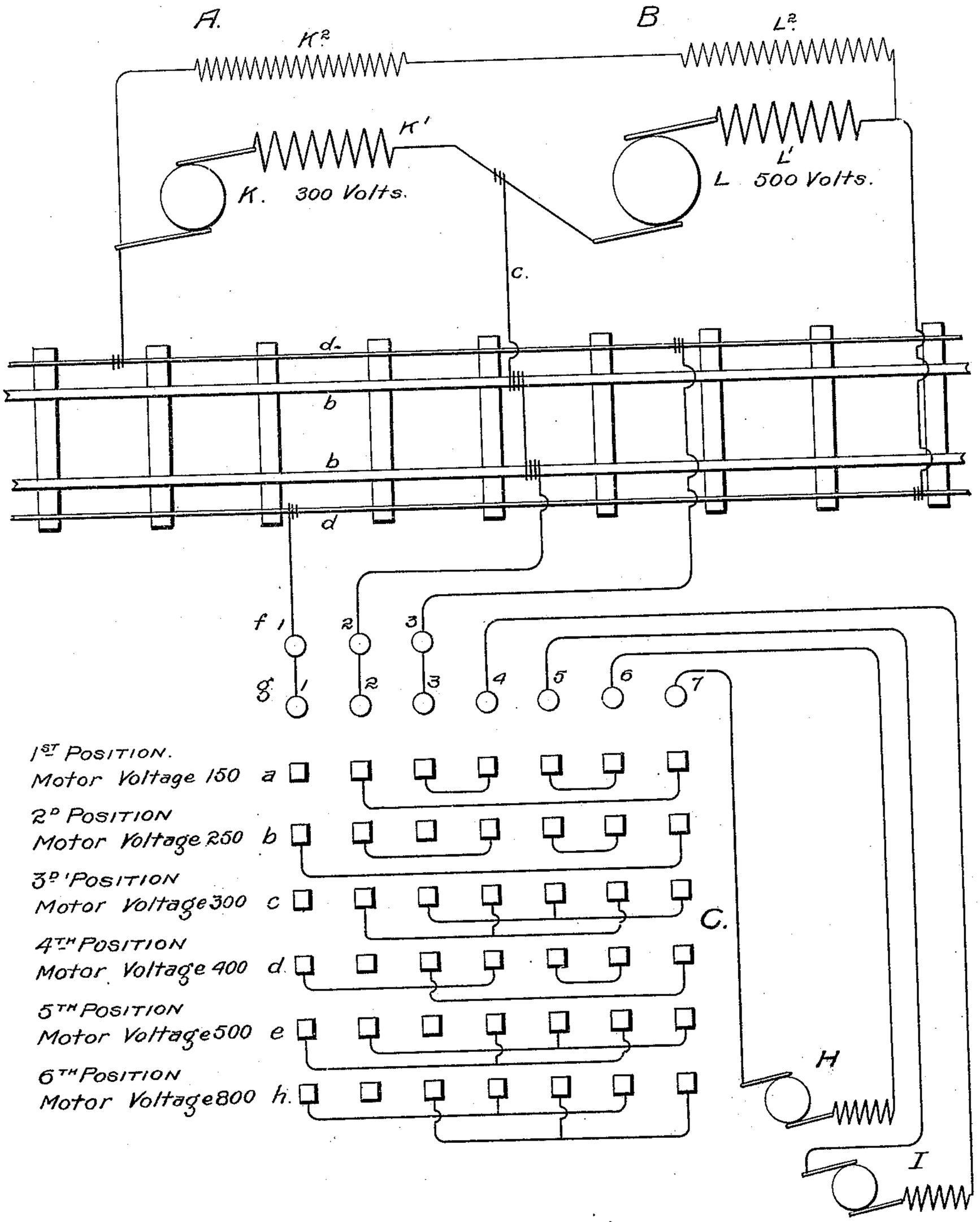
(No Model.)

J. C. HENRY.

ELECTRIC RAILWAY.

No. 545,158. Patented Aug. 27, 1895.



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ELECTRIC RAILWAY.

SPECIFICATION forming part of Letters Patent No. 545,158, dated August 27, 1895.

Application filed April 20, 1895. Serial No. 546,541. (No model.)

To all whom it may concern:

Be it known that I, JOHN C. HENRY, a citizen of the United States, residing in Westfield, county of Union, State of New Jersey, have invented certain new and useful Improvements in Electric Railroads, of which the following is a specification.

This invention relates to improvements in electric railways. It has more particularly in view improvements in the distribution of the current and desirable means of regulating electric motors.

In my co-pending case, Serial No. 546,540, I have shown and described a method of applying the three-wire system to electric railroads. In the system referred to three separate traveling contacts are employed. The track-rails are used as one of the conductors, the car wheels and axles completing the circuit thereto. Those rails form the neutral conductors. Traveling contact is also maintained with both of the opposite terminals of the dynamos. In the method herein shown the same or other constructions may be used.

In the operation of electric cars the common or almost universal method employed is what is known as "the series-multiple arrangement." In it numerous changes are made in the motor circuits to gradually increase or decrease their force and speed. The common practice is to have but two running positions—that is, when the motors are in series or when they are in parallel with each other. The other four or five changes are usually made by adding wasteful resistance to the motor circuits. In this application I show in diagram in combination with a novel method of electrical distribution an arrangement whereby all desirable changes are made without waste of current through unuseful resistance.

In the diagram, A represents a compound-wound dynamo arranged to give a potential of three hundred volts. B represents a similar dynamo of larger capacity arranged to give a potential of five hundred volts. Those machines are connected in a novel manner to the well-known three-wire system.

b b represent the track-rails of an electric railway to which the neutral wire *c* is connected.

d represents one of the mains from the dynamo B. *d'* represents the other main leading from the dynamo A.

f 1, 2, and 3 represents the terminals of said conductors, which lead from the three different traveling contacts of an electric railroad to the terminals of the switch C on line *g* at 1, 2, and 3.

H represents motor No. 1 with its wires leading to the switch-terminals at figures 6 and 7, line *g*.

I represents motor No. 2, whose wires terminate at figures 4 and 5, same line.

C represents a switch, the contact-points of which are made to move upward and engage with the terminals on the line *g*. In the first position the contacts 2, 3, 4, 5, 6, and 7, line *a*, engage with the similarly-numbered terminals on line *g*. In this position the two motors are in series and receive current from the dynamo A. They are each then working under a pressure of one hundred and fifty volts. In the second position contacts 1, 2, 4, 5, 6, and 7, line *b*, engage with the similarly-numbered terminals on line *g*. In this position the motors are in series and receive current from dynamo B. They are each consequently working under two hundred and fifty volts pressure. In the third position contacts 2, 3, 4, 5, 6, and 7 engage with the similarly-numbered terminals on line *g*. In this position the motors are working in parallel and receive current from the dynamo A under three hundred volts pressure. In the fourth position the contact-points 1, 3, 4, 5, 6, and 7, line *d*, engage with the correspondingly-numbered terminals on the line *g*. In this position the motors receive current in series from both dynamos in series, making the working-pressure on each motor four hundred volts. In the fifth position the contacts 1, 2, 4, 5, 6, and 7, line *e*, connect with the correspondingly-numbered terminals on line *g*. In this position the motors are in parallel and receive current from dynamo B. They are consequently working under five hundred volts pressure. In the sixth position contacts 1, 3, 4, 5, 6, and 7, line *h*, engage with the similarly-numbered terminals on line *g*. In this position the motors are working in parallel, each under eight hundred volts pressure from the two dynamos in series.

I have described the system and operation where two motors are used. Where but a sin-

gle motor or more than two are used it is obvious that numerous other changes may be provided for in the switch without departing from the spirit of the invention. I do not herein claim any particular form of switch. The general design may be such as is shown in my Patent No. 500,066, dated June 20, 1893.

In experimenting with compound dynamos connected in series in the ordinary manner I experienced much trouble, particularly so when they were of a different voltage. The difficulty was that the strongest machine overpowered the weaker and tried to run the latter as a motor and would do so unless the belt was very tight. To relieve this difficulty, I secured satisfactory results by coupling the dynamos up in the manner shown.

In the drawings, K represents the armature of the three-hundred-volt or smallest dynamo. K′ represents its series coil, and K^2 the shunt-coil.

L represents the armature of the larger or five-hundred-volt dynamo, L′ its series, and L^2 its shunt-coil.

Instead of connecting the shunt-coil across the armature-terminals of each machine I have put the shunt-wires of both dynamos in series and connect their other terminals to the points of the combined machine having the greatest potential difference.

What I claim as new, and desire to secure by Letters Patent, is—

1. In a three wire system of electrical distribution, the combination with the main leads and the neutral conductor, of two self-regulating dynamos of predetermined but unlike electro-motive force, substantially as described.

2. In a three wire system of electrical current distribution, two compound wound dynamos of different electro-motive force having their shunt-coils connected in series, substantially as described.

3. In a three wire system of electrical current distribution, two dynamo electric generators of different electro-motive force having their series coils and armatures connected with the mains in the usual manner, and a single shunt coil circuit common to both machines, substantially as described.

4. In a three wire system of distribution, a pair of dynamos unmatched as to voltage connected together in series and having intermediate connection with the neutral wire; the shunt wires of the separate machines coupled in series and having their terminals connected at the points of greatest potential difference.

5. In a three wire system of electrical distribution adapted to furnish current to electric motors or translating devices whose requirements fluctuate, a source of electrical energy consisting of two or more dynamos unmatched as to electrio motive force, said dynamos having their series coils and armatures coupled together in series, the neutral wire connected intermediate thereto, as shown, and having the shunt wires of the separate dynamos coupled in series and having their terminals connected to the assembled dynamos at the points showing the greatest potential difference.

6. The combination with sources of electrical supply arranged to furnish current of varying voltages, of translating devices, and a switch adapted to connect said translating devices with either or both sides of said sources of supply either in series or in parallel, substantially as described.

7. In a three wire source of electric supply, a switch adapted to connect two or more motors thereto from either side in series or in parallel.

8. In electric railroads, an arrangement of circuits leading from the terminals of dynamos having different electro-motive force; motors in traveling connection with said circuits, and a switch arranged to connect said motors with the circuits from either or both sides.

In testimony whereof I hereunto affix my signature in presence of two witnesses.

JOHN C. HENRY.

Witnesses:
VALLA KILTON,
MARY HAMPTON LLOYD.