

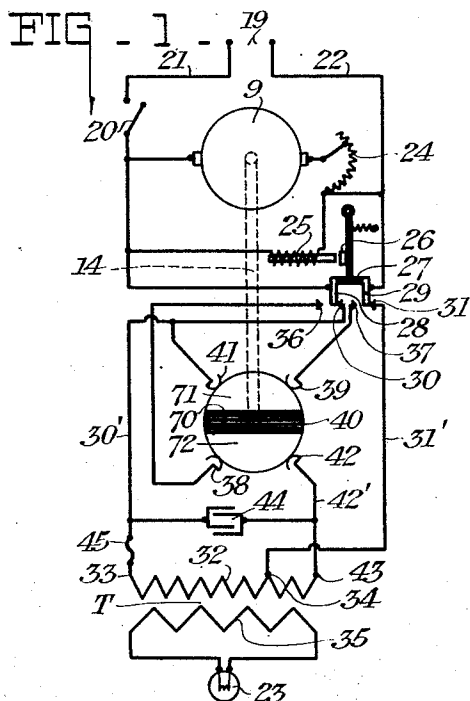
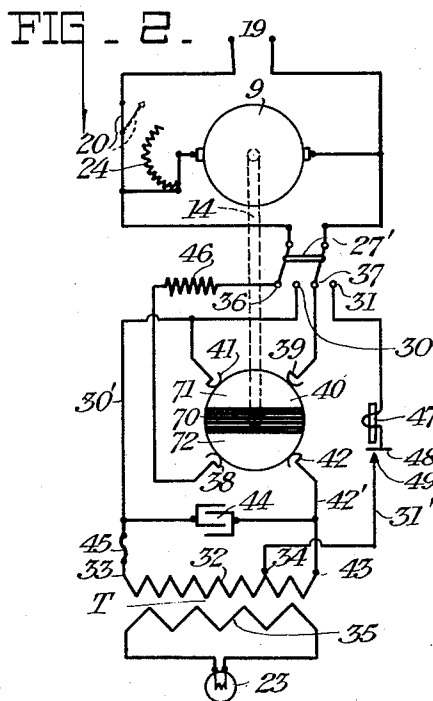
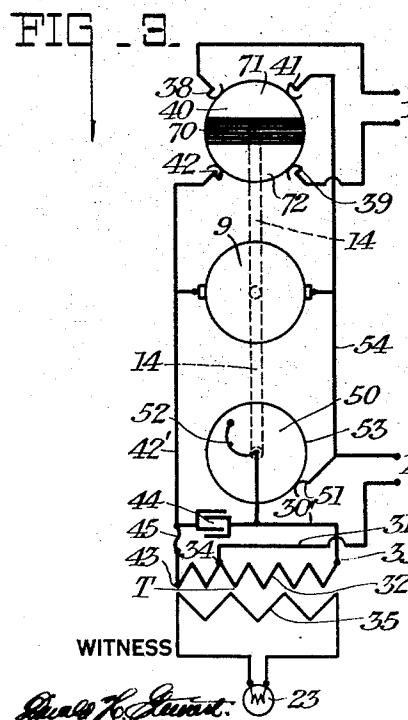
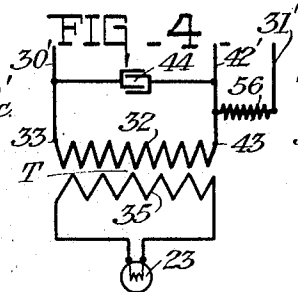
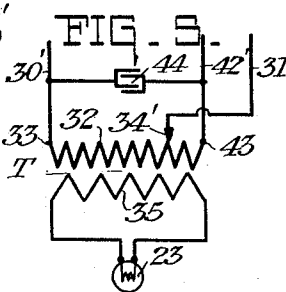
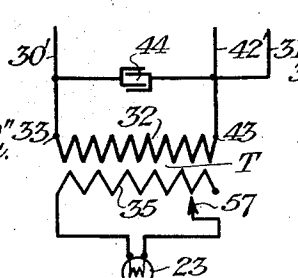
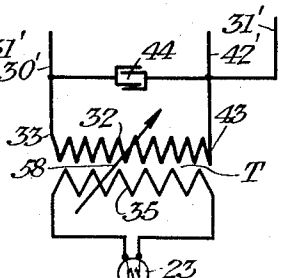
Aug. 11, 1925.

N. B. GREEN

1,548,943

ELECTRICAL CIRCUITS FOR MOTION PICTURE PROJECTORS

Filed Jan. 13, 1922



INVENTORS
Newton B. Green,
BY R. L. Stinchfield
N. J. L. Perrins
ATTORNEYS

Patented Aug. 11, 1925.

1,548,943

UNITED STATES PATENT OFFICE.

NEWTON B. GREEN, OF ROCHESTER, NEW YORK, ASSIGNOR TO EASTMAN KODAK COMPANY, OF ROCHESTER, NEW YORK, A CORPORATION OF NEW YORK.

ELECTRICAL CIRCUITS FOR MOTION-PICTURE PROJECTORS.

Application filed January 13, 1922. Serial No. 528,975.

To all whom it may concern:

Be it known that I, NEWTON B. GREEN, a citizen of the United States of America, residing at Rochester, in the county of Monroe and State of New York, have invented certain new and useful Improvements in Electrical Circuits for Motion-Picture Projectors, of which the following is a full, clear, and exact specification.

10 This invention relates to motion picture projectors and particularly to such projectors wired so that they may be connected to sources of either alternating or direct current with satisfactory functioning of the driving motor and the projection lamp.

15 In designing motion picture projectors for popular or home use, it is necessary to adapt them for connection with sources of both direct and alternating current, since both are found in general use in different places. It has been found desirable for various practical reasons that for such projectors the lamp should be designed for low voltages, while the motor should take the voltage, 110
20 volts, that is practically the standard in domestic supply circuits. It is highly desirable, therefore, that the circuit should be such that it will supply, without waste or undesirable heating, the required voltage to the lamp as well as the full voltage to the motor. The objects of my invention are to produce an outfit which may be used in the home by persons unskilled in electrical apparatus, which may be used with any source
25 of current at standard voltage, which is economical and efficient in use, and in which each piece of apparatus will be supplied with the voltage at which it is designed to operate. These and other ends are attained by the apparatus and circuits which will be more fully described and claimed hereinafter.

30 Reference will now be made to the accompanying drawings in which the same reference characters indicate the same parts throughout and in which:

Figs. 1, 2 and 3 are alternative wiring circuits for motion picture projectors; and

35 Figs. 4, 5, 6 and 7 are alternative forms of the transformer comprising a part of such circuits.

40 In Fig. 1 I have shown one form of my wiring system which is entirely automatic in its operation. From plug 19, wires 21
45 and 22 lead to the opposite terminals of the

universal motor 9, which may have a starting and speed controlling resistance 24, the motor 9 having low resistance and high impedance. Connected across the circuit is a high impedance, high resistance relay 25
50 controlling the spring retracted armature 26, carrying the two-way switch 27 having blades 28 and 29, permanently connected to the two sides of the circuit. In a normal position these blades 28 and 29 contact with
55 points 30 and 31 which are connected to the primary coil 32 of a transformer T, contact 30 being connected by wire 30' with one terminal 33 of the primary 32, while the other contact 31 is connected by wire 31' to the
60 primary at a point 34 short of the other end of the primary coil. The lamp 23 is connected with the secondary coil 35 of the transformer. When the switch 27 is in its second position its blades contact with the
65 points 36 and 37, these being connected with the contacts 38 and 39 bearing against the surface of the commutator 40, against which also bear the contacts 41 and 42 connected to
70 the terminals 33 and 43 of the primary coils of the transformer by wires 30' and 42' respectively. The commutator 40 may be of any known or preferred type having an insulating portion 70 and two symmetrical
75 conducting portions 71 and 72, so arranged that on rotation it will alternately change the polarity of the current passing through it, as is obvious. The commutator 40 is directly driven from the motor 9, this being
80 indicated diagrammatically by the dotted lines 14, indicating any driving connection or shaft. An electrical condenser 44 may be connected across the primary to prevent undesirable sparking at the commutator, while
85 fuse 45 is provided for safety purposes. When connection is made with a source of alternating current with the terminals 19, the motor is at once actuated, it being assumed that switch 20 is closed. The relay
90 25 does not operate and alternating current is applied to the points 33 and 34 of the transformer primary; and secondary voltage of the required strength is supplied to the lamp 10. When connection is made
95 with a source of direct current, the motor is operated, as is also the relay 25, closing the contacts 28—36 and 29—37. The revolving commutator acts now to make and break the direct circuit in such a way as to transform
100 it into alternating current, which is supplied

to the terminals of the primary of the transformer. It is obvious that the direct current must be applied to a larger number of coils of the primary to induce the same voltage in the secondary, since the sources of direct current will have a voltage of 110, which will be the peak of voltage supplied to the transformer, while the sources of alternating current have a mean or effective voltage of 110, the peak being much higher.

In the circuit shown in Fig. 2, the two-way switch 27' is manually operated instead of automatically. The other parts of the circuit have the same functions as in Fig. 1 and are similarly designated, the only difference being the omission of the relay 25 and the inclusion of the protective devices 46 and 47, which are designed to render ineffective each of the alternative circuits, if the switch 27' is so thrown as to complete that circuit which is not adapted for the particular current used. As shown, the protective device 46 in the circuit adapted for direct current consists of a high impedance coil, while the protective device 47 consists of a low impedance, slow acting magnet, the armature 48 of which will make and break contact with the point 49. The operation of this circuit is obvious. When the plug 19 is connected to a suitable source of current, the hand switch 29' is thrown to the proper pair of contacts 30 and 31, or 36 and 37, the apparatus then functioning as before described. If, however, this hand switch is improperly thrown and a source of direct current is supplied to the contacts 30 and 31, the contact 48 will oscillate slowly back and forth, making and breaking the circuit, thus protecting the transformer, and also failing to produce the proper illumination of the lamp, so that the operator is at once warned that the connection is wrong. If the plug 19 is connected to the source of alternating current and the hand switch thrown to the contacts 36 and 37, the high impedance will prevent a sufficient voltage being supplied to the terminals of the transformer to cause proper illumination of the lamp 10, thus warning the operator.

In the circuit shown in Fig. 3, two separate plugs 19' and 19'' are shown for use with direct and alternating current respectively. The terminals of 19' are connected directly to the two contacts, 33 and 39 respectively, which bear upon the commutator 40. Contacts 41 and 42, as before, bear upon this commutator and these are connected to the opposite terminals of the motor 9 with which, by means of the driving connection indicated diagrammatically by dotted lines 14, turns the commutator 40 and a centrifugal switch 50. Contact 42 is connected by wire 42' to the terminal 43 of the transformer, while the contact 41 is connected by wire 54 to a contact 51, bearing against the

continuous contact 53 of a centrifugal switch, the circuit being closed when the moving contact 52 of the switch bears against the contacting band 53. The contact 52 is connected by wire 30' to the terminal 33 of the primary 32 of the transformer T. One terminal of the plug 19'' is connected directly by wire 54 to the contacts 41 and 51 and to one terminal of the motor 9, while the other is connected by wire 31' to a point 34 of the primary transformer, as already defined.

When the plug 19' is now connected to a source of direct current, the motor will be started and simultaneously the commutator will begin to move, it then transforming the direct current into alternating current, which is supplied to the motor. Should the contacts 38 and 39 rest on the insulating portion 70 of the commutator 40, a slight movement of a part of the driven mechanism of the projector, will move the commutator to a conducting position. When the centrifugal switch attains a sufficient speed, the contacts 52 and 53 complete the circuit and supply this alternating current to the terminals 33—43 of the primary. When the plug 19'' is connected to a source of alternating current, this is applied to the terminals of the motor 9 by means of wire 54 on one side and the wire 31', contact 34, the remaining coils of the primary 32, terminal 43 thereof and wire 42' to the other terminal of the motor. The governor switch 50 prevents the excessive sparking while the motor is getting up speed. If the plug 19'' is connected to a source of direct current, the fuse 45 will be blown, since the effective turns of coil 32 and the motor 9 have low resistance permitting a much greater flow of direct current than of alternating current, to which both offer considerable impedance. If, the plug 19' is connected to a source of alternating current, the alternating current from the commutator will result in improper illumination, warning the operator of the incorrect connection.

Instead of connecting the alternating current to an intermediate point of the transformer coil, an impedance 56 may be introduced in series with the transformer primary, lowering the effective voltage applied thereto, so that it will be the same for alternating current as for direct. This is indicated in Fig. 4. Although I prefer that the connection of the alternating current shall be a fixed one so that the operator will not have to make any adjustments, I consider it within the scope of my invention that it may be adjustable to provide for variations in the sources and in Fig. 5 at 34' the point of connection to the primary is indicated as thus adjustable. Adjustment in strength may, however, be made by the use of an adjustable secondary, as indicated

at 57 in Fig. 6, or by an adjustable transformer, as indicated at 58 in Fig. 7, the circuits being otherwise the same as in the other figures.

5 When in the claims I refer to the current being transformed, it is to be understood that I refer, to a change or conversion of the nature or voltage of the current without dissipation such as would result from the mere insertion of resistance into the circuit. It is to be understood that a wide range of equivalents may be used without departing from the spirit and scope of my invention as defined in the appended claims.

10 15 Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In apparatus of the class described, a transformer, electrical apparatus requiring a definite voltage, a circuit including said apparatus and the secondary coil of said transformer, and alternative electrical circuits, each including at least a part of the primary coil of said transformer, one being adapted for use with a source of direct current at a certain voltage and comprising means for converting direct current into alternating current, and the other being adapted for use with a source of alternating current having an effective voltage equal to the voltage of the direct current source, and means whereby the first named circuit is maintained at the required definite voltage, when either of the alternative circuits is completed in the manner specified.

2. In apparatus of the class described, a transformer comprising primary and secondary coils, a commutator adapted to convert direct current into alternating current, alternative circuits, one adapted for use with a source of alternating current at a certain effective voltage and including at least a part of the primary coil, the other adapted for use with direct current at the same voltage and including said commutator and said primary coil, a circuit including said secondary coil, and means whereby the effective voltage of the last named circuit may be made substantially the same when either of the alternative circuits is completed in the manner specified.

3. In apparatus for the purpose specified, a motor, a transformer comprising primary and secondary coils, means for converting direct current into alternating current, alternative circuits, one adapted for use with

a source of alternating current and including the motor and at least a part of the primary coil of the transformer, and the other adapted for use with a source of direct current and including said converter, said motor and said primary coil, whereby alternating current from said converter will be applied to said primary coil.

4. In apparatus for the purpose specified, a motor, a transformer comprising primary and secondary coils, means for converting direct current into alternating current, alternative circuits, one adapted for use with a source of alternating current and including the motor and at least a part of the primary coil of the transformer, and the other adapted for use with a source of direct current and including said converter, said motor and said primary coil, whereby alternating current from said converter will be applied to said primary coil, a circuit including said secondary coil, and means whereby the effective voltage of the last named circuit may be made substantially the same when either direct current voltage or equally effective alternating current voltage is applied to the alternative circuit adapted therefor.

5. In apparatus of the class described, a motor capable of being actuated by either alternating or direct current, a transformer, a commutator driven by said motor and adapted to convert direct current into alternating current, alternative circuits, one adapted for use with a source of alternating current and including the motor and at least a part of the primary coil of said transformer, and the other circuit including said motor, said commutator and the primary coil of the transformer.

6. In apparatus of the class described, a motor capable of being actuated by either alternating or direct current, a transformer, a commutator driven by said motor and adapted to convert direct current into alternating current, alternative circuits, one adapted for use with a source of alternating current and including the motor and including effectively only a part of the primary coil of said transformer, and the other circuit including said motor and said commutator and including effectively the whole of the primary coil of the transformer.

Signed at Rochester, New York, this 10th day of January 1922.

NEWTON B. GREEN.