

# REPORT OF COMMITTEE ON ELECTRICAL DEVICES

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H. M. WIBLE, Chairman  
W. C. KUNZMANN  
H. A. CAMPE  
MAX MAYER  
J. C. MOULTON  
ROBT. P. BURROWS

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The Committee on Electrical Devices has made an investigation of the various forms of converting equipment for use in operating D. C. arcs from A. C. mains and submits for your approval the following report, which intends to show the characteristics and advantages of each of the forms. Information has not yet been secured on all of the devices on the market and this report, therefore, does not include the entire list.

The ultimate purpose of such an investigation is to determine the principles by which the selection of apparatus for any installation may be made. Briefly summarized, the data submitted by the several manufacturers result in the general principles stated below.

Owing to the lack of data, it has been necessary to limit the recommendations for application to Mercury Arc Rectifiers and Motor Generator Sets, but it is probable that the same considerations applying to the Motor Generator Sets will apply to Rotary Converters in a general way.

Either type of equipment will give satisfactory service when properly installed and cared for as directed. The question as to which piece of apparatus should be adopted should properly be determined by the local conditions of the individual application.

The arc current required is determined by:

- (a) Dimensions of screen
- (b) Length of throw
- (c) Reflective value of screen
- (d) Intensity of general illumination
- (e) Angle of projection
- (f) Type of density of film.

Information to be taken into consideration in selecting one equipment where either may be applied is listed below:

- (a) There is a difference in over-all efficiency between the Motor Generator Set and rectifier.
- (b) The first cost, including installation, is lower for the rectifier.

- (c) The rectifier may be and usually is installed in the operator's booth.
- (d) In cases where it seems necessary that both arcs be operated simultaneously for any purpose, the Motor Generator is the proper equipment. Some theatres operate two machines from a single rectifier by stealing the arc from one machine to the other, without any warming-up period.

### Mercury Arc Rectifier Equipment

The equipments now made for this service differ only in details and the descriptions of the outfits are, therefore, combined for sake of brevity, and mercury arc rectifiers have been recognized as standards for a number of years.

The equipments now made consist of a transformer, regulating reactance, a bulb or tube, control mechanism, and an automatic starting device. The transformer and regulating reactance, which may be included as part of the transformer, are for the purpose of reducing the line voltage to the proper value and provide stability to the arc. The bulb or tube serves as an electrical valve, which prevents the flow of current in the wrong direction. The connections are such as to utilize current from two different parts of the transformer winding in such a manner as to secure continuous current, and the transformer is so designed that the pulsations are slight.

These connections, which are internal to the rectifier, are shown in the two diagrams, Figures No. 1 and 2, which illustrate two types of rectifier equipments in common use. The only external connections are those required to bring the supply to the A. C. Terminals of the outfit through a switch and fuses, and to carry the load current from the D. C. terminals to the lamps.

In order to compensate for variations in line voltage and to permit adjustments to be made to take care of variable conditions, such as film density, etc., means are provided for controlling the current, by changing connections of the reactance or transformer. These outfits are so arranged as to permit the operation of an A. C. arc as an emergency measure.

For convenience in operating and to permit the installation of the outfit at some distance from the operator, automatic starting devices are provided. These are such that the outfit is started by closing the line switch and striking the arc.

The over-all efficiency of the rectifier is approximately 70%. This represents the percentage power from the line, which is delivered in the form of power to the arc.

All outfits are designed so as to operate at full load continuously without temperatures that are unsafe.

Mercury Arc Rectifiers are made in 30, 40 or 50 D. C. amperes capacity, and can be made for service on any commercial A. C. circuit. The inherent characteristics of all outfits are such as to make the arc voltage at normal current highly efficient.