W. A. TURBAYNE.

ELECTRICAL SYSTEM OF DISTRIBUTION.

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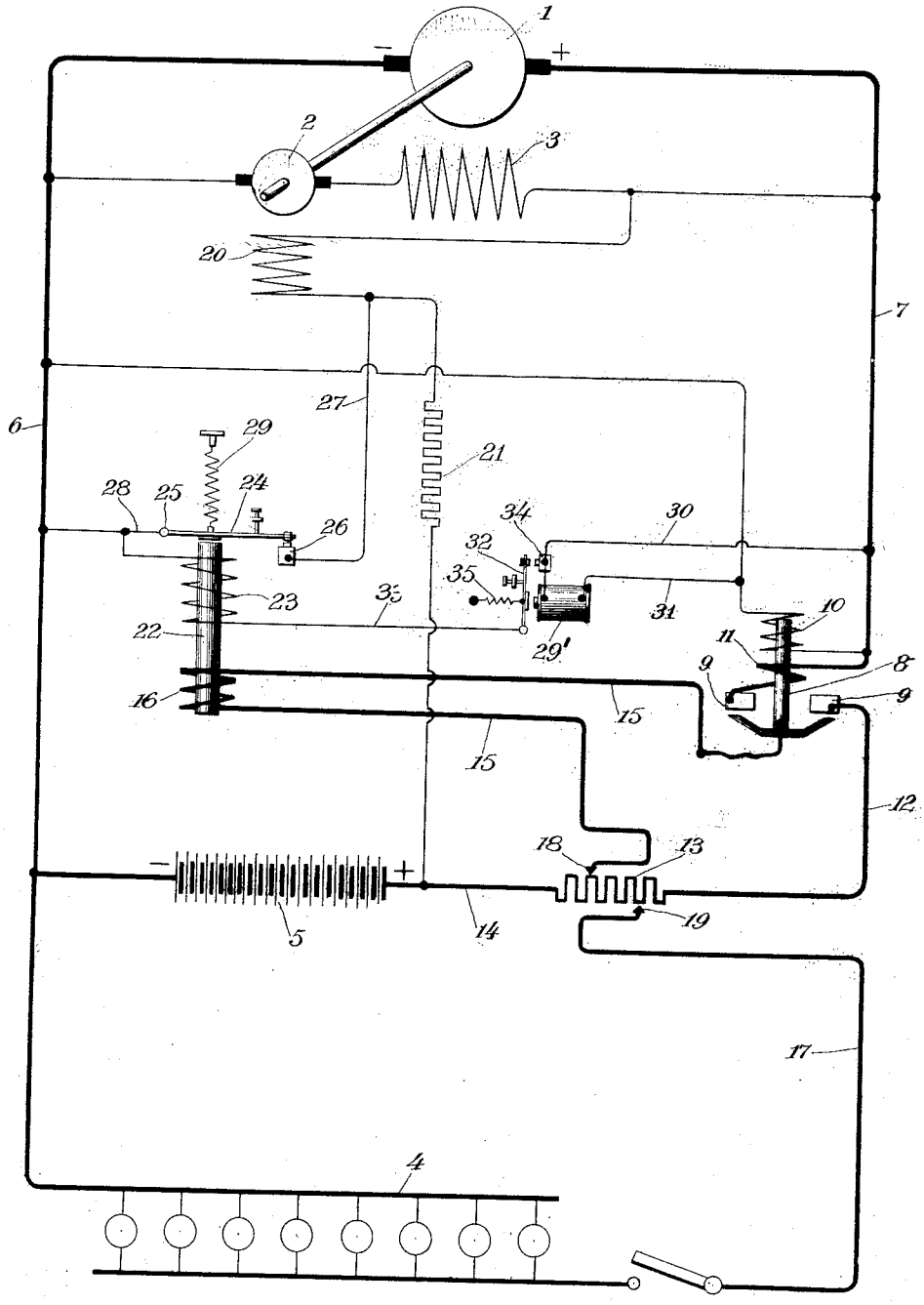

Witnesses:

Geo. H. Harris.

John A. Kempler.

Inventor

William A. Turbayne

By his Attorneys

Kenyon & Kenyon

UNITED STATES PATENT OFFICE.

WILLIAM A. TURBAYNE, OF LANCASTER, NEW YORK, ASSIGNOR TO GOULD COUPLER COMPANY, A CORPORATION OF NEW YORK.

ELECTRICAL SYSTEM OF DISTRIBUTION.

1,034,537. Specification of Letters Patent. Patented Aug. 6, 1912.

Application filed October 29, 1909. Serial No. 525,408.

To all whom it may concern:

Be it known that I, WILLIAM A. TURBAYNE, a citizen of the United States, and a resident of Lancaster, in the county of Erie, State of New York, have invented certain new and useful Improvements in Electrical Systems of Distribution, of which the following is a specification.

My invention relates to electrical systems of distribution and more especially to car lighting systems in which the main generator is driven by the movement of the car and in which automatic means is employed to regulate the voltage of the main generator.

One object of my invention is to provide a system in which the characteristic or voltage of the main generator may be maintained more nearly at the desired value at substantially all speeds of the car.

A further object of my invention is the provision of a system in which the regulation of the generator is maintained in accordance with current changes during the charging of the battery but is maintained in accordance with voltage changes when the battery has become substantially charged.

Further objects, features and advantages will more clearly appear from the detailed description given below taken in connection with the accompanying drawing which forms a part of this specification.

In the drawing which shows diagrammatically a system embodying one form of my invention, 1 represents the main generator driven at a variable speed by the movement of the car as by the car axle.

2 represents an auxiliary dynamo driven from the same shaft as the generator 1 and connected in series with the shunt field 3 of the main generator 1. The main generator 1 is arranged to feed a work circuit 4 and a storage battery 5 through the mains 6 and 7. Connected in series in the main 7 is a switch 8 arranged to make electrical connection between the contacts 9 when the voltage of the generator reaches a predetermined value. For this purpose the switch 8 is acted upon by a voltage coil 10 connected directly across the mains 6 and 7. The switch 8 is also provided with a coil 11 connected in series with the mains 7 in a well known manner.

From the switch 8 the current has several paths which it may take in passing to the work circuit 4 and battery 5. One of these paths is through the main conductor 12, resistance 13 and conductor 14. Another path is through the conductor 15 and coil 16. All of the work circuit current, however, passes through the conductor 17 from the resistance 13. Conductors 15 and 17 are arranged to contact with the resistance 13 at various points by means of contact points 18 and 19. By this arrangement the current in coil 16 may be arranged to be responsive to the battery current or to the generator circuit current or to both, according to the positions of the contact points 18 and 19. The conductor 15 is connected to the movable member of the switch 8, so that when the car is stationary and the switch is open the coil 16 is entirely disconnected and no current can flow therethrough from the battery, for if the coil 16 was thus energized the field coil 20 would be energized in the wrong direction so that it would not perform its proper function of initially causing the excitation of main generator 1. The opening of the automatic switch 8 prevents the battery current from flowing back to the main generator.

The auxiliary dynamo 2 is provided with a field 20 having one end connected to the conductor 7, while its other terminal is connected to the positive side of the battery through the resistance 21.

22 represents the core of an electromagnet upon which is wound the coil 16 and also a voltage coil 23 which is arranged to be connected across the mains 6 and 7 at the proper time. The electromagnet formed by the core 22 and the coils 16 and 23 is arranged to operate a vibrating armature 24 secured at 25 and arranged to make electrical contact with a terminal 26. The terminal 26 is connected with the field coil 20 by means of a conductor 27 while the armature 24 is connected with the coil 23 and with the main 6 by means of a conductor 28. The adjustable spring 29 normally maintains the armature 24 out of contact with the terminal 26.

29′ is an electromagnet connected across the mains 6 and 7 by means of conductors 30 and 31. The magnet 29′ is arranged to operate an armature 32 electrically connected to the coil 23 by means of a conductor 33. The armature 32 is normally held away from a contact terminal 34 by means of a

spring 35 and the terminal 34 is connected to the main 7 by means of conductor 30. When operated upon by the electromagnet 29′ the armature 32 contacts with terminal 34 and thus connects the coil 23 directly across the mains 6 and 7.

In operation when the system is started up the coil 20 is excited by current from the battery in a direction to cause the dynamo 2 to aid the main generator in building up. This action continues until after the main switch 8 is closed and until the speed of the main generator increases such that its voltage tends to exceed the predetermined value necessary to give the proper charging current. Upon reaching this condition the armature 24 will close upon contact 26 thus energizing coil 20 in the opposite direction and causing the dynamo 2 to act as a counter machine to materially decrease the field strength of the main generator and prevent any further rise in generator voltage and battery current. The vibrating armature 24 is maintained very near the point of equilibrium by means of the current in the coil 16. If the voltage of the main machine tends to increase the current in coil 16 increases, the armature 24 makes contact with the terminal 26 thus throwing the field 20 across the main 6 and 7, causing a material counteraction by the auxiliary machine 2, so that the voltage of the main generator tends to decrease to a very great extent below normal. Immediately, however, this effect tends to take place and the voltage of the main machine decreases the current in coil 16 decreases, so that the spring 29 becomes the more powerful and the armature 24 is withdrawn. This action continues and the rate of vibration of the armature 24 varies such that the voltage of the main generator is maintained at a proper value, in order to cause a substantially constant current to flow in the coil 16. In this manner a substantially constant charging current may be given the battery or the total load on the generator may be maintained substantially constant, this depending on the connection of the contact terminals 18 and 19. When, however, the battery has reached a predetermined voltage, indicating that it is sufficiently charged, the electromagnet 29′ attracts the armature 32, so that the coil 23 is thrown in circuit across the mains 6 and 7. This action increases the counter-action of the auxiliary machine 2 so that the voltage of the main generator is somewhat decreased, thereby causing the battery to float. The action of the armature 24 is now controlled substantially by the coil 23 so that the voltage of the main generator is maintained substantially constant irrespective of its current output.

By providing a counter-machine 2, and regulating or controlling the same by means of a vibrating armature 24 the current through the vibrating armature is small, so that sparking troubles are substantially eliminated. Furthermore, by regulating the counter-machine by means of the armature 24 there is no tendency for the main generator output to fall off at the higher speeds, as is the case if the coil 16 were placed directly on the auxiliary dynamo 2 to regulate the same. Furthermore, slight variations in the air gap or in the density of the steel casings of the machine do not affect the characteristics, since the characteristics of the machine are properly maintained by the vibrating armature 24 and the coils 16 and 23.

With this system also the generator will put up its full output at much slower speeds, since no counter-electromotive force is included in the main circuit until the generator output exceeds the predetermined value. That is, the closing of the main switch 8 does not cause the dynamo 2 to become a counter-machine as would be the case if the coil 16 were directly upon the same. But the dynamo 2 only becomes a counter-machine when the battery or other current becomes excessive. Furthermore, by providing the core 22 and armature 24 the heavy windings which would otherwise be necessary upon the auxiliary machine 2 are eliminated and the functions thereof are performed by the smaller windings 16 and 23 upon the core 22.

Although I have described my improvements in great detail, nevertheless, I do not desire to be limited thereto except as specified hereinafter in the claims. But

Having fully and clearly described my invention what I claim as new and desire to secure by Letters Patent, is:

1. In an electrical system of distribution, a generator, means for regulating the voltage of said generator including a vibrating armature and two coils, one of said coils being connected to regulate the action of said armature responsive to current variations of the system until the generator voltage reaches a predetermined value, and means for bringing the other coil into operation when the generator voltage reaches said predetermined value to regulate said armature responsive to voltage variations.

2. In an electrical system of distribution, a variable speed generator, a storage battery and work circuit supplied thereby, means for regulating the voltage of said generator including a vibrating armature and two coils, one of said coils regulating the action of said armature responsive to current variations of the system until the generator voltage reaches a predetermined value, and the other coil being responsive to voltage variations of the system for regulating the action of said armature when the generator voltage

reaches said predetermined value to regulate said armature responsive to voltage variations.

3. In an electrical car lighting system, a generator driven by the movement of the car, a storage battery and work circuit supplied thereby, means for regulating the voltage of the generator, including a vibrating armature, and two coils, one of said coils regulating the action of said armature responsive to current variations of the system while the battery is charging and means responsive to voltage variations for bringing the other coil into operation to regulate the action of said armature responsive to voltage variations of the system when the battery has reached a predetermined voltage.

4. In an electrical car lighting system, a generator driven by the movement of the car, a storage battery and work circuit supplied thereby, means for regulating the voltage of the generator, including a vibrating armature, and two coils, one of said coils regulating the action of said armature responsive to variations in the battery charging current, and the other coil regulating the action of said armature responsive to voltage variations of the generator, and a switch for throwing said last mentioned coil into operation when the battery voltage has reached a predetermined value.

5. In an electrical car lighting system, a generator driven by the movement of the car, a storage battery and work circuit connected to be fed thereby, means for regulating the voltage of the generator including an auxiliary dynamo in the field of the generator, a vibrating armature for regulating the action of said auxiliary dynamo and two coils, one of said coils regulating the action of said armature responsive to current variations of the system while the battery is charging and the other coil regulating action of said armature responsive to voltage variations of the system when the battery has reached a predetermined voltage.

6. In an electrical car lighting system, a generator driven by the movement of the car, a storage battery and work circuit connected to be fed thereby, means for regulating the voltage of the generator including an auxiliary dynamo in the field of the generator, a vibrating armature for regulating the action of said auxiliary dynamo, an electromagnet for operating said armature, two coils on said magnet, one connected to be responsive to variations in the battery current and the other connected in circuit across the terminals of the generator to be responsive to variations in the battery and generator voltage, and an electroresponsive switch in said circuit controlled by a coil connected across the terminals of the generator and arranged to throw said second mentioned coil into operation when the battery has reached a predetermined voltage.

7. In an electrical car lighting system, a generator driven by the movement of the car, a storage battery and work circuit supplied thereby, means for regulating the voltage of the generator, including a vibrating armature, and two coils, one of said coils regulating the action of said armature responsive to current variations of the system while the battery is charging and means for bringing the other coil into operation to regulate the action of said armature responsive to voltage variations of the system when the battery has reached a predetermined voltage and means for disconnecting said first mentioned coil when the voltage of the generator drops below a predetermined value.

8. In an electrical car lighting system, a generator driven by the movement of the car, a storage battery and work circuit connected to be fed thereby, means for regulating the voltage of the generator including an auxiliary dynamo in the field of the generator, a vibrating armature for regulating the action of said auxiliary dynamo and two coils, one of said coils being connected to regulate the action of said armature responsive to variations in the battery charging current, and the other coil being arranged to regulate the action of said armature responsive to voltage variations of the generator, and a switch for throwing said last mentioned coil into operation when the battery voltage has reached a predetermined value.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

WILLIAM A. TURBAYNE.

Witnesses:
W. H. PATTENDEN,
P. W. ENGLISH.