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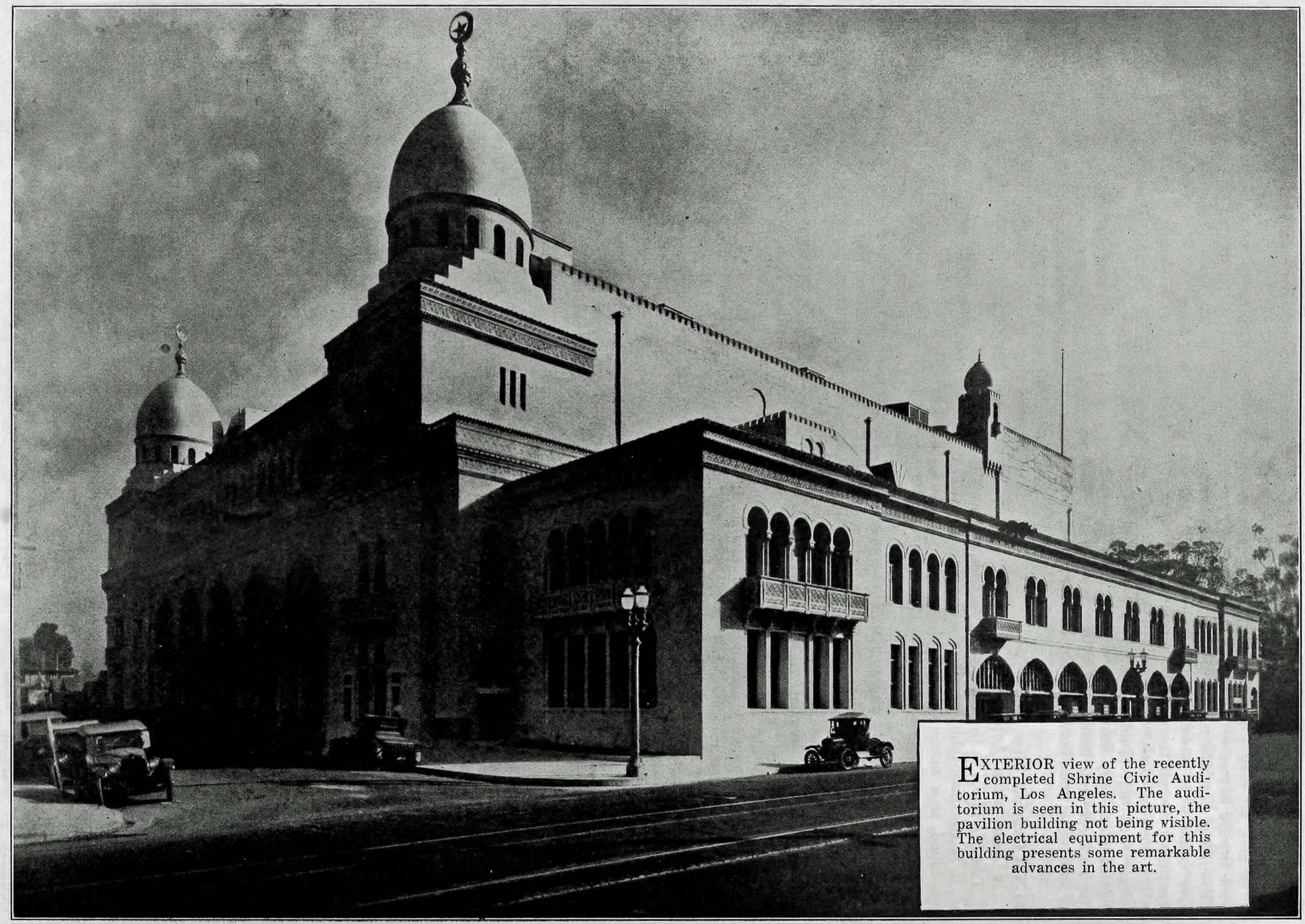


EXTERIOR view of the recently completed Shrine Civic Auditorium, Los Angeles. The auditorium is seen in this picture, the pavilion building not being visible. The electrical equipment for this building presents some remarkable advances in the art.

Electrical Equipment of the World's Largest Stage

New Al Malaikah Temple Civic Auditorium in Los Angeles Embodies Unique Electrical Features

By C. A. Sanborn

Holmes and Sanborn, Consulting Engineers

FIFTEEN feet wider than the New York Hippodrome, the stage of the new Al Malaikah Temple Civic Auditorium is unquestionably the largest indoor stage in the world. The switchboard is the largest stage switchboard ever constructed, and the main chandelier in the auditorium is claimed by fixture men to be the largest lighting fixture ever built. In the construction of this mammoth auditorium the electrical problems presented to Holmes and Sanborn were no less mammoth. How they were handled is modestly set forth in the accompanying article.

RANKING with the great auditoriums of the world and containing one of the largest indoor stages, the Shrine Civic Auditorium recently has been completed by Al Malaikah Temple in Los Angeles. Joined to the auditorium building is a three-story pavilion building arranged to handle carnivals, fairs and exhibits, banquets and large dances, making, together with the auditorium, a group of two buildings sufficient to serve the civic needs of Los Angeles as a convention city.

The Moorish style of architecture with its distinctive features, as designed by John C. Austin, F.A.I.A., dominates the group. The buildings cover an L-shaped area measuring 294 ft. on Jefferson Street, 279 ft. on Royal Street and 564 ft. in length on the east property line and so arranged that the banquet floor of the pavilion building leads directly into the north side of the auditorium stage, making it possible to arrange pageants and processions in the banquet hall before proceeding onto the stage. Housed also in the group are the Shrine organization rooms.

Auditorium Lighting

The auditorium, with seating accommodations for 6,442 people, has an immense stage measuring 192 x 72 ft. and having a proscenium opening of 100 ft., which is 15 ft. wider than that of the New York Hippodrome. The decorative color designs in the auditorium range from rich deep blue, reds and deep scarlet and royal purples to bright blues and soft shadings of buff and yellow, making an extremely artistic effect. The ceiling is in effect a tinted canopy with the blue sky and stars above. A double cove illuminating the sky and the canopy, with its draped folds held by huge ropes, is lighted by the main chandelier.

Reported to be the largest electric chandelier ever built, this fixture weighs approximately 5 tons and has a diameter of 20 ft. and an overall length of 28 ft. The lighting is in four colors, the total load in the fixture being 65 kw. Relamping is accomplished through a trap door in the canopy ceiling above the fixture through which a ladder may be lowered.

In addition to the ceiling coves and main fixture, decorative coves in three colors are installed around the front and side walls, about 18 ft. below the main ceiling. A secondary ceiling above the orchestra pit is cove lighted in three colors, no white light being used. At the center of this ceiling is a smaller crystal fixture also in three colors.

The soffit of the balcony is panelled to provide for ventilating grilles. In each of the seventeen panels is a fixture in four colors. The ceiling space outside the panels is provided with fixtures in white light only, to give uniform illumination during conventions.

Emergency lighting in the auditorium is provided by aisle lights which are located at every fourth row on the main floor and at every third row in the balcony.

Stage Lighting

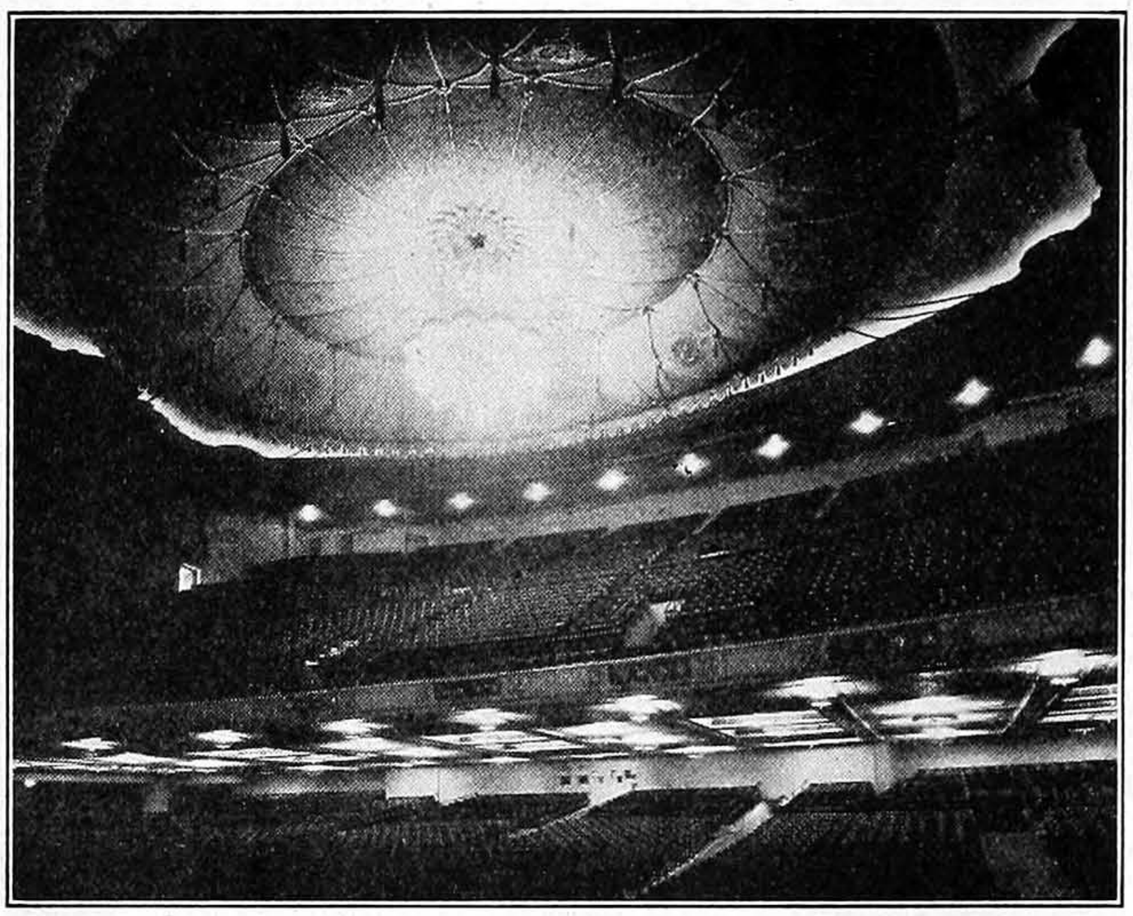
All of the stage lighting is in four colors. A single row footlight with 150-watt lamps wired in a sequence of red, white, amber, white, blue, white, red, etc., provides down-stage illumination. This is augmented by six banks of four 500-watt floods set in front of the balcony and 96 500-watt spot floods overhead for orchestra pit and front stage lighting. In addition to the above the stage has:

7	99-ft. borders using 500-watt lamps.
68	30-amp. incandescent pockets.
8	30-amp. proscenium strip pockets.
15	75-amp. d.c. pockets.

The first border is of the "concert type," and is equipped with four-unit suspension hoods, each unit being provided with separate leads, terminating in a screw plug for attachment to raceway outlets. There are also in the concert border 12 pin plug connectors on 12 circuits for the additional attachment of spotlights.

Due to the extreme width of the stage the ordinary type of prescenium strip lights was not desirable. Therefore a four-section pocket was provided on each side of the proscenium opening, into which portable strip lights can be plugged. The two pockets of the same color on both sides are connected to the same dimmers. Four 1,000 to 2,000-watt dimmers per color are supplied and arranged with paralleling switches to dim any wattage from 1,000 to 8,000 watts per color.

Due also to the great width of the proscenium opening, the electrical equipment was engineered



It will be seen from this view of the auditorium that no columns are used to support the balcony. The largest bridge truss known to have been used inside a building supports the balcony. The immense ceiling fixture, 20 ft. in diameter, floods the auditorium and particularly the balcony.

so as to allow a segregation of the center 50 ft. of the stage in order to provide for the ordinary show and visiting theatrical companies, which in general cannot utilize a 100-ft. opening.

The circuits and dimmers for the footlights and borders, therefore, are arranged so that either the "full proscenium" or the "short proscenium" can be used, using the same switch and dimmer handles on the switchboard for the control of lights for either opening. Each border is divided into three sections, the center one being 49 ft. long and the two end sections each 25 ft. long. Each section is hung independently of the others, allowing the raising of the two end sections when the "short proscenium" is used so as not to interfere with the sets.

As the building is located outside the downtown section, no direct current is available. A 100-kw., 3-wire, 110/220-volt direct-current generator set consisting of two 50-kw. 110-volt generators in series driven by a 150-hp., 2,200-volt, 3-phase, 60-cycle induction motor was provided, located in the auditorium service switchboard room. This generator set provides direct current for all the d.c. arc pockets and also provides an extra feed to the projection room supplementing the generator set for projection service.

In addition to the above equipment, a 400-amp., 3-wire auxiliary lead is brought up to both sides at the rear of the stage from which additional capacity can be obtained for any effects which need not be controlled from the stage switchboard.

On the stage adjacent to the pilot switchboard is located the stage manager's station on which is mounted a return call annuciator to all the dressing rooms, curtain control equipment and signals for intercommunication telephones, one on the house system and one on the private line to the projection booth; also a return call buzzer to the projection booth and a stage ventilator control station. A desk shelf is provided for script and notes.

The stage ventilator control operates from the emergency light service and operates to close stage dampers when the circuit is broken. Operating keys are located in the box offices and the stage manager's station.

Stage Switchboard

A Hub Electric Company pre-set, selective, remote-control stage switchboard controls all the stage and house lights. This switchboard is 26 ft. long and has 152 Locke main pilot switches and 279 Ward-Leonard dimmer plates and 147 Sundh contactors. It is the largest stage switchboard ever constructed.

Projection Room

The projection room is located at the rear of the main floor of the auditorium and is of the latest design equipped with two projection machines, four spotlights and one stereopticon. The direct-current circuits are controlled from a switchboard arranged to throw each machine across either the d.c. service from the stage motor-generator set or across the projection room generator-set service.

Return call buzzer stations between the stage manager, orchestra leader and organ console are provided between the projection machine and spotlights. A private phone system between the stage manager and projection room is installed with three phones on the front wall of the projection room, one beside each lookout port.

A complete pilot unit for operation of the stage and house masters on the stage switchboard also is provided on the front wall of the projection room. This permits the operation of any lighting effects on the stage and house, the set-ups having been made on the stage board.

The Pavilion Building

The three-story pavilion building has an exhibition hall and a banquet hall and is 300 x 150 ft. with a wing 120 x 75 ft. adjoining the lobby of the auditorium building.

The basement of the wing is used for boiler and fan rooms and transformer vaults for the exhibition and banquet hall. Portions adjoining the auditorium are used for foyers and passageways from both

the auditorium and banquet and exhibition halls. The balance of the first and second floor is used for kitchens and service rooms, with living quarters for the caretaker on the second floor.

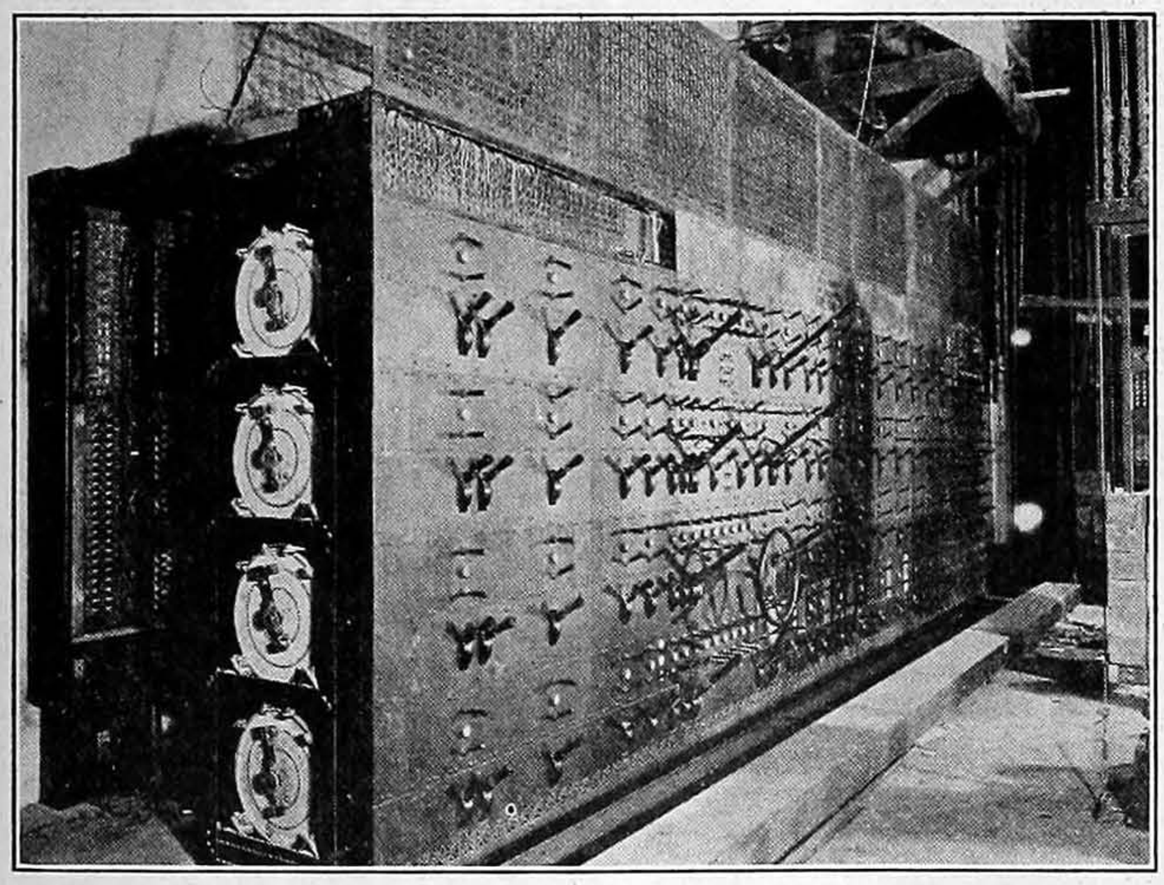
The main basement is designed for an exhibition hall. Two ramps provide direct access to outdoors. The main lighting is provided from ceiling outlets. Each column has a 1,000-watt receptacle circuit to provide for additional decorative lighting. Special power gutters for carrying three-phase and single-phase power lines to booths have been installed along both side of two ventilating ducts run exposed on the ceiling. Each gutter consists of two 4 x 4-in. sections mounted one above the other and provided with hinged covers. Heavy leads will be laid into these gutters from which taps can be taken to the booths through holes drilled in the covers.

The second floor of the banquet hall is a mezzanine entirely surrounding the first floor, and leaving an open space 64 x 213 ft.

All the lighting in the banquet hall is arranged for two-color control, the circuits being run to three panel boards distributed about the building and controlled from a switchboard in the kitchen wing. A receptacle with a 1,000-watt circuit is provided on each column under the mezzanine for decorative lighting when the room is used for exhibitions.

The mezzanine extends approximately 13 ft. inside the line of columns. At the railing, and in line with the columns, free standing indirect lighting pedestals have been installed.

A special power gutter for the first floor and mezzanine is run along the ceiling of the first floor just inside the line of columns. This gutter is 4 x 8 in. divided into two 4 x 4-in. compartments arranged side by side and equipped with hinged covers

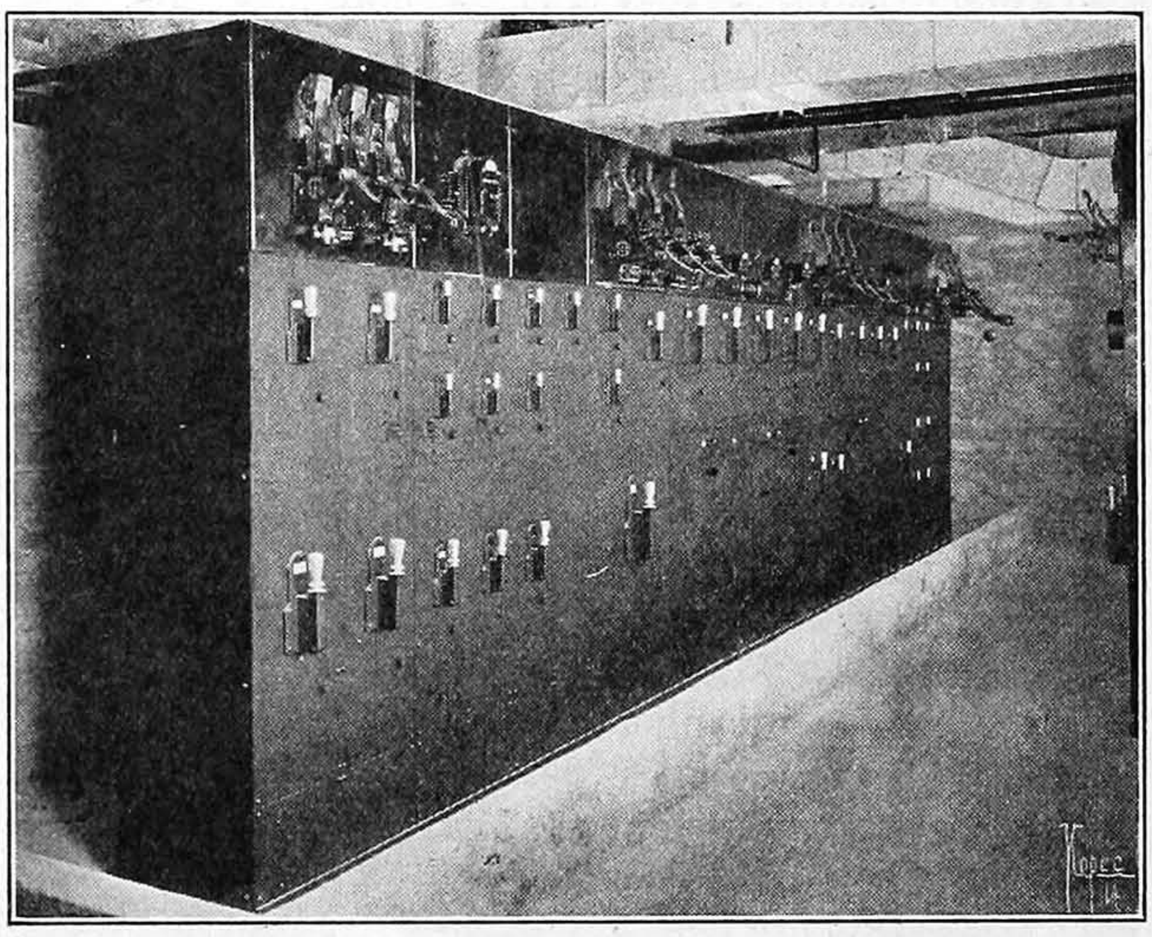


The stage switchboard at the Shrine auditorium, the largest stage switchboard so far constructed, is a Hub Electric Company pre-set, selective, remote-control board. It is 26 ft. long and has 152 main pilot switches and 279 dimmer plates.

with turn catches. Straps 1/8 x 1 in. spaced 24 in. on centers support the cables when the covers are open. Cast iron boxes 8 x 8 in. with gasketed covers through the mezzanine floor connect with the gutters below.

The special power gutters are connected to a distribution switchboard in the basement with 4-in. conduits, one conduit connecting with each gutter section. Three-phase and single-phase 600-amp. leads are brought from the main exhibition hall service switchboard to the distribution board.

A 4-in. conduit only also is provided from the outside of the building to the distribution board for



Main distribution switchboard at the Shrine auditorium, showing side view of the control panel (on extreme right) for the 150-hp., 2,200-volt motor of the 3-unit motor-generating set which provides direct current to the stage.

bringing large capacity direct-current feeders from the portable engine generator sets for dances and entertainments, requiring arc lights and color wheels.

Heavy capacity pockets are provided in seven of the ceiling trusses from which festoon lighting can be extended.

Electrical service for the two buildings is provided from four transformer vaults, two in each building. One service company supplies all the lighting in both buildings, the other company the power and the standby lighting.

The power service in the auditorium building consists of three 200-kw. transformers for light, two 100-kw. for standby light and three 50-kw. for power. In the exhibition and banquet hall building it consists of three 100-kw. for light, one 15-kw. for standby light and three 50-kw. for power. An additional transformer vault is provided in the exhibition hall building in which extra transformers can be placed to supply additional special power for various commercial uses during exhibitions.

Separate service switchboards are provided in each building so that electrically the two buildings are separate units, with the exception of certain lobby lights in the kitchen wing which are used for both the auditorium and banquet hall. All services entering these main switchboards are protected with I-T-E circuit breakers, using type L.L. and L.G. as required.

Power service for the heating and ventilating system and the organ is supplied in the usual man-

ner, the organ blower being controlled from the console.

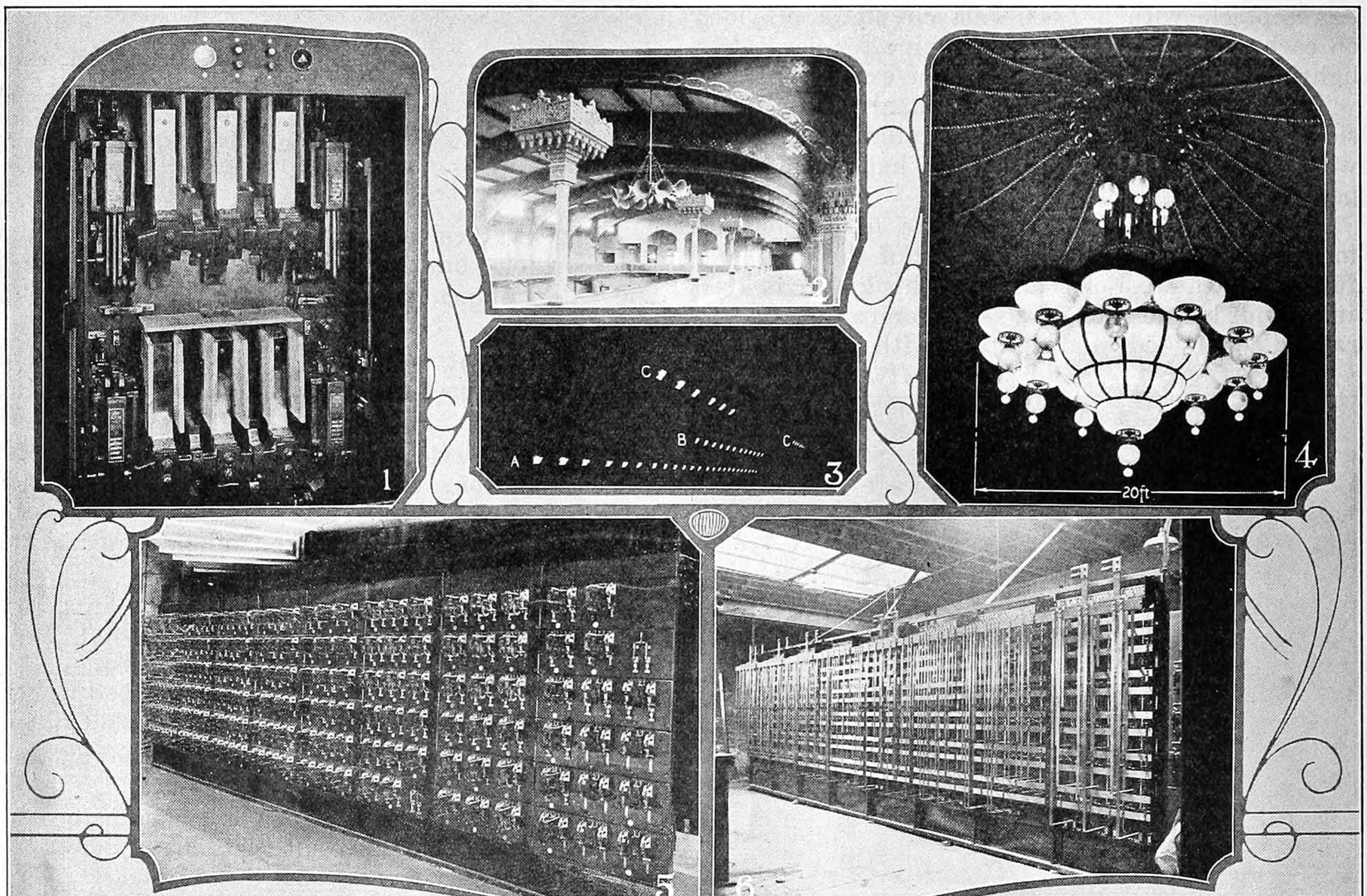
Three 110/220-volt, 1,600-amp. lighting phases are used in the auditorium building. One goes direct to the stage switchboard contactor board, the other two are split to feed the contactor board and the several panel boards throughout the building. Two of the leads feeding the contactor board are connected on the load sides of two Sunhd remotely controlled transfer switches of 600 and 400-amp. capacity, respectively, which normally are fed from the lines of the standby power company. The third lead is carried direct to the contactor board. The two circuits which are on the transferred services are used to feed the operating buses of the remote-controlled switchboard and the footlights and borders No. 1 and 2, switchboard lights and certain other circuits on which power must be maintained. The transfer switches are operated from the stage manager's station, pilot lights being provided to indicate when the normal services are "hot" and when the standby services are being used.

The auditorium building emergency lighting service is taken from the load side of a Sundh semi-automatic transfer switch, which transfers automatically to the standby company on a reduction in voltage below 200 volts. Pilot lights are provided on the service switchboard and at the stage manager's station with the same features as mentioned above for the stage transfer switches. Reset switches are located directly below the pilots.

The lighting service of the banquet hall building consists of one 1,000 and two 800-amp. 110/220-volt phases. An emergency lighting transfer switch similar to the one for the auditorium building is provided for the banquet hall building with resetting stations on the service switchboard and the banquet hall master lighting switchboard.

Public Address System

A public address system has been installed which makes it possible not only to amplify the oral action on the stage into the auditorium but into the banquet hall and exhibition hall at will. The system can be used in the banquet hall alone to amplify speeches and also can be used with outside horns at the main entrances of the auditorium and banquet hall to address overflow gatherings.



Representing some of the more interesting features of the Shrine auditorium electrical equipment: (1) A close-up of one of the Sundh semi-automatic transfer switches on the main switchboard (shown elsewhere). (2) A view from mezzanine floor of the banquet hall in the pavilion building, showing the Western Electric public address system horns installed, and the fixtures on columns from which the ceiling is floodlighted. (3) Because of the extreme stage width borders have been designed to accommodate smaller stage use. (a) Shows full proscenium concert border, (b) the center section of another border separated for short proscenium use, with (c) the two end sections of the same border drawn up. (4) The immense chandelier which hangs from the center of the auditorium, weighing 5 tons, 20 ft. in diameter, 28 ft. in length, and having an electric load of 65 kw. (5) Front view of the remotely controlled contactor panel, operated by the stage switchboard. This board is 24 ft. long and contains 142 contactors. (6) Rear view of the same contactor board, showing the busing.

At the conclusion of the meeting, it is adapted to summon cars, transmitting outlets being provided in each of the vestibules. Meetings in either of the buildings can be broadcast by remote control over telephone lines through one of the large radio stations. The system also is equipped with a radio receiving set by which messages from speakers who are unable to attend may be broadcast from other cities and heard at the conventions.

Outlets for the public address horns are located at two points in the banquet hall. This makes it possible for the speaker's table to be located either at the end of the room or at the center near one side. The outlet for basement horns is located in the center of the room.

Auditorium horns are concealed in the ornament over the proscenium arch.

Both buildings are provided with a complete conduit system for the installation of public telephone service. Provision is made for a P.B.X. board in the exhibition hall so that lines can be extended readily to any booth during exhibits.

A Western Electric selective ringing intercommunicating telephone system is installed for communication between the administrative offices of the auditorium, the several foyers, the stage manager, projection booth, green room and so forth. There are thirty-three stations on the system, and the connections have been so made that each station is able to talk with such other stations as is necessary.

George L. Patterson, of Los Angeles, was the electrical contractor for the job.