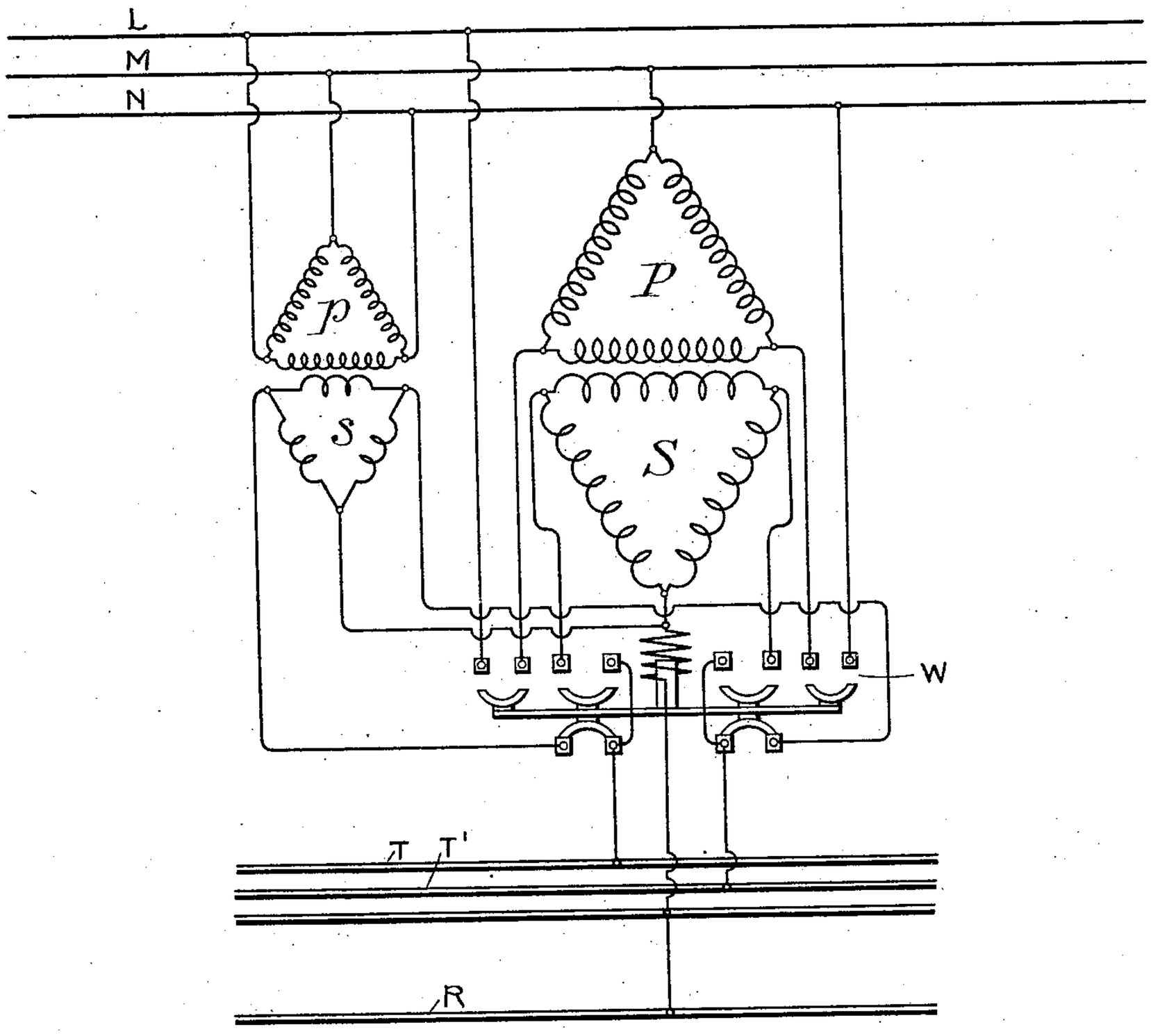
No. 713,016. Patented Nov. 4, 1902.

W. B. POTTER.

ELECTRIC RAILWAY SYSTEM.

(Application filed Mar. 21, 1901.)

(No Model.)



Witnesses.
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UNITED STATES PATENT OFFICE.

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ELECTRIC-RAILWAY SYSTEM.

SPECIFICATION forming part of Letters Patent No. 713,016, dated November 4, 1902.

Original application filed March 5, 1900, Serial No. 7,260. Divided and this application filed March 21, 1901. Serial No. 52,121. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM B. POTTER, a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Electric-Railway Systems, (Case No. 2,134,) of which the following is a specification.

This application is a division of application Serial No. 7,260, filed March 5, 1900.

The invention relates to alternating-current systems in general, with especial application to sectional-conductor railways, wherein it is not desirable to maintain current of high potential permanently upon the working conductors. This object is obtained with the advantageous feature of reducing the fixed core losses of transformers, as described in the patent to Ferranti, No. 409,775, August 27, 1889.

In the application above referred to, of which this is a division, the working conductors were shown as normally maintained at low potential by transformer secondaries which control electromagnetic switches for cutting in high-potential transformers upon the passage of a car. In that application two methods were described by which the low-potential secondary was prevented from being short-circuited when the high-potential secondary was cut into circuit. The specific method claimed in that application was an arrangement by which the low-potential transformer was compounded at the time the high-potential secondary was connected with the working conductors, so that the first secondary then supplied current to the working conductors at the same potential as the high-potential secondary. The other specific form is intended to be covered in this application.

The drawing is a duplicate of Figure 3 of that application, and is a working diagram of the electrical connections, showing diagrammatically the transformers connected between the line and the working conductors.

L, M, and N represent the mains of a multiphase system, and R the track-rails, which may constitute a common return and need not be insulated. T and T′ are the other two working conductors, which in this system are divided into sections which are well insulated from ground and which are normally maintained at low potential to avoid danger to animal life. The electromagnetic switch W is normally held by gravity in its open position. In this position it connects the secondary *s* of the low-potential transformer *p s* with the working conductor T, T′, and R. Thus the transformer *p s* normally supplies a considerably lower electromotive force to the working conductors than that flowing in the mains. The transformer P S is wound to supply a higher potential than the transformer *p s* and is normally disconnected from the working conductors. As shown, the primary P has one leg normally connected to one of the mains, the other legs thereof being normally disconnected from the other mains, and the secondary S has one leg normally connected to one of the working conductors, the other legs thereof being normally disconnected from the other working conductors. It is not essential that both the primary P and the secondary S should be out of circuit, and either one, preferably the primary P on account of the fixed core loss, may be normally cut out. So far as the invention herein is concerned the low-potential secondary *s* might be adapted to coöperate with the primary P, the primary *p* being in this case dispensed with; but in such case the primary P would necessarily be continually in circuit and the secondary S cut out. In order to avoid the consequent fixed core losses, it is preferable to employ the auxiliary primary *p* as the inducing winding for the low-potential secondary *s*.

Assuming that the potential of the mains is substantially ten thousand volts, the low-potential secondary *s* is constructed to develop about one hundred volts, which is not dangerous to animal life, while the secondary S may be wound to supply a potential of one thousand volts to the working conductors, which may be sufficient to operate the car-motors. It is thus clear that the secondaries S and *s* must not be connected across each other's terminals at any time and that some means must be provided for preventing the short-circuiting and burning out of the secondary *s*.

As shown in the drawings, when the working conductors are engaged by the collectors carried by the car the high-potential transformer P S, which is normally disconnected from the mains and working conductors, is operatively connected therewith by the switch W, and the low-potential secondary *s* is cut out of circuit. Thus it will be seen that the electromagnet-coil which is utilized to connect the transformer P S in circuit serves the additional function of cutting the low-potential secondary *s* out of circuit, and thus prevents a short-circuit. The fixed core loss in the primary *p* of the low-potential transformer is not regarded as serious; but, if it is desired, the electromagnetic switch W may be readily adapted to cut out the primary *p* when the high-potential transformer is connected to the mains and working conductors. This can be readily done in the same manner in which the primary P is connected and disconnected.

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

1. In a three-phase system, the combination with the mains, of a transformer adapted to coöperate with said mains, a second transformer having only one leg of each member connected to the mains and load respectively, and an electromagnetic switch controlled by the current through the first transformer for cutting out the latter and for connecting the two remaining legs of each member of the second transformer with the mains and loads respectively.

2. In an electric railway, the combination with the feeders and working conductors, of a transformer adapted to normally supply a low potential to said conductors, a high-potential transformer normally disconnected from the mains and conductors, and an electromagnetic switch operated by the low potential transformer upon the passage of a car, to cut out the low-potential transformer and connect the high-potential transformer with the mains and working conductors.

3. In a system of distribution, the combination with the feeders, of a transformer secondary coöperating therewith to normally supply lower potential than that of the feeders, a second transformer secondary adapted to coöperate with the feeders to supply greater potential than that supplied by the first secondary, and an electromagnetic switch operated by the low-potential current to cut out the first secondary and to cause the other secondary to become operative.

4. In a system of distribution, the combination with the mains, of a transformer cooperating therewith to supply lower potential than that flowing in the mains, a second transformer adapted to coöperate with the mains to supply a current of higher potential than that supplied by the first transformer, and means for automatically cutting out the first transformer at desired times and rendering the second transformer operative.

5. In a system of distribution, the combination with the mains, of a transformer cooperating with said mains to supply lower potential than that flowing in the mains, a second transformer adapted to coöperate with the mains to supply higher potential than that supplied by the first transformer, and an electromagnetic switch adapted to cut out the first transformer and render the second transformer operative.

6. In a system of distribution, the combination with the mains, of a transformer cooperating therewith to supply lower potential than that flowing in the mains, a second transformer adapted to supply higher potential than that supplied by the first transformer, and normally disconnected from the mains and load, and an electromagnetic switch operated by the low-potential transformer to cut out the first transformer and connect the second transformer to the mains and load.

7. The combination with high-tension alternating-current mains, of sectional railway-conductors, low-potential transformer-secondaries which normally supply the conductor-sections, transformer-secondaries adapted to supply higher potential than said low-potential secondaries to said conductor-sections, and means actuated by said low-potential secondaries when their circuits are closed by a passing car to cause the low-potential secondaries to be inoperative, and to cause the high-potential secondaries to be operative.

8. The combination with high-potential alternating-current mains, of sectional railway-conductors, low-potential transformers which normally supply the conductor-sections, higher potential transformers having their primaries normally open-circuited, and means actuated by said low-potential transformers when their circuits are closed by a passing car, for open-circuiting the low-potential transformers and closing the primary circuits of the higher potential transformers.

9. The combination with high-potential alternating-current mains, of sectional railway-conductors, low-potential transformers which normally supply the conductor-sections, higher potential transformers having their primaries normally open-circuited, and electromagnetic switches actuated by said low-potential transformers when their circuits are closed by a passing car for disconnecting the low-potential transformers from the sectional conductors and for connecting the primary and secondary circuits of the higher potential transformers to the mains and sectional conductors respectively.

10. In an electric-railway system, a source of high-potential current, a source of low-potential current, working conductors from which the current for operating the car-motors is collected, said low-potential source being normally connected to, and said high-potential source being normally disconnected from said working conductors, and means

operated by the low-potential current for connecting said high-potential source with and disconnecting said low-potential source from said working conductors upon the passage of a car.

11. In an electric-railway system, a source of high-potential current, a source of low-potential current, working conductors from which the current for operating the car-motors is collected, said low-potential source being normally connected to, and said high-potential source being normally disconnected from said working conductors, an electromagnetic switch operated by the low-potential current for connecting said high-potential source with and disconnecting said low-potential source from said working conductors upon the passage of a car.

In witness whereof I have hereunto set my hand this 18th day of March, 1901.

WILLIAM B. POTTER.

Witnesses:

BENJAMIN B. HULL,

FRED RUSS.