

## Stage Lighting Directed by Baton\*

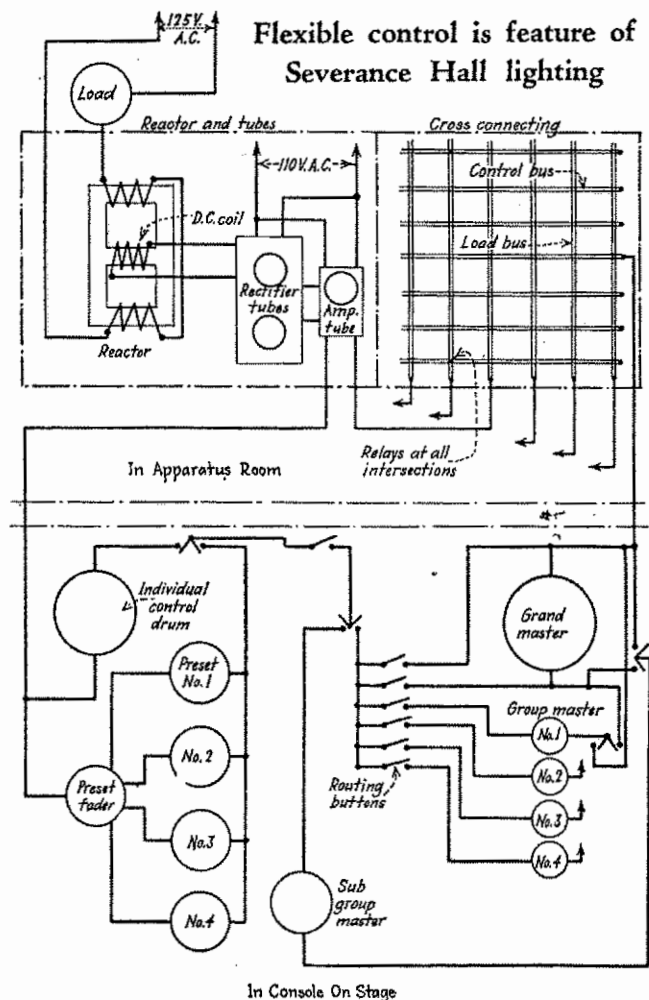
WITH a very carefully worked out scheme of lighting in Severance Hall, the new home of the Cleveland Symphony Orchestra, it was desired to make it possible for a single operator to control singly and in combination all lighting of the main auditorium and stage in a manner analogous to an organist's control of sound. The system developed to accomplish this consists of a console in the orchestra pit having hand and foot controls conveniently located as on an organ, reactance dimmers controlled by electron tubes and a relay cross-connecting panel which connects the reactors, through their control tubes, to the organ controls.

One reactor per load is provided. To make the operation of these units clear, any reactance dimmer may be taken as an example. The a.c. load current flowing in the reactor is directly dependent on the d.c. saturation current flowing in the other coil of the same unit. This d.c. supply is furnished by two neon-filled rectifier tubes, the output of which is controlled by varying their grid bias. The output control is accomplished by a small tube of conventional radio amplifier type, which in turn has its output controlled by variation of a d.c. or conventional radio "C" battery bias on its grid. The control wires to this grid come from one of the 110 vertical buses on a relay panel, the nerve center of the cross-connecting mechanism.

The relay cross-connecting panel consists of 36 horizontal rows of relays with 110 relays in each row. Each horizontal row is connected with one of the 36 dimmer-control drums on the console. Each vertical row is connected to a one-tube control unit, its associated reactor and, in turn, load. By closing any relay at the intersection of a horizontal with a vertical bus, any one of 3,960 possible connections can be made.

It was obviously impossible to run the 3,960 wires of the system to the console or to accommodate that number of switches. Therefore, 110 load switches and 36 con-

trol selectors were placed at the organ-console-type switchboard. This provides flexible control of 110 sliding circuits by 36 flexibly connected dimming controls and four additional controls which do not pass to the



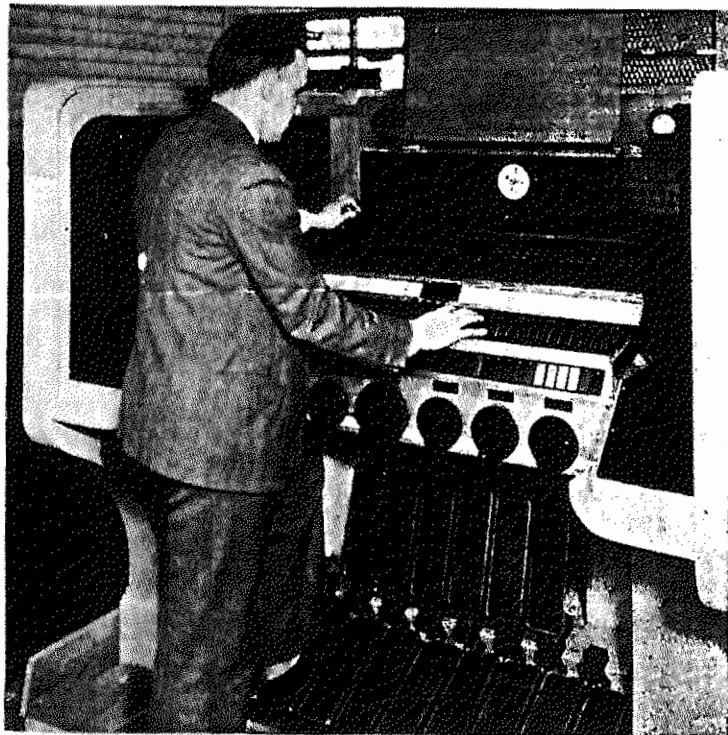
\*Based on I.E.S. paper by Dean H. Holden, Walker & Weeks, Cleveland.

cross-connecting mechanism. Essential elements consist of:

Remote controls enabling the switching of any one or up to seven of the 110 load circuits to any one of the 26 individual control drums; 36 individual control drums which remotely control the resistance dimming of whatever circuits may be connected to them by the switching above mentioned; nine sub-group foot pedals, each capable of electrically controlling any or all of the corresponding sub-group of four control drums; four group masters, foot- or motor-operated, each capable of electrically

controlling any combination of the 36 individual controls which it may be desirable to connect to them; one grand master, foot- or motor-operated, capable of controlling electrically any or all individual controls or group controls; one preset dimming device associated with each individual control drum, but with individual scene faders operated on a common gang shaft by motor or hand; small sliders which provide for four presets of dimming on a control unit; four individual controls and one master for handling the house direct lighting; remote individual control for twenty four-color boomerangs on spotlights; remote individual "joy stick" control for direction and focusing of nine spotlights; signals and remote iris diaphragm control to nine arc "spot" positions; telephone to ten stations, and adequate illumination for cue-sheet rack and all working faces of console, including pedal portion.

In the console are located the potentiometers which control the grid bias from the smaller amplifier tubes. Each individual control drum operates one of these resistance units. In turn, these units can be cascaded through sub-group or through group master, each of which, in turn, can be fed from the variable voltage grand master bus or from direct feed. The individual unit, too, can operate direct from feed, independent of the mastering system. Lastly, any combination of individual controls can be fed from the grand master bus without first going through the group or sub-group masters. Field control of the generator in an independent motor-generator set is obtained by a master rheostat on the console.



Courtesy Westinghouse Electric & Manufacturing Company

Beginning at the floor in the physical arrangement, there are inclined foot pedals comparable to the swells of an organ, one for each group master and one for the grand master. In front of these are nine broad foot keys. These operate the sub-master potentiometers. Next above, and at the edge of the operating manual position, are 36 tilt tablet switches, again of the usual organ type. Each of these is associated with one of the 36 individual control drums, and, in turn, each group of four tablets is tied to one of the foot-pedal sub-group masters. Immediately above these on a sloping ledge are 36 individual drum controls. The next tier is a row of 36 tilt tablets serving to connect a given load circuit to preset or manual control at will. Above these are 36 panels containing jack-type telephone switches. There are six buttons in each of the panels, the first connecting control circuit direct to feed, the second to grand master and the last four to any one of the group masters. On the next slope are located the preset, slider-type potentiometers. There are four of these to each of the 36 control circuits. Associated with these, but behind the panel, is the preset fader potentiometer. All of these faders are ganged on a common shaft. The last row at the top of the board has 36 tilt tablet switches to throw a given control on or off and a test button which lights pilots on load circuit switches. The tilt tablets have an additional contact which lights a pilot light.

A 4-in. panel running from top to bottom through the center face of the console contains all master controls. At the top is a clock; below, the master fader drum. The grand master drum follows. Below this are the four group master interlocks from foot to motor control. Lock and master switches and other miscellaneous items are worked into the spare space just above these. Scene pilot lights are provided which fade from scene to scene.

On the diagonal sides of the board, in the vertical faces, are the 110 cross-connecting switches and pilots, 55 on each side of the operator. On the inclined face at the left are the house light dimmers and above these are located the boomerang controls. In the right-hand inclined panel are the "joy sticks" for remote directional spot control. There also are the spot signals and diaphragm controls.

In the vertical ledge, immediately in front of the operator, are the five slow-motion wheels for master control.

### Console-type switchboard controls lights

