one end with the draw-on coils of the adjoining controlling appliances and at the other end with fixed contact-pieces arranged in groups symmetrical with each other and controlled by multiple-switch levers, as and for the purpose set forth.

2. In a surface-contact and relay system of electric railways or tramways of the type described, a series of sectional relays arranged together in groups and provided with multiple switches and circuit connections for reversing them at will and maintaining the run of the car in the desired direction, all of said parts acting substantially as and for the purpose set forth.

Signed at Munich, in the Kingdom of Bavaria, German Empire, this 28th day of July, A. D. 1899.

GUSTAV PAUL.
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Witnesses:
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