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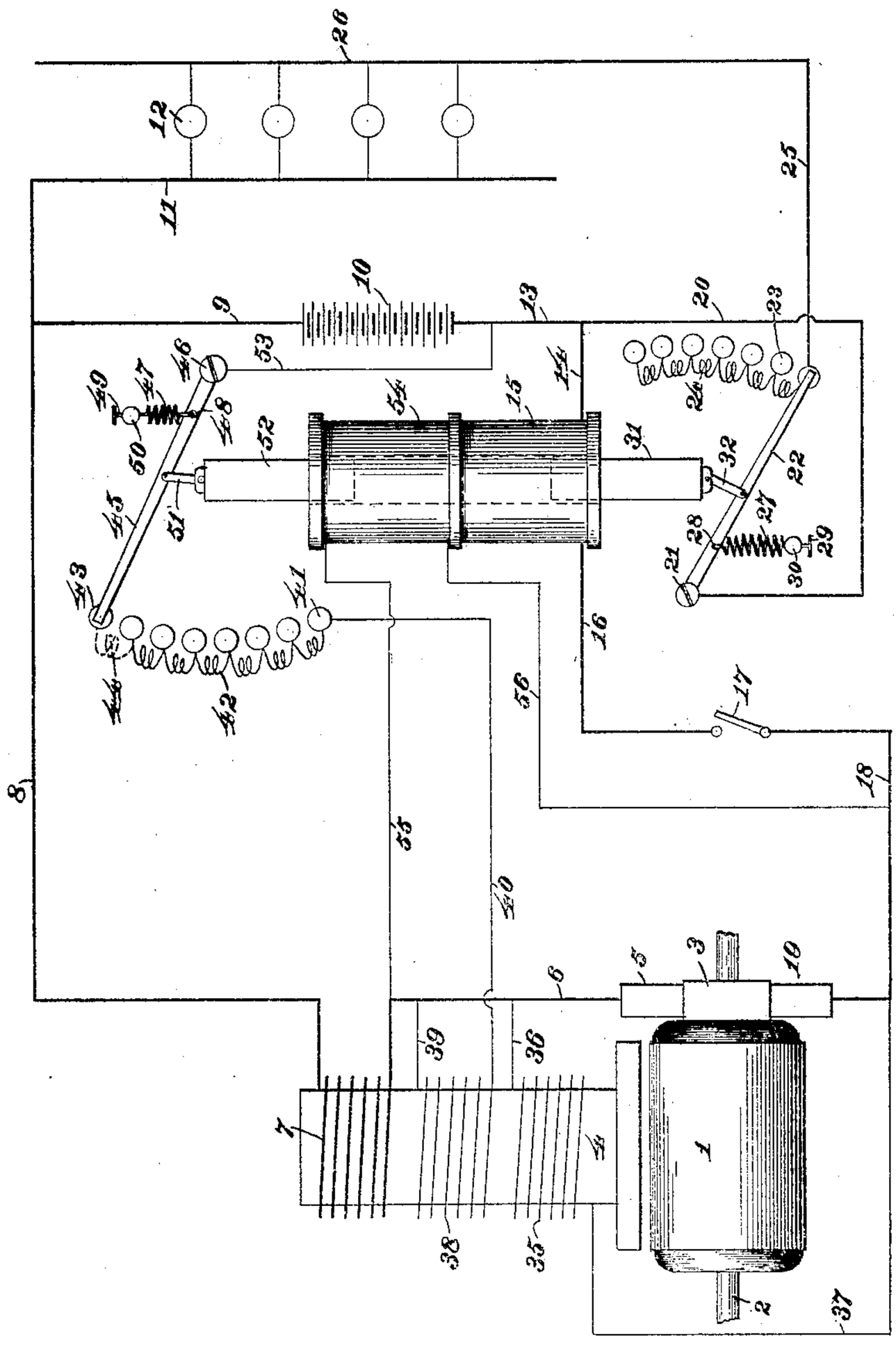
J. L. CREVELING.

SYSTEM OF ELECTRICAL DISTRIBUTION FOR CAR LIGHTING PURPOSES.

(Application filed Dec. 7, 1900.)

(No Model.)



Witnesses
Karl F. Daniel.
H. S. Austin.

Inventor:
John L. Creveling.
By Joseph R. Atkin
Attorney.

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UNITED STATES PATENT OFFICE.

JOHN L. CREVELING, OF NEW YORK, N. Y.

SYSTEM OF ELECTRICAL DISTRIBUTION FOR CAR-LIGHTING PURPOSES.

SPECIFICATION forming part of Letters Patent No. 706,165, dated August 5, 1902.

Application filed December 7, 1900. Serial No. 39,048. (No model.)

To all whom it may concern:

Be it known that I, JOHN L. CREVELING, of New York, in the county of New York, State of New York, have invented an Improved System of Electrical Distribution for Car-Lighting Purposes or the Like, of which the following is a complete specification, reference being had to the accompanying drawing.

The object of my invention is to produce an improved system of electric lighting by power taken as from a car-axle or other variable source. It is therefore specially, but not exclusively, adapted for use in car-lighting systems, but may be employed to advantage in any electric-lighting system in which the speed of the generator-driving shaft is widely variable and subject to interruption.

In the accompanying drawing is shown diagrammatically one form of embodiment of my invention. The illustration employed being of a diagrammatic character is of course intended solely for the purpose of lending clearness to the explanation of the principle of my invention and is not intended in any wise to limit the same to any specific structural details or arrangement.

Referring to the numerals on the drawing, 1 indicates the armature, 2 the armature-shaft, 3 the commutator, and 4 the field-magnet, of any preferred form of dynamo or generator. From one of the brushes 5, which is assumed to be the positive, a lead 6 communicates through the differential series coil 7 with a main 8, which, branching, communicates through the wire 9 with one pole of an accumulator or storage battery 10 and with one main 11 of the translating device or lighting system 12. From the other pole of the battery 10 a main 13 is led, which, through a wire 14, winding of a solenoid 15, main 16, switch 17, and main 18, communicates with the brush 19 of the generator, assumed, as above indicated, to be the negative brush.

The main 13 is connected by a wire 20 with the pivotal support 21 of a lever 22, whose free end sweeps in contact across the several contact-plates 23 of a variable resistance 24. Normally the free end of the lever 22 is in direct contact with a wire 25, that is connected with the main 26 of the translating device 12. The said normal direct connection is maintained by a suitable yielding member, preferably a coiled spring 27, secured at one end, as indicated at 28, to the lever and at the other, as by an adjusting-screw 29, to a stud 30. The power of the spring 27 is comparatively weak, being adapted to counteract the tension, when exerted, of the solenoid-core 31, which, working within the solenoid 15, is movably secured, as by a link 32, to the lever 22. It may here be observed that the movement of the lever 22, if the core 31 be attracted by the solenoid 15, is adapted, by sweeping across the several contact-plates 23 successively, to insert the variable resistance 24 between the wires 20 and 25.

35 indicates the shunt-coil of the field-magnet 4 in shunt across the mains 6 and 18, as by the wires 36 and 37.

38 indicates the battery shunt-coil connected, as by the wire 39, with the main 6 and by the wire 40 with the terminal contact-plate 41 of a variable resistance 42. The contact-plate 43 at the end of the variable resistance 42 may constitute the last of a series of contact-plates of a variable resistance or it may be isolated therefrom, as by omission of the last section of resistance 44 of the variable-resistance device, in which case of course the circuit between the contact-plate 43 and the resistance device 42 is completely broken.

45 indicates a lever pivotally movable, as indicated at 46, whose free end is adapted to sweep across the several contact-plates of the variable resistance successively and which is normally held in contact with the contact-plate 43, as by a spring 47, secured, as indicated at 48, to the lever, and at the other end to an adjustment-screw 49, working in a stud 50. The springs 27 and 47 are substantially identical in function, the latter being movably connected to a link 51 by the lever 45 and through it to a solenoid-core 52. The circuit of the battery shunt-coil is completed with the battery 10 as by a wire 53 connecting the lever 45 and the wire 13.

The core 52 works within and is actuated by a solenoid 54, which derives current from the generator, its coils being shown, for example, in shunt across the brushes 5 and 19, as through the wires 55 and 56, connected, respectively, with the mains 6 and 18.

The solenoids 15 and 54 are coaxially united and their windings are opposed to each other

in order that a mutual action may be derived from them, which will, in effect, balance the relative operations of the levers 22 and 45, as will hereinafter more fully appear.

It was stated at the outset that the brush 5 is assumed to be the positive and the brush 19 the negative; but this assumption is adopted solely for convenience The generator might be driven either in one direction or the other; but, if so, it would be necessary to employ some form of pole-changer. Since, therefore, pole-changing apparatus of many well-known types are familiar in the art and are not essential to the explanation of the principle of my invention, illustration thereof is in order to abbreviate the specification omitted.

The operation of this system is as follows: Supposing the several mechanical members of the apparatus to be in the relative positions shown in the drawing, the switch 17 being open, it should be first observed that no current will flow back through the armature from the battery. If the section 44 of the resistance device 42 be employed, a very small quantity of current will flow from the battery 10 through main 8, differential coil 7, wire 39, battery-coil 38, wire 40, resistance 42, lever 45, and wire 53 to the battery. The resistance of the resistance device 42 may be so high as to permit the passage of but an extremely small quantity of current when the lever 45 is in the position shown in the drawing. Nevertheless, some current would always pass which when the system is at rest would be wasted. For that reason the resistance-section 44 may be omitted, which would occasion a break in the circuit and prevent the waste referred to Whether the resistance-section 44 be employed or omitted the field-magnet 4 will be slightly magnetized either by action of the coil 38 or by residual magnetism. If, therefore, the armature start to revolve in such direction as to cause the brush 5 to be positive, a feeble current will at once commence to flow through the shunt-coil 35 and in that manner to build up the field of the generator. At the same time current will also flow through the windings of the solenoid 54, producing therein a tendency to attract the core 52 against the action of the spring 47 through the mediation of the lever 45, to which both the solenoid-core and the spring are attached. The spring 47 being, as above specified, quite weak, very little current in the solenoid 54 will suffice to attract the core 52 against the tension of the spring and cause the lever 45 to slip successively across the contact-plates 41. By that movement the resistance of the variable-resistance device 42 is gradually diminished until the lever 45 reaches its limit of movement, when it comes into contact with the terminal contact-plate 41. In that position the entire resistance of the device 42 is eliminated and the coil 38 is placed across the battery-terminals. Thereupon the generator-field will soon become very strong and the generator will soon reach a voltage at which the switch 17 will close. Let it be noted in this connection that when the armature 1 begins to rotate, as above specified, the switch 17 is open and that the switch diagrammatically indicated is such a one known in the art as will close when the voltage in the mains reaches a predetermined degree and will open when the voltage of the generator falls below that of the battery. Switches of this description being familiar in the art do not appear to require detail illustration and description herein. If after the closure of the switch 17 the speed of the generator continues to increase so that its electromotive force is in excess of that of the battery, current will flow from the generator through main 6, differential coil 7, main 8, wire 9, battery 10, main 13, wire 14, solenoid 15, main 16, switch 17, and main 18 to the generator. As this current increases there is of course a tendency for the line-voltage to increase, and consequently a tendency to increase the electromotive force is imposed upon the translating device 12, causing the light produced therein to be variable. To overcome this objectionable tendency, I introduce the variable-resistance device 24 into the lamp-circuit and enable it to perform its function through the employment of the lever 22, actuated by the action of the solenoid 15 upon its core 31, to which the lever 22 is connected. It may here be observed that the core 31, being attracted in proportion to the degree of excitation of the solenoid, actuates the lever 22 upon its pivot 21 against the tension of the spring 27 and causes the lever 22 to sweep successively against the contact-plates 23 of the resistance device 24, thereby gradually increasing the resistance to the flow of current between the lever 22 and the wire 25. If the solenoids 15 and 54, with their respective cores, are properly wound in the reverse direction, as specified, the current flowing through the solenoid 15 can be made to insert resistance into the lamp-circuit, so as to make any given number of lamps in the translating device burn with a practically constant illumination. Moreover, by coaxially uniting the solenoids the approach of the core 31 to the core 52 may be made to diminish the effect of the current circulating through the solenoid 54 in such manner that when the maximum flow of current desired is obtained in the generator the action of that current upon the solenoid 15 will be to attract the core 31 so far within the solenoid 15 as to cause the core 52 to recede. Consequently the lever 45, attached to the core 52, moves in the direction of the force exerted upon it by the spring 27, thereby through interposition of the resistance device 42 increasing the resistance in the circuit of the shunt-coil 38 of the field-magnet 4. This of course prevents any increase in the current from the generator. If, on the other hand, the current from the generator

should fall, the action of the solenoid 15 would become weaker and the core 52, being attracted by the solenoid 54, would restore to the generator its full field. Should the generator slow down, it would of course receive its full field excitation, and the core 31, released by its solenoid 15, would respond to the action of the spring 27 until the lever 22 reached the position shown in the drawing, when the full voltage of the battery would be bestowed upon the lamps of the translating device 12. At this point the electromotive force of the generator and battery would nearly equal each other. This would leave the translating device 12 in circuit across the battery. The dynamo would continue with full field excitation until its speed got very slow or stopped altogether, in which case there would be no current flowing through the solenoid 54 to hold the core 52. Thereupon the spring 47 would actuate the lever 45, causing it to sweep successively across the contact-plates of the resistance device 42, thereby gradually increasing the resistance in the field-circuit or finally breaking it if the resistance-section 44 be omitted. This gradual introduction of the resistance 42 into the field-circuit may be accomplished without any vicious sparking due to induction, owing to the gradual manner of cutting down the current by the introduction of the variable resistance.

It may be observed that after the system is in full operation the solenoids, through the actuation of their cores, play against each other to preserve a practically constant current in the translating device. Up to the predetermined maximum voltage of the generator the resistance of the resistance device 24 is employed to prevent excess of current to the translating device, and when that maximum is reached the influence of the core 31 produces movement in the core 52 to weaken the field of the generator.

In the accompanying drawing I have illustrated a differential compound machine; but it is obvious that the series winding may be omitted, although I prefer to use some compound winding, because it makes the operation of the generator somewhat more steady.

What I claim is—

1. In a system of electrical distribution the combination with a generator, a main circuit and electromagnetic means for controlling the magnetization of the generator, of a work-circuit and electromagnetic means for controlling the work-circuit, said last-mentioned electromagnetic means being adapted under predetermined conditions to act magnetically upon the first-mentioned electromagnetic means to cause the first-mentioned electromagnetic means to vary the magnetization of the generator.

2. The combination with a generator, storage battery and translating device, in electrical communication one with the other, of a field-coil, a resistance device in circuit therewith, a yielding member coöperating with the resistance device, a second resistance device, and coöperating yielding member intersecting the translating-circuit, a pair of coaxially-disposed solenoids provided with separate cores, one core being operatively united to one of said yielding members and the other core to the other.

3. The combination with a generator, storage battery, and translating device, in electrical communication one with the other, as by usual mains, of a field-coil comprehending a yielding member and a resistance device, a solenoid having its windings in shunt with the generator-circuit and its core adapted to actuate said yielding member, a second solenoid having its windings in series with the generator, a variable resistance and coöperating yielding member intercepting the translating-circuit, the core of the second solenoid being operatively connected with said yielding member for the purpose specified, the two cores being separate.

4. The combination with a generator, storage battery and translating device in electrical communication one with the other, as by usual mains, of a field-circuit comprehending a yielding member and a resistance device, a solenoid having its windings in shunt with the generator-circuit and its core adapted to actuate said yielding member, a second solenoid coaxial with the first and having its windings opposed to that of the first and in series with the generator, a variable resistance and coöperating yielding member intercepting the translating-circuit, the core of the second solenoid being operatively connected with the yielding member for the purpose specified, the two cores being separate.

5. The combination with a generator, storage battery and translating device, in electrical communication one with the other through a switch adapted to close at a predetermined voltage, of a field-circuit comprehending a yielding member and a resistance device, a solenoid having its windings in shunt with the generator and its core adapted to actuate said yielding member, a second solenoid having its windings in series with the generator-circuit, a variable resistance and coöperating yielding member intercepting the translating-circuit, the core of the second solenoid being operatively connected with the said yielding member for the purpose specified, the two cores being separate.

6. The combination with a generator, storage battery, and translating device, in electrical communication one with the other through a switch adapted to close at a predetermined voltage, of a field-circuit comprehending a yielding member and a resistance device, a solenoid having its windings in shunt with the generator-circuit and its core adapted to actuate said yielding member, a second solenoid coaxial with the first and

having its windings opposed to that of the first and in series with the generator-circuit, a variable resistance and coöperating yielding member intercepting the translating-circuit, the core of the second solenoid being operatively connected with said yielding member for the purpose specified, and a field-coil in shunt with the generator-circuit, all coöperating substantially as and for the purpose specified, the two cores being separate.

In testimony of all which I have hereunto subscribed my name.

JOHN L. CREVELING.

Witnesses:

FREDERICK E. KESSINGER,

EDW. C. SOFIO.