

MOTOR GENERATOR EQUIPMENT

Those investigated, and on which your Committee is prepared to report, consist of two general A. C. to D. C. types which may be classified under the headings of:

Constant Current
Constant Potential
also
D. C. to D. C. Types.

Constant Current Equipment—A. C. to D. C.

The A. C. to D. C. equipment is a straight motor generator set of a standard alternating current induction motor direct connected to a special D. C. generator. Both units are mounted on a common bed plate, forming a three-bearing set.

This equipment is built in three sizes—35, 50 and 70 amperes. These machines are designed to handle one arc continuously, and two arcs for a short period of time when changing over the pictures. During the process of changing over, when two arcs are burning, they are connected in series across the armature of the generator. The 35 ampere machine is designed to run one lamp at 35 amperes, 55 volts, and two lamps at 35 amperes, 110 volts. The 50 ampere machine is designed to run one lamp at 50 amperes, 60 volts, and two lamps at 50 amperes, 120 volts. The 70 ampere machine will operate one lamp, 70 amperes, 65 volts, and two lamps at 70 amperes, 130 volts.

In Figure No. 3 you will find the diagram of connections for the 35 ampere two lamp outfit.

Figure No. 4 gives a diagram of connections for the 50 to 70 ampere two lamp outfit.

These machines have an over-all efficiency of approximately 70% at their rated load. They will operate continuously under full load to a temperature rise not to exceed 40 degrees Centigrade, two hours at 25% overload, with temperature rise not to exceed 55 degrees Centigrade. They can be built for any commercial alternating current circuit, as standard induction motors are used.

The equipment includes the motor generator set complete, a steel panel, on which is mounted an ammeter and generator field rheostat. Two short-circuiting switches are also supplied, the function of which is to short circuit the arc which is not burning.

Operation

After the set is up to speed, the generator field rheostat is turned to a marked point, and one arc is short circuited. The other arc is struck in the usual manner. The voltage of the machine will automatically drop to that required by the arc depending on the current used. When ready to change over, the carbons of the second lamp are brought together until they touch, the short-circuiting switch is opened, and the carbons gradually separated. The voltage of the machine will automatically increase to take care of the added resistance, holding the current constant. To shut down the first arc, close the short-circuiting switch.

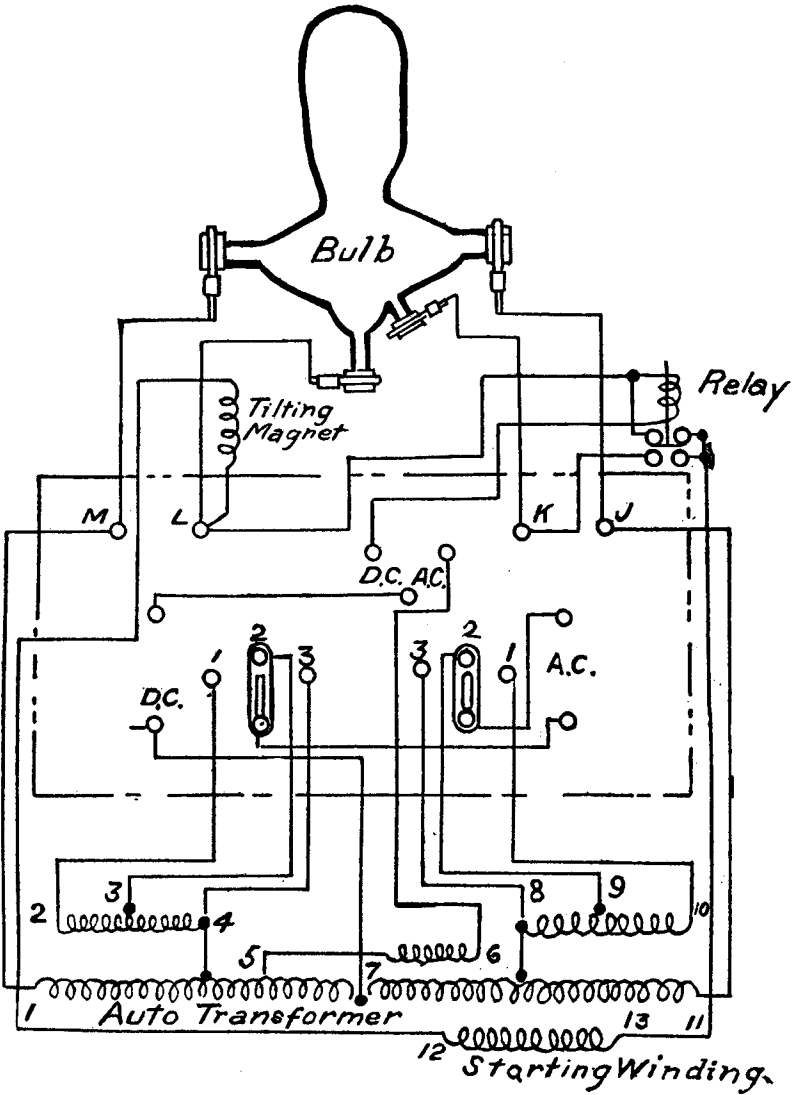


FIG. 2

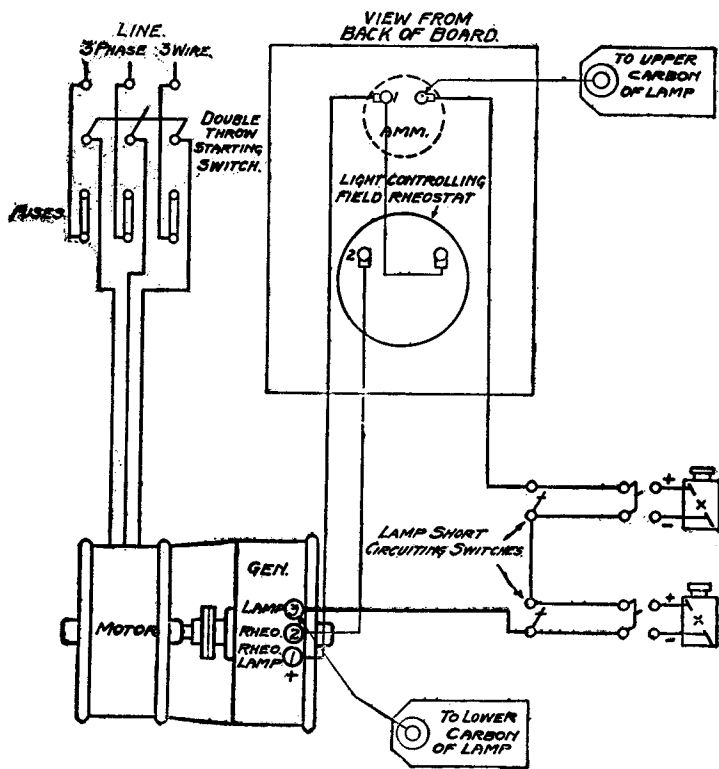


FIG. 3

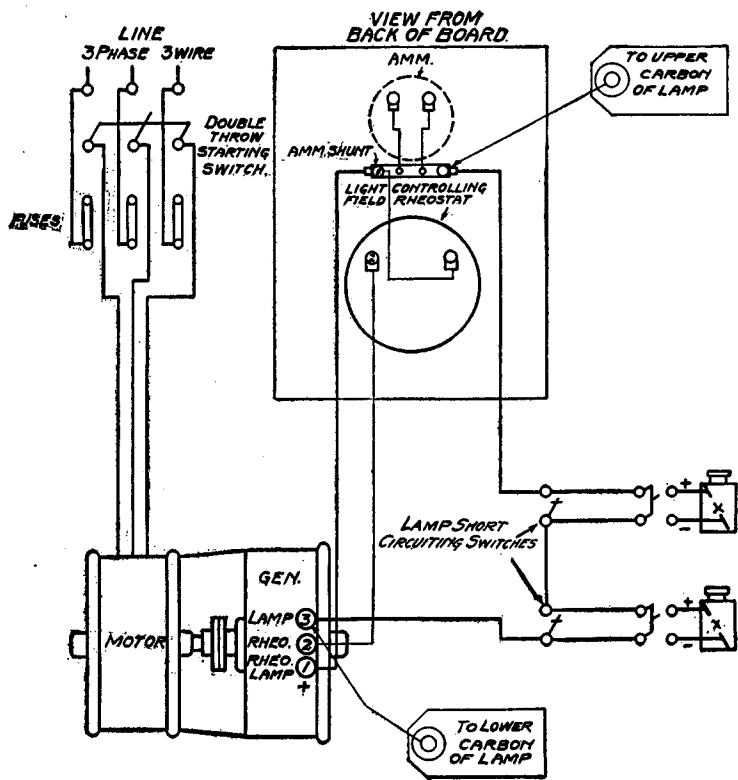


FIG. 4

The D. C. to D. C. equipment is not a true motor generator set, but very closely resembles a balancer set. Both armatures are mounted on a common shaft, making a two-bearing outfit, the two armatures being connected in series across the line. The arc circuit is taken from a connection between the armatures and side of the line. This volt ampere characteristic is such that one lamp can be operated from this machine without the use of a steadying resistance. The machine, therefore, not only lowers the line potential to that suitable for the projection arc, but allows the arc to be operated in a highly efficient manner.

The D. C. to D. C. outfits are built for 35, 50 and 70 ampere one-lamp equipments, and 35 and 50 ampere two-lamp equipments. The two-lamp equipments are designed with a compound field which is cut in service when two lamps are operating. The two lamps are connected in multiple across the armature of the machine; the machine very closely resembling a constant potential generator.

With the two-lamp equipments there is furnished a special panel which contains an ammeter, voltmeter, generator field rheostat and a change-over switch. The function of this change-over switch is to cut in the series field on the generator, changing its characteristic so as to allow the operation of two lamps. It is, however, necessary to use a slight amount of steadying resistance with this type of outfit when operating two lamps. This is because the outfit is practically a constant potential generator. Due to the use of the steadying resistance, the over-all efficiency is lowered about 18% when operating two lamps, 70% one lamp.

Operation

The method of operating the D. C. to D. C. outfit is as follows:

After the set is up to speed with the change-over switch on the panel closed, the first arc is struck in the usual manner. When one arc is burning, there is no steadying resistance to be used. When ready to change over, to include the second arc, the short-circuiting switch is opened, which automatically cuts in the series field of the generator and at the same time inserts a steadying resistance in series with the arc. The second arc is then struck. When ready to shut down the first arc, the arc switch is opened and the change-over on the panel closed.

The single arc D. C. to D. C. outfit consists of a motor generator complete with motor starter and generator field rheostat.

Constant Potential Equipment.

The motor generator sets built for this service each comprise a 75-volt compound wound commutating pole direct current generator, directly connected to and driven by a suitable motor, both units being mounted on a common cast iron bed plate or sub base. They are built in four capacities, namely, 40, 55, 70 and 90 amperes. Sets, the motors of which are for single phase service or for direct current service, are of the four bearing rigidly coupled type, whereas all others are of the common shaft type. The motors of all three phase sets, except the 40 ampere rating, have six leads so that the motor may be star connected

Motion Picture Equipment
SINGLE LIGHT
Schematic Connections
Panel provided for Emergency Service

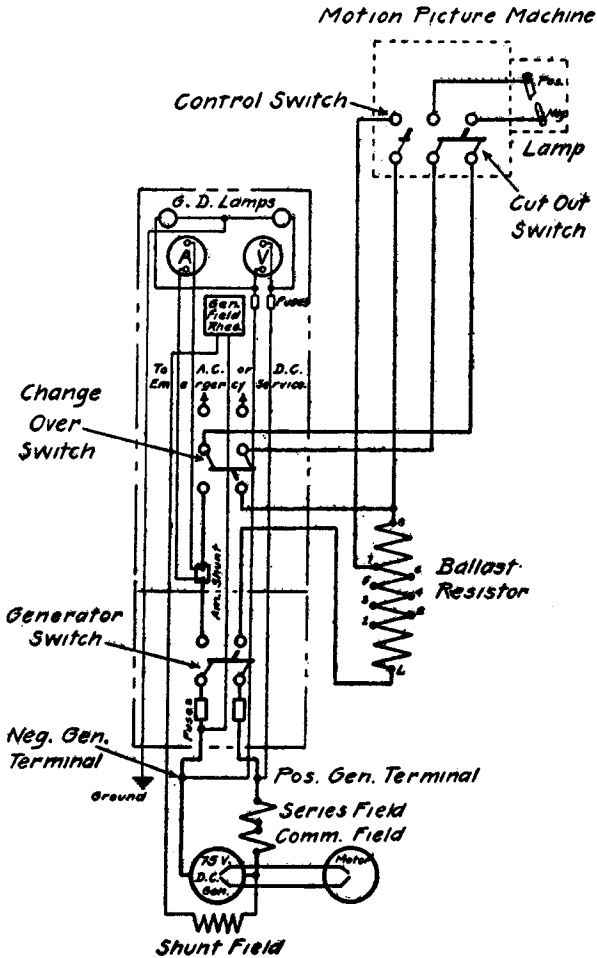
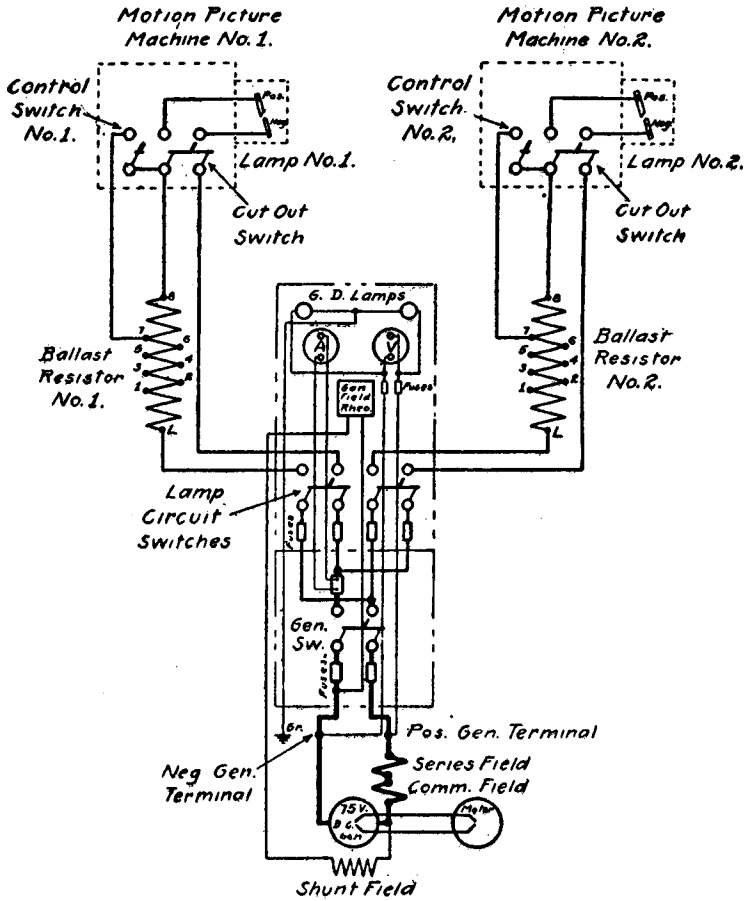


FIG. 6

Motion Picture Equipment
TWO LIGHT
Schematic Connections



Extra Main Lines indicate wires which must carry current for both lamps.

FIG. 7

for starting, and delta connected for running, thereby, eliminating the necessity of using a regular auto transformer for starting, with a reduced voltage at the motor terminals.

Motors for any standard commercial electric circuit can be readily supplied, as all motors used are of standard construction and characteristics.

The over-all efficiency of the various sets is approximately 70% when developing full rated capacity. The sets will operate continuously, delivering rated capacity at a temperature rise not exceeding 40 degrees Centigrade, and also are capable of delivering 125% of rated capacity for a period of two hours, at a temperature rise not exceeding 55 degrees Centigrade. Each set also will develop sufficient energy to operate two motion picture machines simultaneously during the change-over period, when one reel of picture is being finished and the subsequent reel is being started.

A complete motion picture equipment comprises a motor generator set, a ballast resistance and control switch for each motion picture machine, a control panel for the generator, and a starter, if required, for the motor. These equipments are usually connected as indicated in Figures No. 6 to No. 8, inclusive.

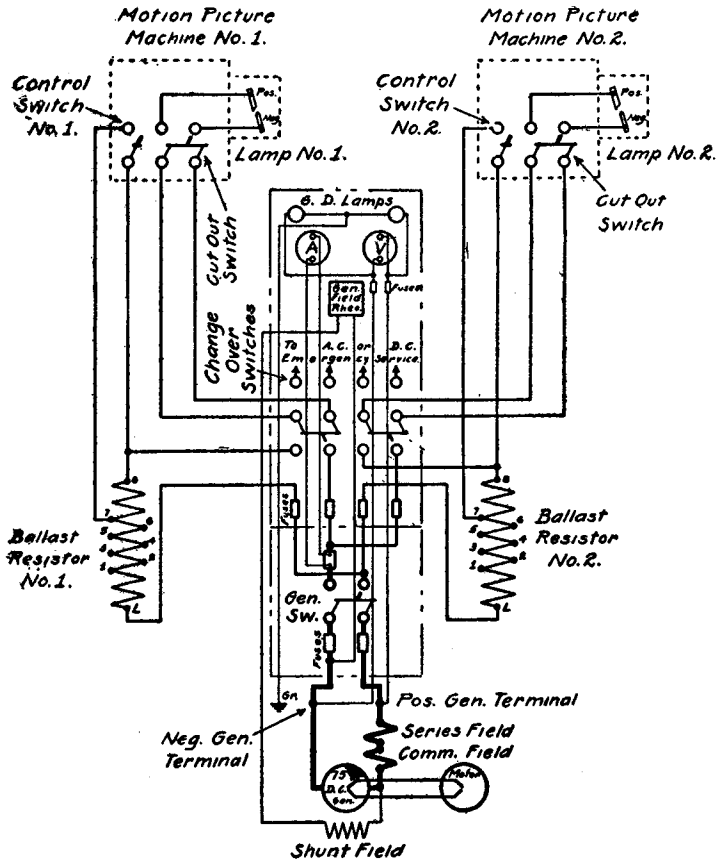
Operation

The motor generator set is started in the usual manner, after which the necessary switches are closed in the direct current circuit, so that the arc may be struck in one of the motion picture machines. The voltage developed by the generator and the voltage across a single arc is indicated by Curve, Fig. 9. The arc can be struck in the second motion picture machine when desired, but the control switch for that circuit should be opened prior to striking the arc. Opening the control switch establishes a circuit whereby all of the ballast resistance for the lamp is in series with the arc, and thereby preventing an abnormal rush of current through the lamp when the arc is struck. This also prevents any disturbance of the light produced by the other lamp. As soon as the new arc is well established, the control switch may be closed whereupon the voltage characteristics of the generator and arcs are indicated by "two arc volts," and "generator volts" indicated by Curve, Fig. 9.

Each ballast resistance is provided with a number of taps so that the current delivered to the arc may be readily adjusted for any value required within the capacity of the equipment.

The constant potential equipments, such as have been described above, have proven to be admirably well adapted for motion picture service, especially in districts where the power supply for the motor is subject to variations, resulting in changes of speed in the motor generator set. This is due to the fact that the ballast resistance in series with each arc compensates for any voltage changes of the generator, due to speed fluctuations. As a result, when the generator voltage decreases, due to a decrease of speed, the voltage drop across the ballast resistance also decreases, due to a comparatively small decrease in current, which results in higher voltage across the arc, and, therefore, the watts dissipated in the arc remain more nearly fixed, or constant.

Motion Picture Equipment
TWO LIGHT
Schematic Connections
Panel provided for Emergency Service



Extra Heavy Lines indicate wires which must carry Current for Both Lamps.

FIG. 8

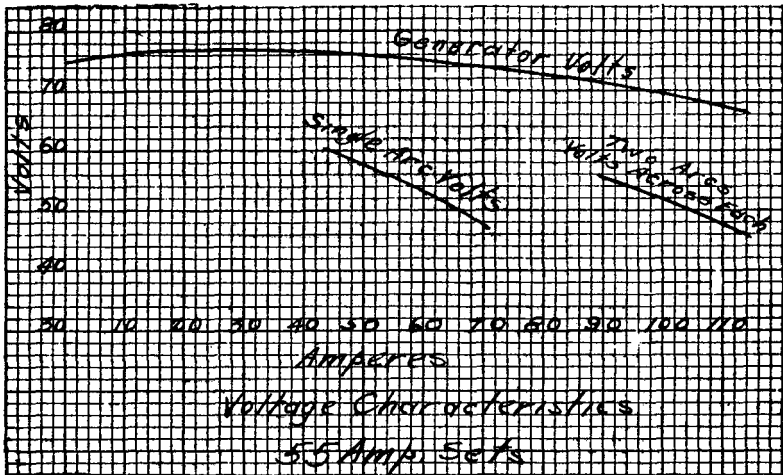


FIG. 9

As a result of these conditions, the intensity of the light generated by the arc remains more nearly constant than it will for an equipment operating under the same conditions, and feeding the arc directly from the generator without the use of a series resistance.

It is unfortunate that the Committee's efforts to secure information from all of the manufacturers met with such incomplete co-operation, and it is the Committee's suggestion that better results could be secured if a more definite effort were made to advertise the Society and its aims. The attitude of some of the manufacturers seems to be founded on the lack of faith in the motives of the Society, which can only be overcome through the united efforts of the Society.

The Committee earnestly requests that the administration of this Society take this situation under consideration and make immediate and continued efforts to overcome it, if the work of the Committee is to continue. Suggestions and criticisms are solicited from various manufacturers.