

(No Model.)

A. H. ARMSTRONG.  
ELECTRIC CAR LIGHTING SYSTEM.

No. 556,079.

Patented Mar. 10, 1896.

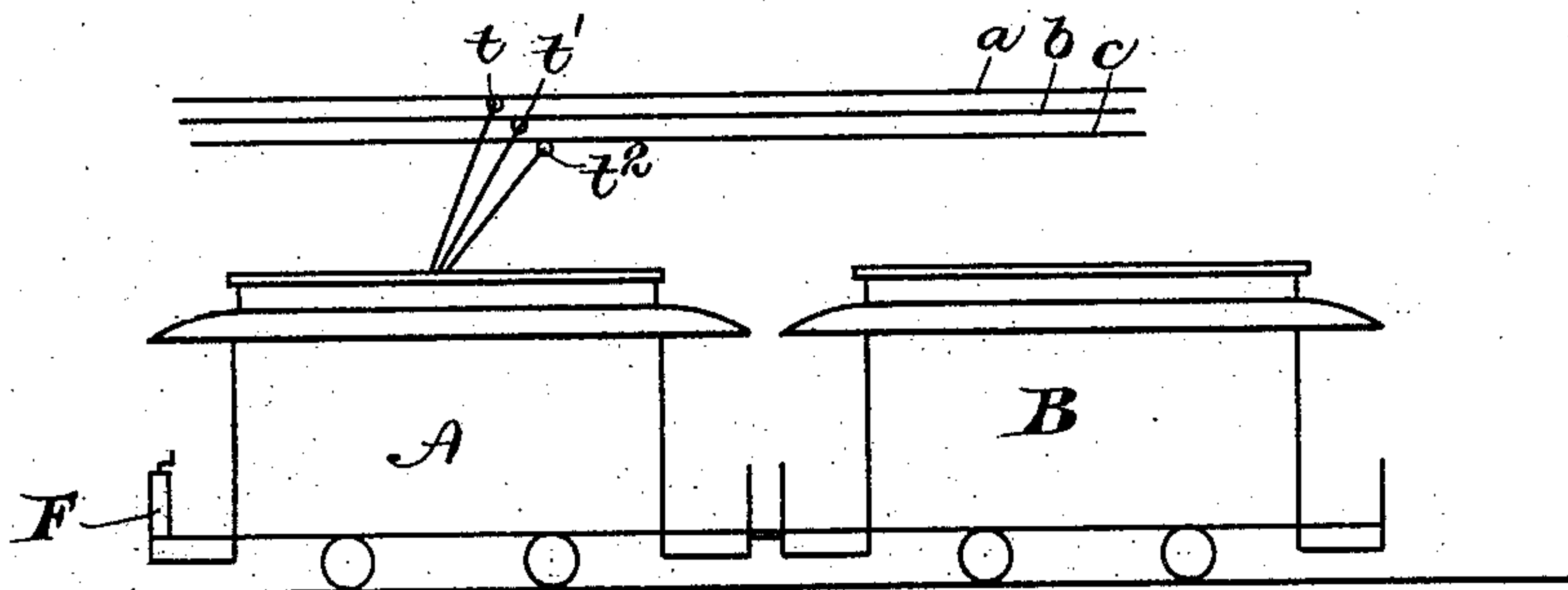
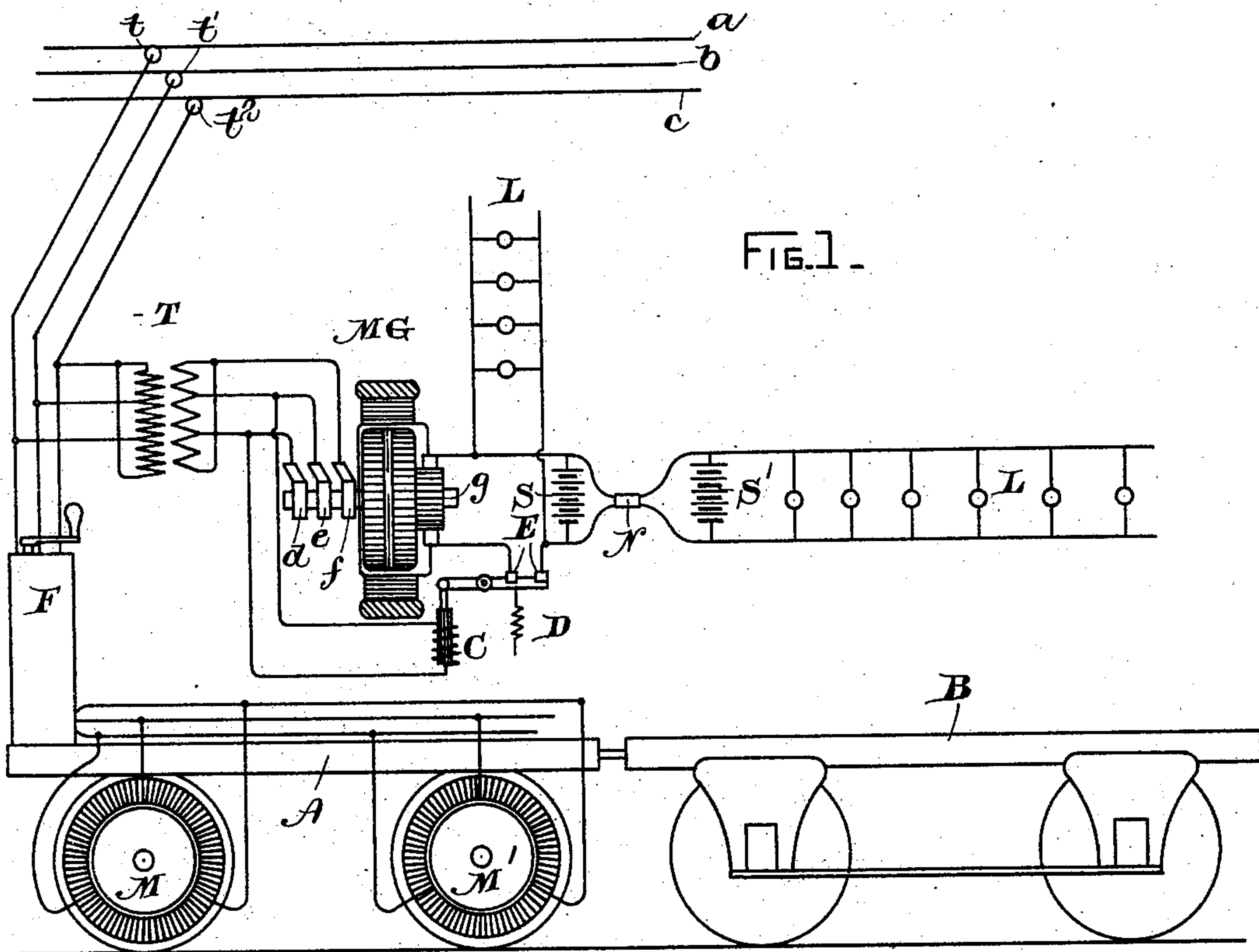


FIG. 2.

WITNESSES.

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# UNITED STATES PATENT OFFICE.

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## ELECTRIC CAR-LIGHTING SYSTEM.

SPECIFICATION forming part of Letters Patent No. 556,079, dated March 10, 1896.

Application filed May 31, 1895. Serial No. 551,038. (No model.)

*To all whom it may concern:*

Be it known that I, ALBERT H. ARMSTRONG, a citizen of the United States, residing at Schenectady, in the county of Schenectady, State of New York, have invented certain new and useful Improvements in Systems of Car-Lighting, of which the following is a specification.

My invention relates to electric railways, and has for its object to provide a remedy for the difficulty experienced in lighting trains of cars upon such roads where the roads are operated by alternating currents.

Ordinarily alternating-current railways are designed to be operated by multiphase currents. This is the preferred construction; but I do not intend to limit the invention herein shown and described to this arrangement.

Where two or more cars are to be lighted, it has been customary to either have a separate trolley connection for each car or to take a connection directly from each car to the trolley of the electric locomotive. In the cases to which I have referred it is, however, desirable to maintain the lights, at least for a time, when for any reason one car is disconnected from another. For the purposes of my invention, therefore, I equip the electric locomotive with a motor-generator having sufficient capacity to light all the cars of the train, and also to supply a small storage-battery upon each car. This battery is ordinarily in circuit when the lamps are lighted, though any suitable device may be employed to cut it out when it has attained its full charge. These devices being well-known, I do not illustrate and describe them herein. With the storage-battery intended to be used upon the electric locomotive I combine a potential magnet or similar device by which the circuit of the motor-generator is opened whenever the trolley-current ceases, as when the trolley leaves the wire or the cars are uncoupled. The operation of this part of my device is to put the lights upon the storage-battery, which can thus operate to maintain constant illumination for as great a length of time as may be desired, in proportion to the size of the battery.

The accompanying drawings show embodiments of my invention, Figures 1 and 2 be-

ing diagrams showing railroad-cars equipped therewith.

In the figures,  $a b c$  are the lines of a three-phase railway system, and  $t t'$  suitable trolleys running upon the lines and having leads to a suitable controller  $F$ , by which the operation of the motors  $M M'$  upon the car  $A$  is regulated.

The car  $B$  is indicated diagrammatically as having no motors.

$T$  is a transformer, from which leads go to the collector-rings  $d e f$  of the motor-generator  $M G$ .

From the commutator  $g$  of the motor-generator leads go to storage-batteries  $S S'$ , one upon the electric locomotive, the other upon the car  $B$ .

Lamps  $L L$  are in circuit with the different batteries, respectively, and the same lines serve to convey current from the motor-generator.

At  $C$ , I illustrate a solenoid with laminated core pulling against a spring  $D$ . The switch is controlled by this device, which is arranged in shunt to two of the mains from the transformer  $T$ , and the switch serves to close the contacts  $E E$ . When the current is cut off by the trolley leaving the wire, so that no current flows in the coils of the transformer  $T$ , the magnet  $C$  ceases to act and the spring  $D$  opens the circuit at the contacts  $E E$ . The storage-batteries then supply the lamps  $L L$  with current. When the trolley is replaced, the current flows in the magnet  $C$ , the switch closes the contacts, and the motor-generator supplies the lamps with current.

Although I have illustrated a step-down transformer, it is manifest that the transformation may, without departing from my invention, be included in the construction of the motor-generator for the purposes herein set out that may be arranged either with two windings upon its armature or with the now well-known type of "Bradley" winding, in which a single wire is used both to rotate the armature by the alternating current and to generate the continuous current delivered from the commutator  $g$ .

It is manifest that the same action described with reference to the motor-generator and its circuit takes place upon the car  $B$  when it is



separated from the car A and the coupling N is disconnected.

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

5 1. In combination, a generator of alternating currents, lines leading therefrom, electrically-propelled vehicles making traveling  
10 contact with the lines, a motor-generator carried upon one of the vehicles, a step-down transformer in circuit between the generator and the alternating-current side of the motor-  
15 generator, connections from the continuous-current side of the motor-generator to the lighting appliances upon all the vehicles, a  
20 storage-battery in circuit with the lighting appliances upon each vehicle, and an automatic switching device controlled by the alternating current and operating to open-circuit the continuous-current side of the motor-gen-  
erator and leave the lamps in circuit with the storage-batteries upon cessation of the alternating current.

2. In combination, a three-phase railway-line, electrically-propelled vehicles thereon,  
25 one of such vehicles making traveling contact with the supply-lines, a step-down transformer carried upon one of said vehicles a motor-generator carried upon said vehicle and supplied with current from said transformer,  
30 lamps supplied from the continuous-current side of the motor-generator, storage-batteries

included in circuit with the lamps, and means in the alternating-current circuit for automatically cutting out the motor-generator and lighting the lamps from the storage-batteries  
35 upon cessation of the alternating current.

3. In combination, a generator of three-phase currents, an electric railway system supplied by lines leading from the generator, vehicles making traveling contact with the  
40 lines, a step-down transformer carried upon one of such vehicles, a motor-generator supplied from the step-down transformer, lamps upon each of the vehicles supplied from the continuous-current side of the motor-gen-  
45 erator, a storage-battery upon each vehicle, in circuit with the lamps thereon a switching appliance actuated by the alternating current and adapted to open-circuit the motor-generator and put the lamps upon the storage-bat-  
50 teries upon the cessation of the alternating current and separable couplings for the lamp-circuit between the vehicles, whereby each vehicle will be independently lighted by its  
55 batteries in case of separation from the one carrying the motor-generator.

In witness whereof I have hereunto set my hand this 20th day of May, 1895.

ALBERT H. ARMSTRONG.

Witnesses:

B. B. HULL,

A. F. MACDONALD.