A STUDY OF THEATRE DESIGN

Including the Design of

A Small Theatre

BY

CLARENCE MILLINGTON HIGGINS

A Thesis Submitted to the Graduate Committee

For the Degree of

MASTER OF SCIENCE

in

Architectural Engineering

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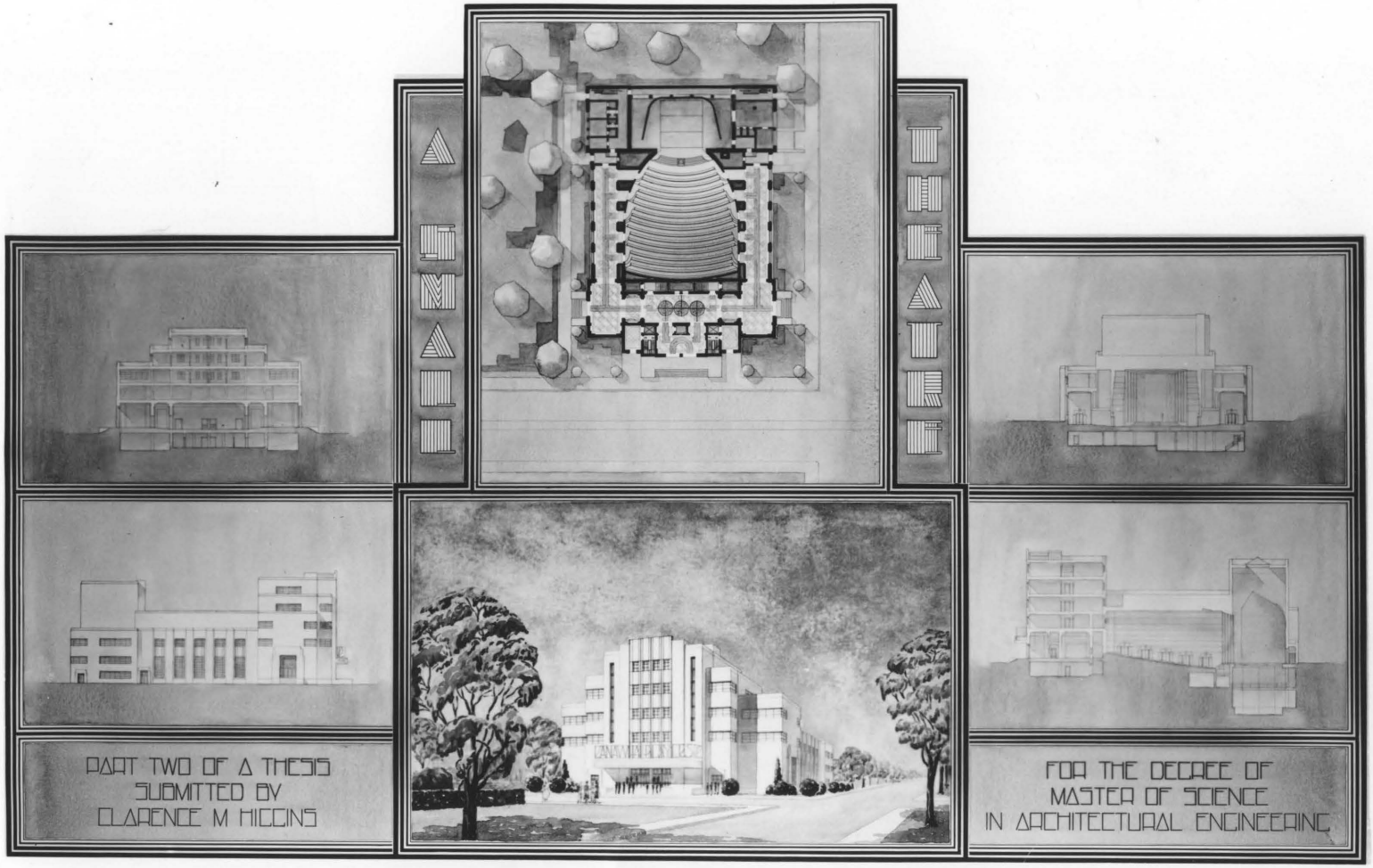
A SMALL THEATRE
PART TWO OF A THESIS
SUBMITTED BY
CLARENCE M HIGGINS
FOR THE DEGREE OF
MASTER OF SCIENCE
IN ARCHITECTURAL ENGINEERING

ACKNOWLEDGEMENT

I would like to say a word of thanks to Professor C. H. Cowgill who has given me advice and help in connection with all phases of this thesis. I have also to thank Professor P. M. Torraca and other faculty members of the Architectural Engineering Department for advice and criticism concerning the design projet.

was especially kind in giving me freely of her time and help in presenting this manuscript. I am indebted to her.

For information concerning the Kanawha Players theatre guild I am obligated to

of that group.

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I INTRODUCTION

American architects have on the whole contributed little to the development of the modern playhouse. Compared to the Dresden Court Theatre at Dresden, the Kunstler Theatre at Munich and other foreign theatres the best work in America is negligible. Of course, we have the Radio City Music Hall, the Earl Carroll Theatre in New York, and other huge auditoriums, but they can only be considered as oversize musical revue theatres and movie houses and no actual development of a new theatre design.

It can be said at the outset that American architects are not to blame. Until recently any architect interested in theatre design in this country had no clients who were the least interested in building better theatres. In Europe, playhouses are as important in the eyes of the community as the public library or a Masonic Temple is to us; every city of importance aspired to have a theatre on an imposing site. But almost all of our theatres have been built for real estate speculators or theatrical landlords whose one interest has been to sell the site value of the plot for as high an annual rental as could be expected.

Little architectural progress can be expected under such conditions. But, recently the professional theatre has taken an economic turn for the worse. Fabulous profits on a single play are no longer the rule, and in New York especially, theatres have stood empty for months at a time.

Theatre architecture is likely to emerge much the better for this depression, for out of the shambles of the "show business" a new type

of management is being born. These managements are not speculators raking together enough capital in order to make a half-million dollars a year at one throw. They undertake theatrical production on a more coherent, self restraining basis. They are content with profits far more modest. They produce on a year-round program with a permanent company of actors, and by sustaining a standard both of material and production, rely on the good will of a permanent audience that returns regularly for successive bills. The Neighborhood Playhouse, the Cleveland Playhouse, the Civic Repertory Theatre and the Theatre Guild are typical of these newer type of producing organizations. When their endowment or their earnings enable them to erect a theatre, they tend to present the problem to the architect as, "What is the best type of theatre to build in order to produce plays well?"

As a result of Professor Baker's experiments at Harvard University twenty-five years ago, courses in play writing and play production are becoming a recognized part of every university curriculum. A well-equipped theatre, as at Yale, will presently be as much a part of the university campus as lecture halls are today. From the universities the demand has seeped into the high schools and from there into the grammar grades. Instruction in the art of the theatre is becoming general. Community playhouses with amateurs increasingly proficient provide a substitute for the defunct local stock company and for the dwindling number of Broadway productions on tour; and civic centers include stages ample to house not only their own efforts but to lure professionals from nearby cities.

These are the theatre architect's new clients who make it imperative for him to know the essentials of good theatre design.

The purpose of this thesis is to present a study of these essentials of theatre design. This study will be confined to theatres of the produc-

tion type, (as the movie theatre is considered quite a different problem) and will consist of three parts.

Part I; a manuscript presenting a concise study of theatre design and a discussion of my own design for a small theatre.

Part II; a rendering of my theatre, designed to meet modern requirements as I see them.

Part III; a set of working details for the previously designed theatre. This includes plans and elevations with dimensions and materials indicated, but lacking the actual structural design of members, and many details that will be required in the finished structure.

II INVESTIGATION OF THEATRE DESIGN

Retrospective

The theatre of today is in a state of revolutionary transition. The change may seem scarcely perceptible to its contemporaries but if we draw comparisons with the high-lights of the stage, the movement which began in Europe about thirty years ago appears to have grown rapidly and to astonishing proportions. This movement - the modern movement - originated partly in the development of a conventional, intellectual and sociological type of drama, but more especially in the growth of a new stagecraft in revolt against the absurd and vulgar daubing which passed for scenic art during the nineteenth century.

The movement began among the dramatists in the creation and refinement of the realistic drama into a conventional form in which the entire action was so arranged, or distorted, to take place in from one to four locations. This drama had for its intellectual content the problems which confronted the people of the day, and was destined to oust, on one hand, the cheap melodrama which was then current, and, on the other, the elaborate revivals of Shakespeare and Sheridan.

The old type of drama was associated with hanging borders for both interior and exterior sets, the light canvas wings thrust out on each side parallel to the footlights, the painted mountain backdrops that fluttered whenever a breeze blew in through the loading door and the "palace" or"drawing room" interior which swayed and occasionally collapsed when a forgetful actor slammed the door. The new drama brought with it the built-up or architectural sets, the wagon and elevator stages, the

"horizont" or skydome and an entirely new system of stage lighting.

The creation of these new scientific devices of stage mechanics developed a new corps of men in the theatre known as scenic artists and stage engineers. The former were recruited, in a large measure, from easel artists who became vitally interested in the stage; the latter, from stage mechanics who made the study and invention of new devices and more flexible stage machinery their life work.

These inventions and developments in stage machinery completely changed the layout and design of the building which housed them. The old stages, of which the Paris Opera House and the Vienna Court Theatre are excellent examples, were deep and only twice as wide as the proscenium opening, while the new stages, of which the Dresden Court Theatre and Reinhardt's Grosses Schauspielhaus in Berlin are examples, are much wider and revised to enclose the skydome.

The rise of the democratic dogma and the development of modern science and safety legislation have affected the auditorium side also. The horrible disasters of theatre fires and panics have caused laws to be enacted to protect the people and make public auditoriums as fireproof as possible. Social conditions have changed the old "horseshoe" and tiers-of-boxes type to the fairly comfortable auditorium of today. The theatres of yesterday had four to six tiers of seats while today, as a rule, even the second balcony has disappeared. In the latest types of intimate theatres in Germany the first balcony is eliminated and the parquet floor is strongly raked in a single unified bank of seats after the manner of the old Greek theatres.

All this has taken place in the last thirty years and has completely antiquated our older theatres. The modern drama and the development of scenic art, together with modern social conditions, have so completely changed the

physical aspect of theatre buildings that today a structure thirty years old is so completely out of date as to be impracticable for use.

Requisites for Design

The Stage

A theatre is not only an auditorium where people sit and see a play but a stage where plays are produced. It involves the very necessary space where the work of putting on a play has to be done. Unless there is to be a shameful waste of time and labor, the stage cannot be constricted below a certain minimum of space. To perform a play there must be enough mechanical equipment to shift scenes speedily and to light them effectively once they are set.

One system of shifting scenery - the usual method in the United States - is that of a high stage loft containing a slotted flooring or gridiron from which lines are run over pulleys and connected to the various parts of the scenery. Settings must be broken in pieces to be handled, then lowered or hauled on stage and lashed together. Smaller sections are rolled or carried off to one side when a scene is shifted, - large sections are hauled up out of sight.

The above is by no means the ideal system of shifting scenery, It is preferable to keep most of the setting intact, instead of breaking it into pieces with every shift, and to move it by moving the stage itself. This is done by three systems either electrically or hydraulically driven. These are: a revolving stage or turntable which comprises most of the stage floor; sliding stages, large enough to hold an entire setting, the shifting being done by shunting one set offstage or backstage and sending another one on; elevator stages, the stage usually being divided into three platforms running the entire length of the playing area, so that even the most elaborate settings can be speedily dropped to the cellar and

others sent up to replace them - the whole operation requiring about thirty seconds.

Flexibility of the stage floor must be provided for. The business of a play often requires descents to lower levels from terraces, cliffs, or the like; therefore, the stage floor should be arranged in easily removable sections (traps) on adjustable beams so that any portion of it can be taken out speedily and replaced in the course of a play.

A forestage is often essential, but it should not be permanent since it handicaps a more realistic production in which the actors are confined within the limits of a setting behind the proscenium opening.

For open air scenes it is essential to hide side walls and simulate the orb of heaven. This is accomplished by the use of either a cyclorama or a skydome. The cyclorama is a movable piece of equipment while the skydome is permanent.

In addition to the stage proper, there are other problems to be solved in the general stage plan, such as the work shop for the stage carpenter where scenery can be altered or repaired, a similar work shop for the electrician, and another where the property department can make or repair furniture which the actors handle.

The following is a summarizing list of units which are necessary in a well-equipped professional theatre.

1. Carpenter's shop with a small office.
2. Electrician's shop with a small office.
3. Scene painter's room with artist's studio adjoining.
4. Property room with a small office.
5. Costumer's room.
6. Wardrobe room.
7. Hairdresser's room.
8. Musician's room.
9. Stage manager's room.
10. Stage hands' toilet and locker rooms.
11. Dressing rooms.
12. Male and female group dressing rooms.
13. Toilet rooms on every level.
14. Green room (actors' waiting room or lounge.)
15. Scene dock.
16. Rehearsal room.

The Auditorium

In designing the auditorium the chief benefit to be had from the newer types of theatrical organizations is the fact that they will have no money to waste on over-elaborate decoration or gilded gingerbread, and no desire to impress their audiences by such means. As they are interested in running the theatre on a sound production basis, the maximum instead of the minimum will go into the items of stage equipment, usually ignored by the speculative builder. In consequence, auditoriums will be much the better designed, for if the audience cannot be induced into a state of restfulness,

pleasure and enjoyment, of receptiveness to entertainment, the actors cannot effect a proper influence over their emotions, and this is necessary to achieve results in the theatre. To give an audience recreation, the theatre must at the same time stimulate it; consequently, the auditorium should be as simple as possible in architectural and decorative treatment.

One essential feature of planning the auditorium as it is done in America today should be reconsidered; that is the system of narrow rows reached by two or three aisles running parallel to the sides of the auditorium. It is neither comfortable nor efficient. A balcony cuts down some of the sight lines of the rear rows in the orchestra floor beneath it and the rear seats of the balcony almost invariably give an unsatisfactory view of the stage. All current seating methods also tend to get the required number of seats into an auditorium by spreading them out in too wide a fan shape, thus giving nearly one-third of the house extremely bad sight lines to the stage.

A scheme to do away with these faults is to build the entire auditorium on an amphitheatre plan, although this may prove impracticable if the demand for seats is too great. In this scheme even the rear seats have an excellent view of the stage. Enough rise is given each row so that every spectator sees well over every other spectator's head. Every row is an aisle, with two exit doors immediately to right and left for every three rows. This arrangement - originating in Germany - not only makes for comfort and better sight lines during the performance, but in the emergency of fire would empty the theatre in far less time than our present arrangement.

This type of seating arrangement has been under consideration

by theatrical men in this country for some time but so far nothing has been done with it. The plan was to use it in the Radio City Music Hall but such a large seating capacity was required that it was found impossible. An adaptation of this system is had in the Little Theatre in New York, but the result is not near so satisfactory. The greatest difficulty, perhaps, with using the amphitheatre plan is with the building codes. The old codes make no provisions for it and New York is the only city that I was able to find that had revised its code to include it.

In designing the proscenium arch the less it is emphasized by ornament the better. This is due to the presentation of non-realistic drama in which the actors move beyond the proscenium or descend to the audience or make entrances from the auditorium. It should be an unemphatic frame, made flexible in size by adjustable draperies or more rigid frames. I considered developing a theatre design in which the stage was made integral with the auditorium, that is, no proscenium arch at all, but until drama as a whole has advanced more towards the non-realistic or theatric, I do not see how it can be done. The present stage must be framed in some manner.

Foyers, Lobbies and Promenades.

First nights in the theatrical world are rather pitiful during the intermissions, for in nearly all the American theatres there is hardly room enough to make people feel at ease. The throng will shuffle slowly through the orchestra promenade, crowd the narrow stairways in an attempt to reach the insufficient toilet facilities, and finally overflow into the courts and street. The metropolitan theatre in this country today has no lobby or foyer space to speak of and only a small lounge or toilet room relegated to some corner of the basement.

The theatre should be provided with more and larger facilities - not merely what is required by law, but ample ante-rooms to care for a cultured and polite society. The newer German theatres provide not only spacious foyers and circulation corridors, but also lounging rooms, restaurants, etc., and these new theatres have all the ground and mezzanine floor facilities of a modern hostelry. In all justification I must say that the Radio City Music Hall has all these features, but it is a great deal the exception to the rule.

Roughly speaking, the ante-rooms and entrances to a theatre, such as the vestibule, lobby, foyer and promenades should be laid out as follows. Between the street and the auditorium there should be three sets of doors to act as wind breaks and shields against the noises of the street. The first set at the pavement separates the vestibule or lobby from the outside. From the lobby a second set of doors leads to the main circulation foyer. Off from the foyer there should be located cloakroom and checking facilities. The third set of doors leads from the foyer to the orchestra promenade, in the rear of the seats, if the regular seating arrangement is used.

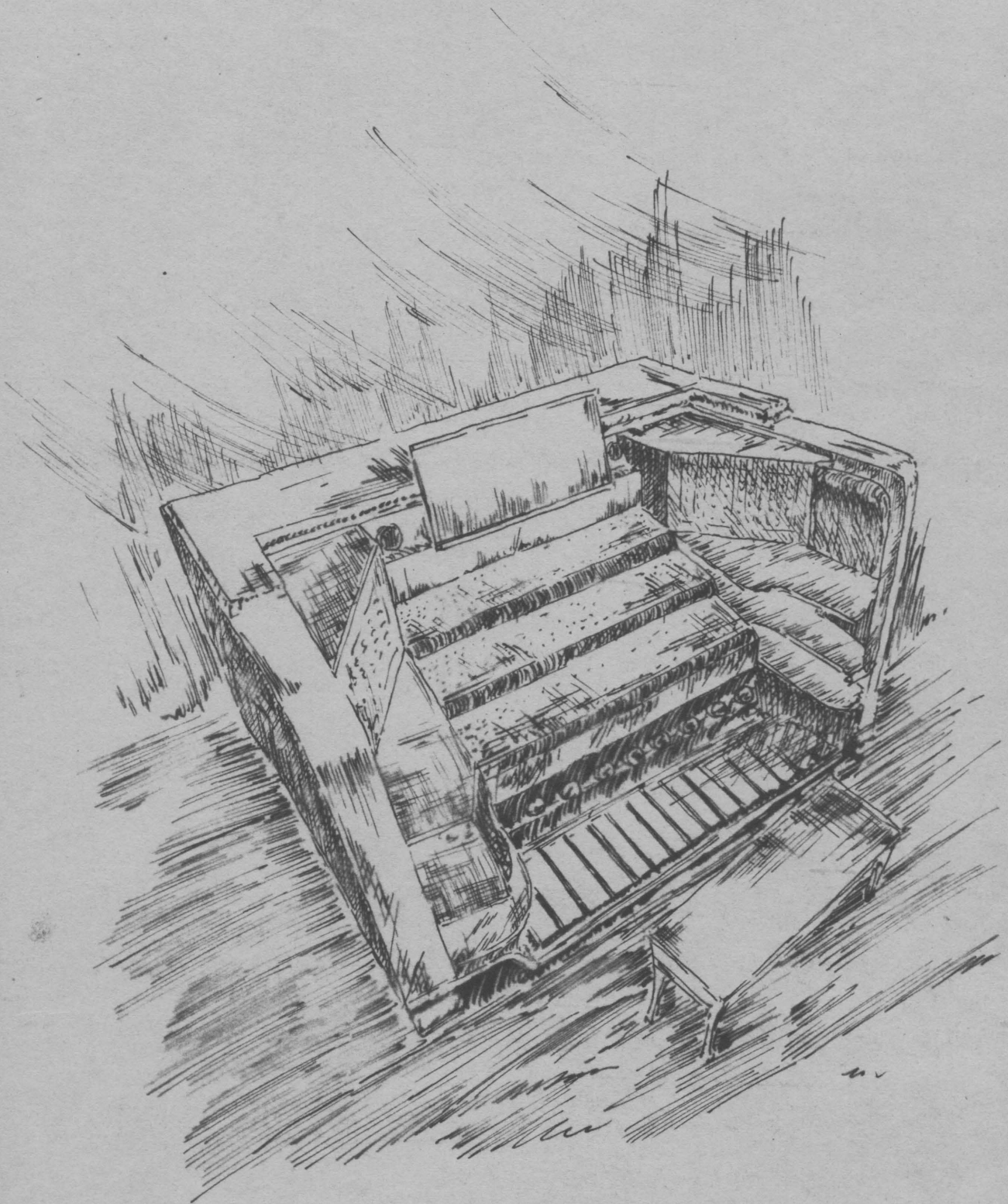
Lighting

The nerve center of a modern stage is the switchboard, and its design is of paramount importance. However, it can be planned only in conjunction with a definite lighting system. One of the first steps in planning a stage is to find out how the particular organization for which the building is being designed intends to light its stage and a lighting engineer should be called into conference before the working drawings are made.

Fundamentally, there are but two principles of stage lighting, concentrated or spotlighting and flood lighting. Flood lighting may be further subdivided into two classifications, direct (footlights, borders, bunches, etc.)

and diffuse, through color mediums or by reflection. The standard lighting system is the Fortuny system which is a method of diffuse lighting by means of reflection from color mediums.

The location of the stage switchboard is a question over which authorities differ. The average theatre has its switchboard located on the stage level, in the recess on one side or the other of the proscenium opening, preferably on the right (facing the audience). In any event the operator must take most of his cues from another man who is watching the performance from the tormentor opening. Some of the most excellently designed theatres have the switchboard under the stage, in the centre, directly behind the apron. The master electrician watches the performance through the prompter's hole - masked from the audience. The most recent development in lighting control is a switchboard designed in the form of an organ console. It is placed in the orchestra pit and the electrician has a full view of the stage.



SKETCH OF LIGHTING CONSOLE

III DISCUSSION OF THE THEATRE DESIGN PROJECT

In order better to realize the conclusions resulting from this study of theatre design, I have designed a theatre to meet the requirements of a little theatre group. Such a problem was chosen because many such groups are as advanced (or perhaps even more advanced) in theatrical technique than the professional stage and would be receptive to a theatre building designed differently from the usual. Then, too, the design of a large theatre was not deemed advisable because of the time element which enters into the developing of a thesis.

Program

In deciding upon a design project I chose the problem of a theatre for the Kanawha Players in Charleston, West Virginia, because this was the only little theatre group with which I was familiar and I felt I could call upon for a program of requirements. Assumptions were found necessary, though, in order to realize a program that would fit the type of theatre I intended to develop, - the main difficulty being that the Kanawha Players are not yet ready for such a project, their income is not large enough to support such a theatre, and their theatrical technique has not been developed far enough to necessitate it.

Using actual conditions as far as they exist, the following program was devised.

The problem is the design of a little theatre for a little theatre group. The organization is heavily endowed and desires a modern and

up-to-date theatre plant in every respect. The theatre should be large enough, that is, with sizable enough stage and adequate equipment, to hold a professional production. It is desired that part of the building be rentable space in order to make the project as nearly self-supporting as possible.

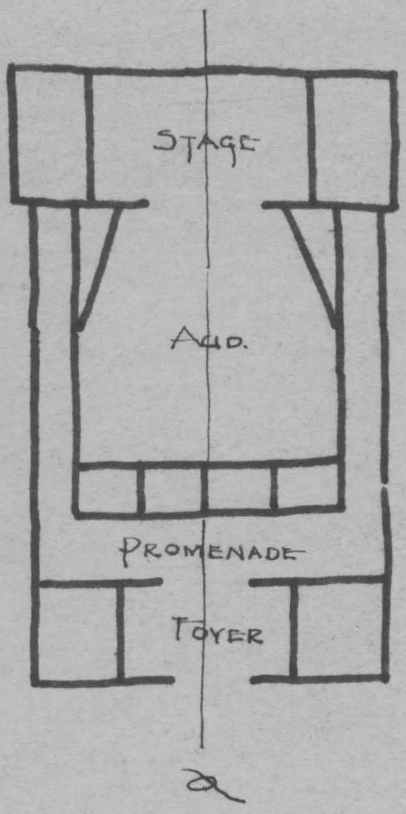
The site is a level plot of ground 175 feet wide and 200 feet deep situated at the edge of the business district. It is a corner lot facing south on a main thoroughfare, bound on the east by a street of lesser importance and on the north and south by residences.

The building must meet the following requirements, which are mandatory:

1. Seating capacity between 600 and 700.
2. Property room.
3. Work shop for electrician.
4. Work shop for scene building.
5. Wardrobe room.
6. Combination Green Room and rehearsal room.
7. Two individual dressing rooms.
8. Two group dressing rooms.
9. Lounge.
10. Office for General Director.
11. Heating and Ventilating Plant.

Design Development

Upon completion of the theoretical study of theatre design I decided that, all things being equal, the best type of seating arrangement was the aisleless, stadium type as used in Germany. With this as a basis the plan was developed in such a manner as was best suited to such an arrangement. Several partis were considered and type (a), in the accompanying sketch selected.



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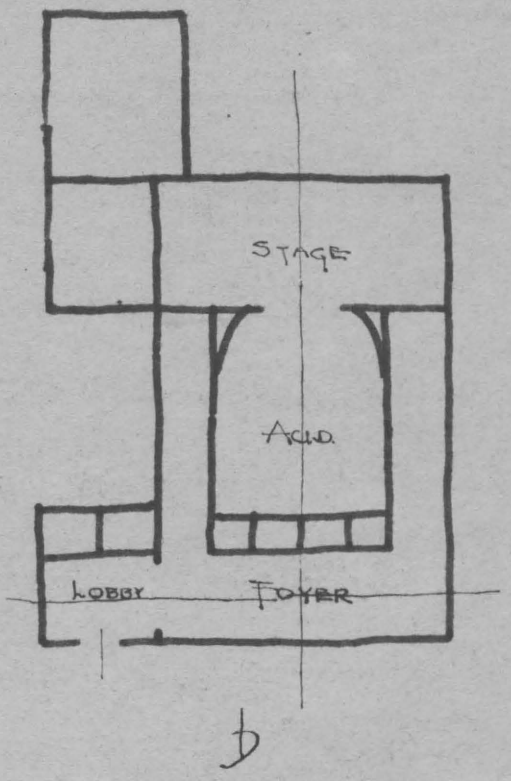

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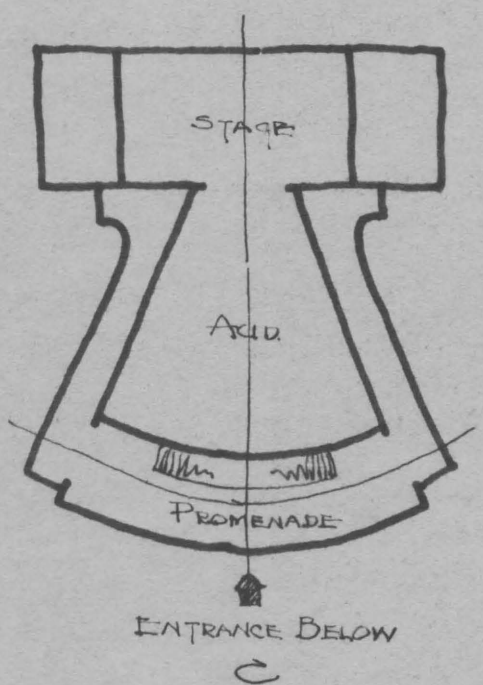

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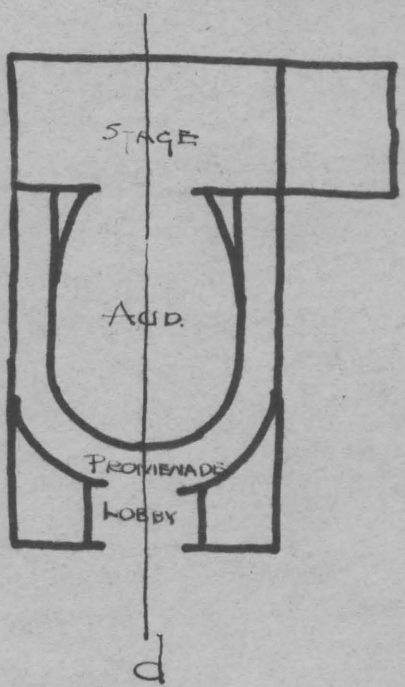

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SKETCHS OF PARTIS

(NOT TO SCALE)

In discussing the final solution I will take up each part of the theatre separately; that is, the auditorium, the stage and lighting circulation units and then the study of the exterior, and the economics of the whole project.

The Auditorium

In designing the arrangement of seats two factors had to be considered; one, good sight lines, and two, the building code. The only code which was available was the revised New York City code, so this was adopted for use.

This code requires an increasing back-to-back distance of seating rows as the length of the row increases. The exact distance is found in inches by the following formula:

$$x = 40" + \frac{y \text{ (in feet)}}{5}$$

where x = distance back-to-back of rows

y = length of row from the two outside seats.

In the final design the maximum distance, y, is seventy feet, resulting in a required distance of fifty-four inches. As the auditorium narrows towards the front, this distance is reduced to forty-nine inches between the first and second rows. Leaving a distance of five feet between the front row and the forestage, the total depth of the auditorium becomes approximately eighty feet. This is satisfactory for good acoustics. A greater distance than this, though, would be unsatisfactory since the human voice tends to become ineffective at auditorium depths greater than eighty feet.

To gain good sight lines in the vertical plane the following formula was used to find the eye level at each row.

$$e_n = \left[\frac{e_1}{d_1} + c\left(\frac{1}{d_1} + \frac{1}{d_2} + \dots\dots\dots\dots \frac{1}{d(n-1)}\right)\right] d_n$$

In which e_1 = eye height of first row spectator.

e_n = eye height of nth row spectator.

d_1 = distance from focal point to first spectator.

d_n = distance from focal point to nth row spectator.

c = rise per row.

I decided upon a rise per row of four inches and chose the point to be seen by all spectators (the focal point) at a distance of sixteen feet back from the curtain line on the floor of the stage. This resulted in the height of the eighteenth or last row of seats being ten feet, nine inches above the first row.

In order to eliminate steps (except in the auditorium from row to row) in reaching the various levels the side aisles were ramped at a rate of one foot in ten feet of length, which is the maximum permitted in good design. By building out the sides of the auditorium to get the extra distance for ramping, the level at each door into the auditorium is reached without the necessity of any steps.

In the horizontal plane no seat was permitted to extend beyond a line thirty degrees with the longitudinal axis, and passing the edge of the proscenium opening. This arrangement allows every spectator a good view of the playing area of the stage.

The centre of curvature of the seating rows was selected at a point about fifty feet back from the curtain line. This was necessary in order that the rear wall of the auditorium would not reflect sound waves to form a point of sound centration. If a centre of curvature had

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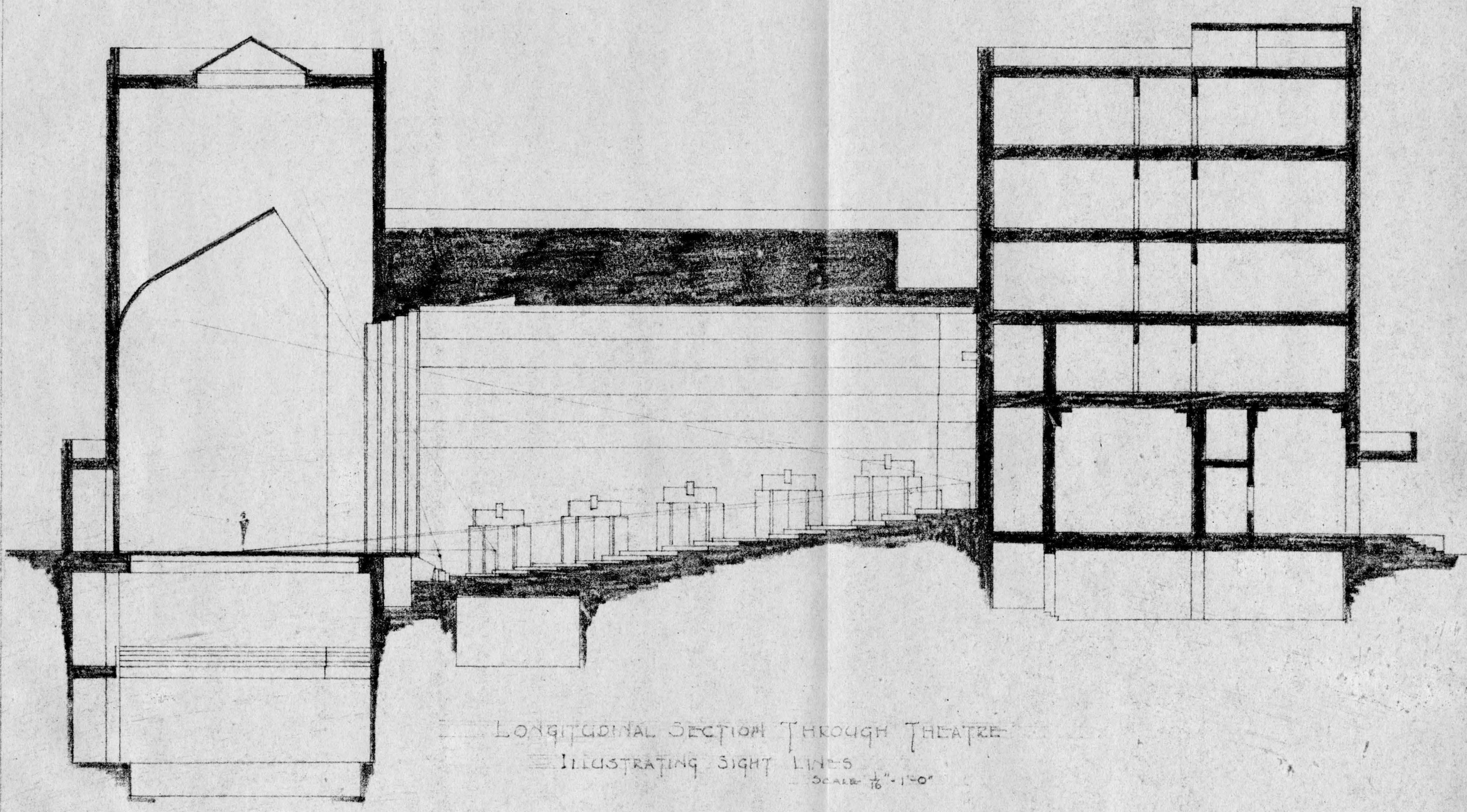
* (This method was prepared for an article in the Architectural Record by Mr. A.B.Randall. See Bibliography, reference No. 3 in Literature Cited



LONGITUDINAL SECTION THROUGH THEATRE
ILLUSTRATING SIGHT LINES
SCALE 1/16" - 1'-0"

been selected at some point on the stage, sound waves originating at this point would reflect from the rear wall directly back to this source.

After studying the subject of acoustics, I found that in a small auditorium a flat ceiling is least likely to result in poor sound transmission, so this type was used. The side walls were stepped inward as they rise so that concealed lighting can be placed under the projections. Three light troughs are placed on the ceiling, extending from the rear of the auditorium to the front and back again, following the curve of the side walls.

A recess extends across the ceiling in front of the stage to take care of the beam lights. These are spotlights that are used when the actor moves out on the forestage. Provision is also had for spotlights in a booth at the rear of the auditorium on a level with the first floor of offices. In case the theatre should need to be used for movies, this room can serve as a projection booth.

The Stage

The area of the stage floor was made as small as possible as permitted in good design. This was done in an attempt to keep the cubic area of the building as low as possible. The height of the stage house was set by the height of the proscenium opening as it was necessary to have sufficient room for carrying the asbestos curtain up out of view from the auditorium.

The stage proper is built like a great vault and kept as clear as possible; stairs, ladders, galleries, and doors are kept at a minimum. This is necessary because there is little room for such when the

scenery is set and the great mass of ropes, drops, and lighting equipment is introduced.

The stage is to be equipped with a combination sliding and raising machinery for the changing of sets. This consists of three elevator sections, each carrying a wagon stage which can be rolled off the elevator in the basement and another rolled on. Theoretically, this is probably the finest and most practicable stage in existence. The reason we find no such equipment in America is the cost; no theatre seems to be heavily enough endowed to afford this initial expense.

The stage is equipped with a Kuppelhorizont or skydome. This is a great oval dome at the back of the stage, made of concrete and given a hard plaster finish. With this dome all sorts of strange and beautiful things can be done. Skies, landscapes, mountains, and different panarama may be painted upon it. Effects of great distance may be obtained or clouds portrayed by means of stereopticons playing from bridges above the proscenium opening. Acoustics determine somewhat the shape of this dome. The radii of all curves are purposely kept short so that reflecting sound waves will not prove troublesome. The lower part of the dome rises and is built into the back wall of the stage above the aisle for cross circulation. The upper part projects out and up into the working space in the flies and is built on a steel framing and hinged so that it may be swung back out of the way.

The forestage is not permanent, since it handicaps a realistic production in which the actors are confined within the limits of the proscenium opening. It is built in removable sections and when removed exposes the orchestra pit. The lighting console is placed in the centre of the orchestra pit on an elevator platform. It can be lowered out of the

way if the whole area of the pit is needed for an orchestra.

The fly galleries are placed on both sides of the stage about level with the top of the proscenium opening. These are used as points of control for the ropes carrying drops, borders, etc. They are built of steel and concrete; the steel being well anchored into the front, side and rear stage walls.

The gridiron or rigging-loft is a platform of steel grating fastened to a channel beam framing , which is hung from the roof framing and anchored into the rear wall. Over the playing portion of the stage there are slots in the gridiron ten inches wide running the entire depth of the stage, perpendicular to the curtain line.

The roof is pierced directly over the centre of the stage to admit a large skylight (a misnomer in this case as light is not desirable on a stage - the glass is not translucent) the size of one-tenth the area of the stage. This skylight is equipped with vents operated from the stage level and equipped with fusible links. Further fire protection is had by the installation of a sprinkler system.

Lighting the Stage

The general lighting system of the stage will consist of lighting from the sides and overhead; the side lighting being done behind the proscenium by spotlights clamped to an upright metal pipe and running about twenty-four feet. Fifteen photolamps can be placed on each side, angled over the playing area, and their colors changed if need be between acts. From the bridge overhead twenty or more spotlights can be hung and similarly used. These lights are supplemented by spotlights from the ceiling and rear of the auditorium.

In addition the stage has base receptacles known as "stage pockets" which will take care of the stand lamps, used for throwing light through entrances, windows, etc., and for lighting the skydome.

Other Stage Units

The dressing rooms and the shops were kept as separate from the stage proper as possible; this for fire protection reasons. The walls separating them from the stage are fire walls and all openings are equipped with automatically closing firedoors.

The individual dressing rooms on the stage level are for a quick-change between the acts and for the use of visiting stars. The two group dressing rooms are for the use of the regular theatre troup. Each has accommodations for fifteen actors or actresses. All dressing rooms are equipped with make-up tables with mirrors, full-length mirrors, lockers, wardrobes, drawers, toilets, and baths.

The wardrobe department consists of two rooms, one for the making of clothes and another for their storage. The sewing room has a space partitioned off as a fitting room, and is provided with closets in which to hang clothes in the process of being made.

The property department is a combination scene dock and property room. It includes a shop for the making of furniture, papier-mache, and pther property work, and a current production storage room.

The work shop for the making and repairing of scenery is located on level with the stage pit or lower stage wagon level. It is lighted by means of a glass block ceiling. Service is had from a large hydraulic elevator.

Other Theatre Units

Other Theatre Units

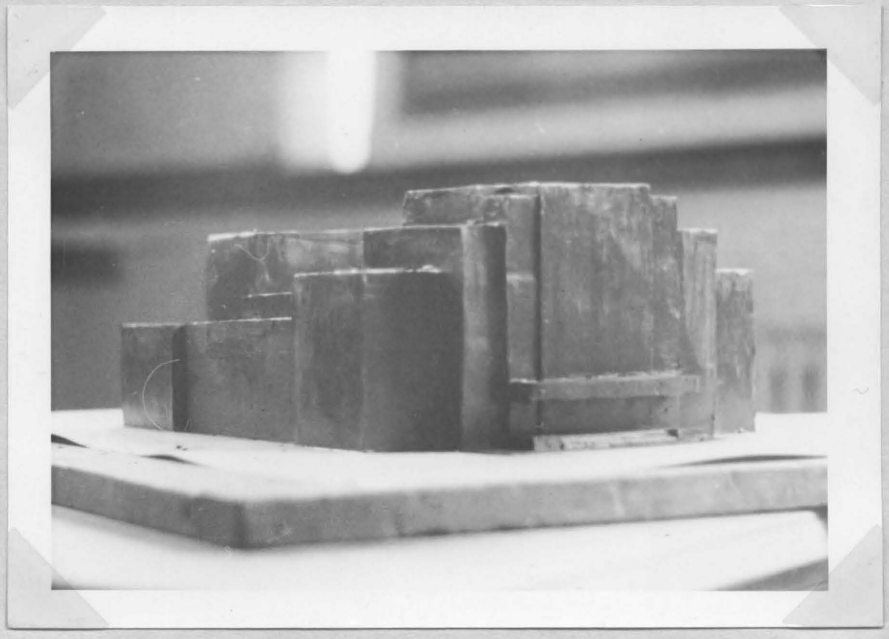
The theatre circulation units consist of a lobby, foyer, and two promenades connected with the large aisles at the side of the auditorium. The aisles might be considered as promenades except that the clientele of the theatre might not wish to loiter on the inclined floor.

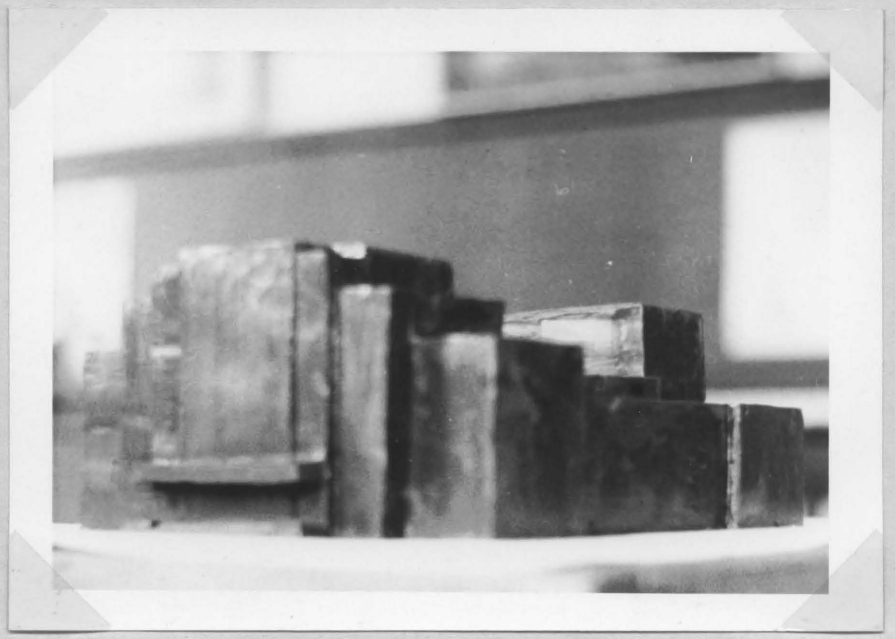
The lounge is located in the basement directly under the foyer and was made as large as the space would allow. Here are located the men's and women's rooms. Both sexes congregate here during the intermissions and chat, smoke or read.

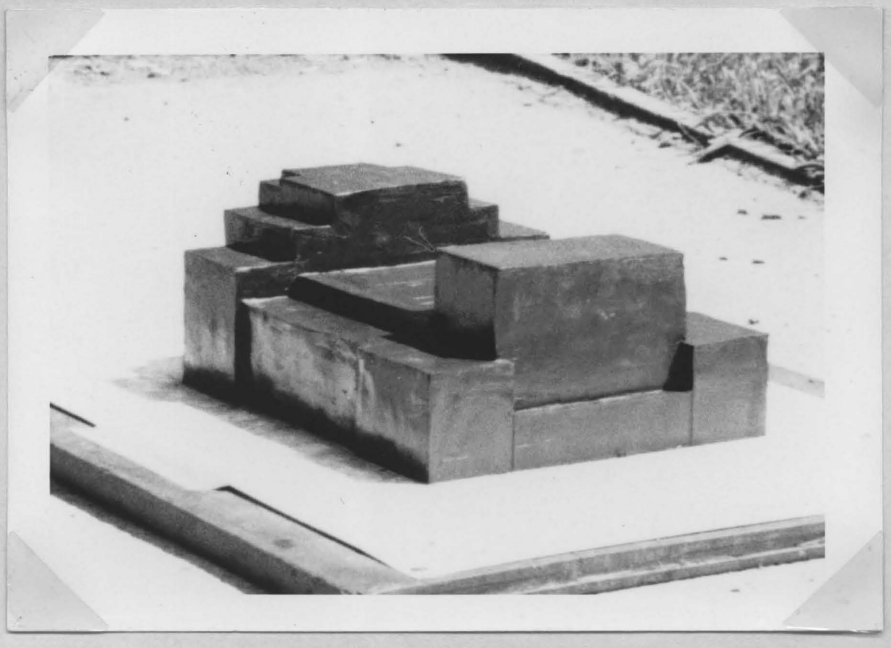
The rentable area of the structure commences on the second floor and is served by two entrances separate altogether from the theatre. All of the space on this floor (except for the lighting booth) and above is used for offices and studies. About 13,000 square feet are available for the actual rentable area and this furnishes an added gross income to the theatre of about $16,000 annually.

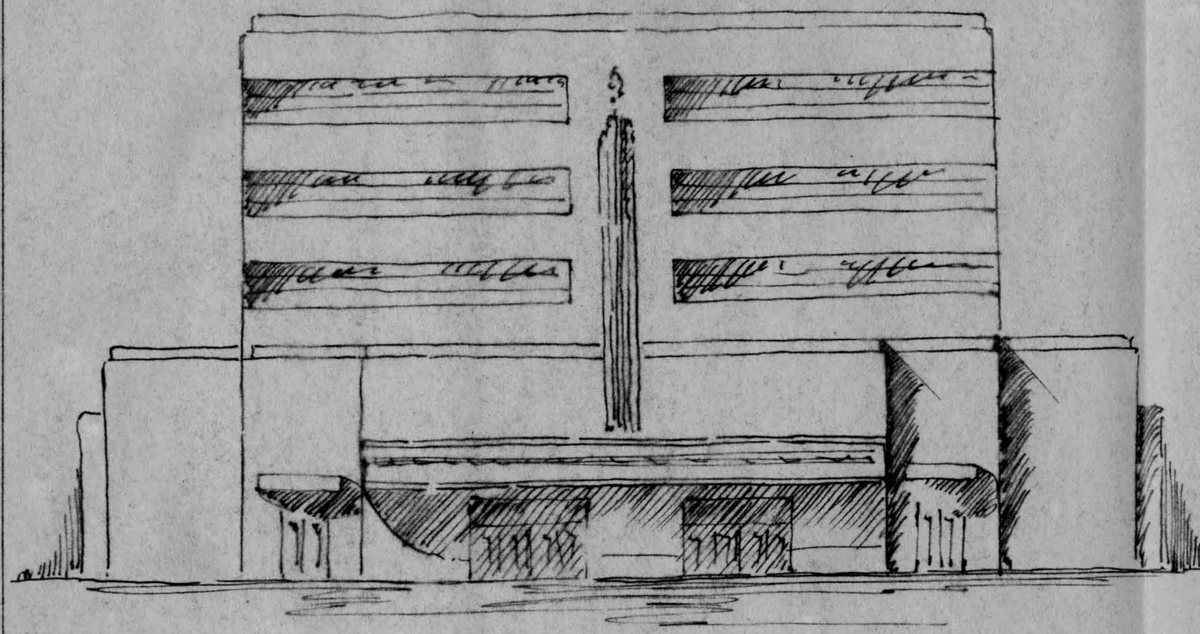
Exterior Treatment

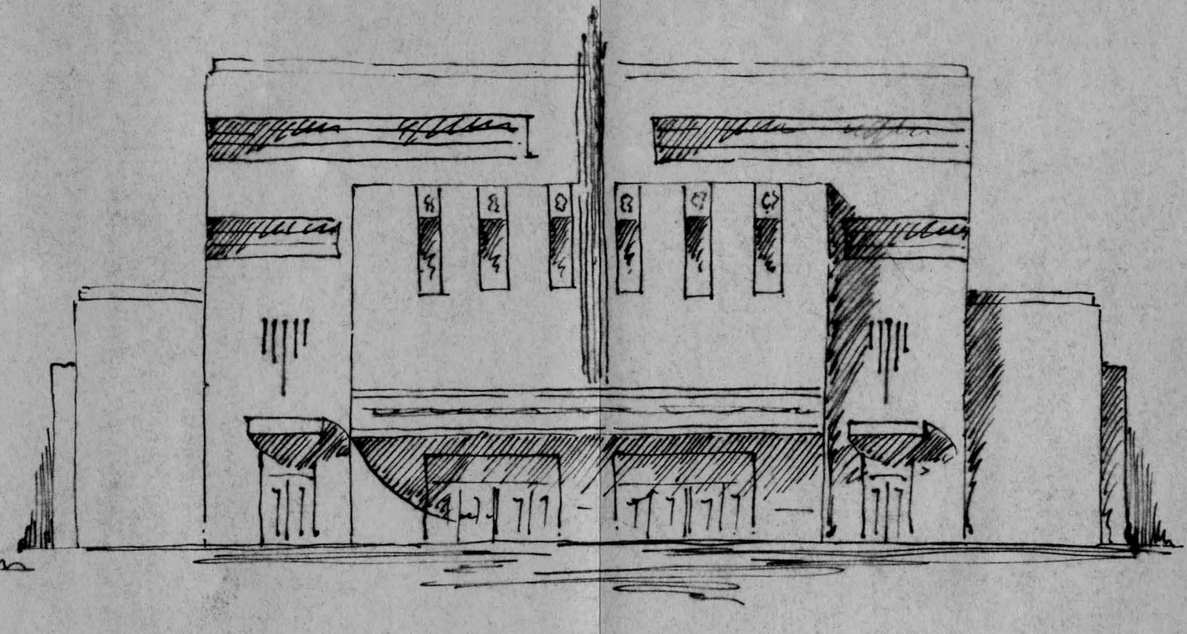
In a structure housing a theatre alone a designer has more real freedom in designing the exterior than most any other type of building - except monumental works - as there are no perforations to speak of, except in the rear, in the dressing room wings. The necessity for office space put a different light on the subject, though, in this particular design. I thought at first that the offices should be set off definitely from the theatre by some means, such as a set-back or separate tower. Various schemes were worked out and studied in elevation and in mass (by use of models) with this in mind, but a satisfactory solution was not discovered. I finally decided that since the building was primarily a theatre, there was no particularly logical basis for my original theory and that the offices could quite logically be incorporated as part of the theatre building.



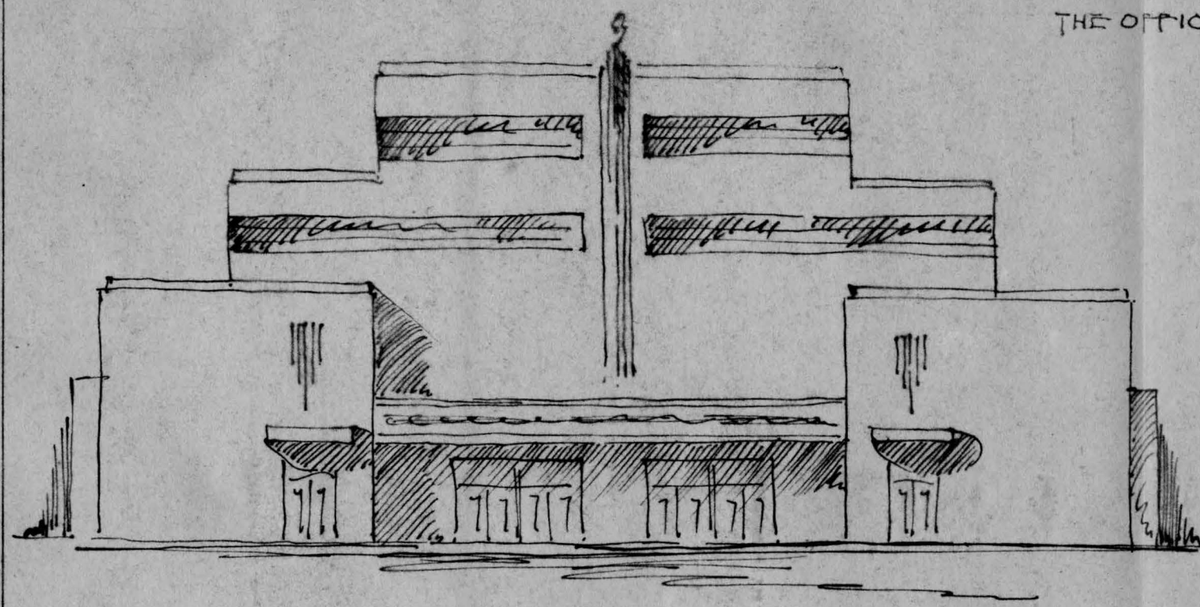


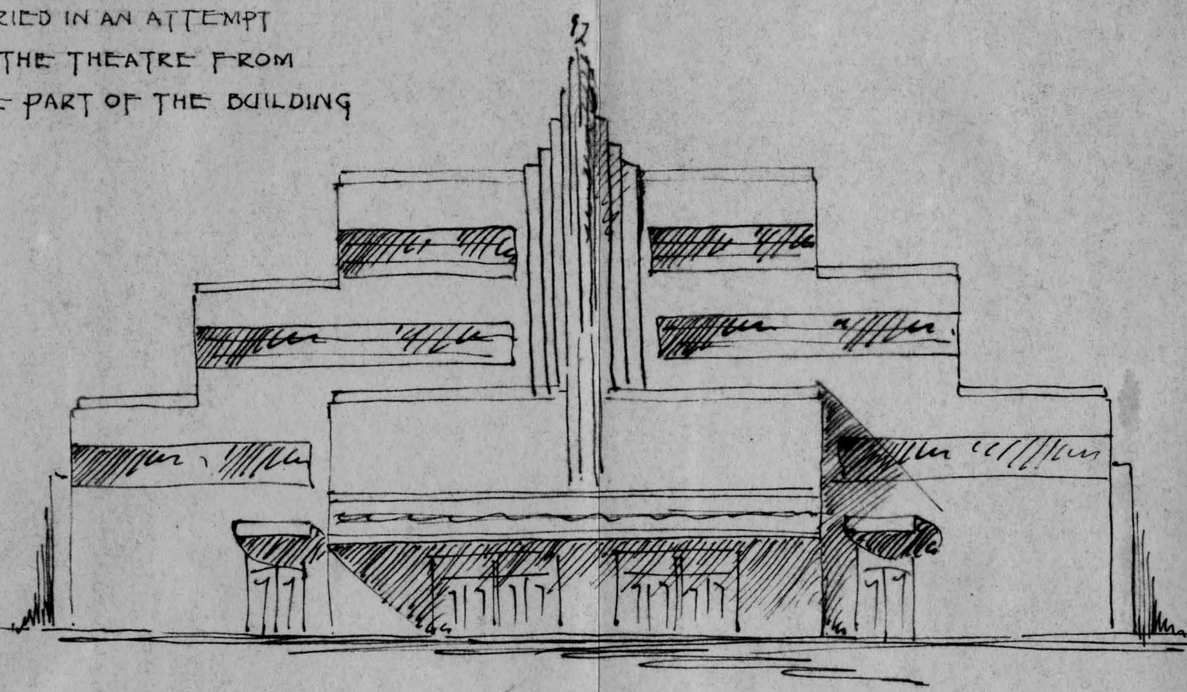






SKETCHS SHOWING SOME OF
THE SCHEMES TRIED IN AN ATTEMPT
TO SEPARATE THE THEATRE FROM
THE OFFICE PART OF THE BUILDING





This change simplified the mass a great deal and resulted in a more straightforward design. The accompanying drawing shows some of the schemes tried in an attempt to incorporate a set back over the lobby.

The mass proportions of the theatre are located frankly in accordance with the plan. This includes three parts: first, the main facade incorporating the office floors; secondly, the auditorium; and thirdly, the stage loft. It was difficult to work this latter into the composition of the rest of the building as it is only a huge box and would not bear much changing of shape. It reared up in the back of the design and, in the first studies, conflicted definitely with the mass in front housing the offices. In the final solution it was reduced to a minimum in height in order to lessen this conflict.

Another difficulty encountered was the means of treating the centre portion of the main facade. It was necessary to tie in the pent houses over the elevator shafts with the rest of the mass. The final solution shows the centre window treatment carried up above the roof and a flat slab extending from it and tying into these pent houses.

Heating and Ventilation

The air-conditioning apparatus is located in the basement and is composed of the following machinery: blower, air-warming apparatus, and, air washing and purifying machinery. In the winter the air is drawn through a grille located above the roof, and a portion of it is circulated again in order to save on fuel consumption. In the summer all the air is taken from the outside.

The system of ventilation to be used in the auditorium consists of projecting the conditioned air horizontally into the auditorium near the

ceiling. Moving down, the air absorbs outer heat transmitted through the walls and the roof and the heat emitted by the occupants, and finally reaches the desired temperature and humidity before it strikes the seated persons. The air is then removed through exhaust outlets on the floor. The moving force of the inlet fans makes the upward effect of the heat from the people negligible.

Economics

Practically all additions and assumptions made to the actual requirements of a theatre for the Kanawha Players were necessitated by the economics of the completed project. Some assumptions were necessary because the design would prove uneconomical in relation to the present setup in Charleston, and others because of incomplete knowledge of the actual conditions; such as, land costs, construction costs, etc.

The following assumptions were made:

1. That it would be possible to obtain the assumed site for a sum of $100,000 clear, without any brokerage commissions, demolition costs, etc.

2. That the construction costs of the theatre would amount to thirty cents per cubic foot. This figure was decided upon after a comparison of theatre costs in similar projects already built. These costs were obtained at a 1933 basis.

   * Cleveland Playhouse, Cleveland, Ohio. .308 per cu.ft.
   Little Theatre, New York City .3572 " " "
   Community Playhouse, Pasadena, Cal. .4028 " " "
   Civic Auditorium, Kalamazoo, Mich. .2433 " " "

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* These figures were obtained from an article in the Theatre Arts Monthly, Vol. 18, page 709, for Sept., 1934)

After a study of these and other costs, considering the relative sizes of the buildings, the type and grade of construction and the geographical location, a thirty cent figure was decided upon. By using Boeckh's * index system, this 1933 cost was related to 1936 costs and to the Atlanta Area and was found to be only a fraction over thirty cents.
The total cost of constructing the office part of the structure was assumed to be forty-four cents per cubic foot. This figure was taken directly from Boekkh's Manual of appraisals.
The cost of equipment was assumed after reference to costs in other theatres.

3. That a minimum of 5000 people see each play offered by the little theatre group instead of the present 2000.

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* E. H. Boeckh's Manual of Appraisals, published by the Rough Notes Co., Inc. Copyright, 1937.

FINANCIAL SET-UP

Land Costs ----------	$100,000
Construction Costs	
Theatre	
Building (30¢ per cu. ft. on 1,168,245 cu. ft.)	$350,475
Stage Equipment	75,000
All Electrical Work	12,000
Lighting Fixtures	8,000
Switchboard	10,000
Heating & Ventilating	10,000
Auditorium Chairs	5,697
Furniture & Decoration	4,000
	$467,172
Commercial (44¢ per cu. ft. on 306,352 cu. ft.)	$135,657
	$604,847
Architect's Fee (5% on above total)	$ 30,243
Total Cost of Construction----------	$635,090
Financing Costs	
Bond Issue $540,000	
Cash Equity $218,133	
Taxes During Construction (Time nine months)	
Land --- (100,000 X .75 X 70%) .0275= $1443	
Building ((485,600/2) .75 X 70%).0275= $3700	
Tax Refunds (27,000 X 2%) + (540,000 X .004)= $2700	$ 2,443
Interest (5% on $540,000)= $27,000	
Less 4% on deposited monies -- $6400	20,600
Total Financing Costs ----------	$ 23,043
Total Land, Building & Financing Costs -------	$758,133
Theatre Overhead	
Mortgage Interest (5%)	$ 27,000
Interest on Money In vested(5%)	10,905
Amortization (3% on bond)	16,200
Taxes	9,000
Insurance	796
Total Theatre Overhead ----------	$ 63,711

Commercial In come		
Office Rent ($1.25 per sq. ft. per year)	$ 16,250	
Operating Costs (30¢ per sq. ft.)		$ 3,900
Net Commercial Income	$ 12,350	
Theatre Income		
Little Theatre		
Seats in House — 633		
House Scale — $ 1.11		
129 - $ 1.50 Seats		
285 - $ 1.00 Seats		
299 - $ 0.75 Seats		
Attendance per Day — 500		
Number Days per Year — 80		
Income From Theatre	$ 44,400	
Production Costs		$ 5,000
Other Income Form Theatre (Rent, Professional Plays, Etc.)	$ 20,000	
Total Income From Project	$ 71,750	
Theatre Overhead		$ 63,711
Operating Costs		7,500
		$ 71,211
Profit	$ 539	

Conclusions

It can readily be seen that such a project as I have designed would not be economical as applied to the present set-up in Charleston, but, such a theatre could very easily prove practical for a more developed theatre group such as the Provincetown Players, or the Cleveland Playhouse, or the Guild Theatre in New York, and many others not as well financially endowed.

IV FINAL SUMMARY

Most so-called modern theatres are merely surface applications of modernistic architectural idioms to basically old-fashioned theatre structures. The fault appears to result from the theatre organizations' inability to bring their ideals to a starting point for a distinctive or positive design.

Our new theatres will probably involve more than an auditorium and stage proper because they tend to be centres of community life. The foyers and circulation space will be far more important than they are in most theatres today where they serve simply as a space to wait for a taxicab. Theatre planning in the near future will probably become not only sounder in its technical basis but more significant in architectural design as well.

When a firstrate theatre is finally built in New York the death knell of the old stage mechanics in America will be sounded. If a theatre as well equipped backstage as the Dresden Court Theatre, and provided with a wide auditorium, with no aisles and no balconies, with a strongly raked floor, and accommodation for a thousand people, were put in the hands of the Theatre Guild - with their present ability to make money on the most artistic plays - the commercial theatre would receive a lasting shock. The Broadway stage, as we know it today, would fall into the dusty limbo which envelopes gas lighting and histrionic acting.

BIBLIOGRAPHY

Literature Cited

1. "Proposed Theatre Building Code, New York City"
American Architect, Vol. 148, page 63, April

2. Boeckh's, Manual of Appraisals
Published by The Rough Notes Co., copyright 1937

3. Davison, Robert L., "Procedure in designing a Theatre"
Architectural Record, Vol. 67, page 457, May 1930

4. Morin, Roi L., "Design and Construction of Theatres"
American Architect (Architectural Library, no date listed)

5. Simonson, Lee, " Some A. B. C's of Theatre Architecture"
Architectural Record, Vol. 67, page 447, May 1930

6. "Theatre Types"
Theatre Arts Monthly, Vol. 18, page 709, Sept. 1934

Literature Examined

1. Architectural Forum, Vol. 55, page 493
"Description of Controled Color Lighting, etc."

2. Berry, "Stage Equipment and Lighting"
Architectural Forum, Vol. 52, page 605

3. Bragdon, Claude, "Technique of Theatrical Production"
Architectural Record, Vol. 66, page 109

4. Cheney, "New World Architecture"
Tudor Publishing Co., copyright 1930, pages 348 - 364

5. Edgell, "American Architecture of Today"
Charles Scribner's Sons, copyright 1928

6. Friend, "How to Design an Auditorium"
American Architect, Vol. 138, page 50, Sept. 1930

7. Friend, "Acoustics of Full and Empty Auditoriums"
American Architect, Vol. 141, page 34, Feb. 1932

8. Geddes, Norman Bel, "Horizons"
Little, Brown and Co., copyright 1932

9. Harmon, "Architecture of the New Theatre"
Theatre Arts Monthly, Feb. 1936

10. Knudsen, "Architectural Acoustics"
John Wiley and Sons, copyright 1932

11. Lescaze, William, "Letters From an Architect to His Client"
Theatre Arts Monthly, Vol. 18, page 684, Sept. 1934

12. Lonberg-Holm, "New Theatre Architecture in Europe"
Architectural Record, Vol. 67, page 490, 1930

13. Osswald, "Acoustics of the League of Nations Assembly Hall"
American Architect, Dec. 20, 1928

14. Powell, "Exterior Illumination of Buildings"
American Architect, Vol. 147, page 60 July 1935

15. Sabine, Paul, "Architectural Acoustics"
American Architect, Vol. 135, page 745, June 5

16. Sexton, "American Theatres of Today"
Architectural Book Publishing Co., copyright 1930

17. Shay, "The Practical Theatre"
Copyright 1926

18. Stepanov, "New Russian Theatres"
Theatre Arts Monthly, Vol. 18, page 674, Sept. 1934

19. Watson, "Acoustics of Buildings"
John Wiley and Sons, Inc., copyright 1930

20. Woltersdorf, "Theatre Planning - Here and There"
American Architect, Vol. 132, page 211, Aug. 20, 1927

DN
CLP
CLP
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DRESSING ROOM
TOILET
DRESSING ROOM
TOILET
LOCKER ROOM
CL
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PROPERTY ROOM
CL
CL
CL
STORAGE
STORAGE
STORAGE
CLOSETS
CLOSET
DOWN
CHECK ROOM
DOWN
CLOAK ROOM
PROMENADE
FOYER
PROMENADE
LOBBY
DN
CLP
BOX OFFICE
LOBBY
DN
CLP
LOBBY
FIRST FLOOR PLAN
SCALE: 1/16 INCH EQUAL TO A FOOT

DN

Clp

GALLERY

Clp

DN

SERVICE ENTRANCE

WORK SPACE

ELEVATOR SINK

ORCHESTRA PIT

MUSICIAN'S ROOM

MACHINERY

STORAGE

HEATING PLANT

ELECTRICIAN'S ROOM

FUEL ROOM

UP TO FOYER

AIR CONDITIONING PLANT

STORAGE

LOUNGE

MEN'S ROOM

TOILET

POWD. ROOM

TOILET

STORAGE

LOBBY

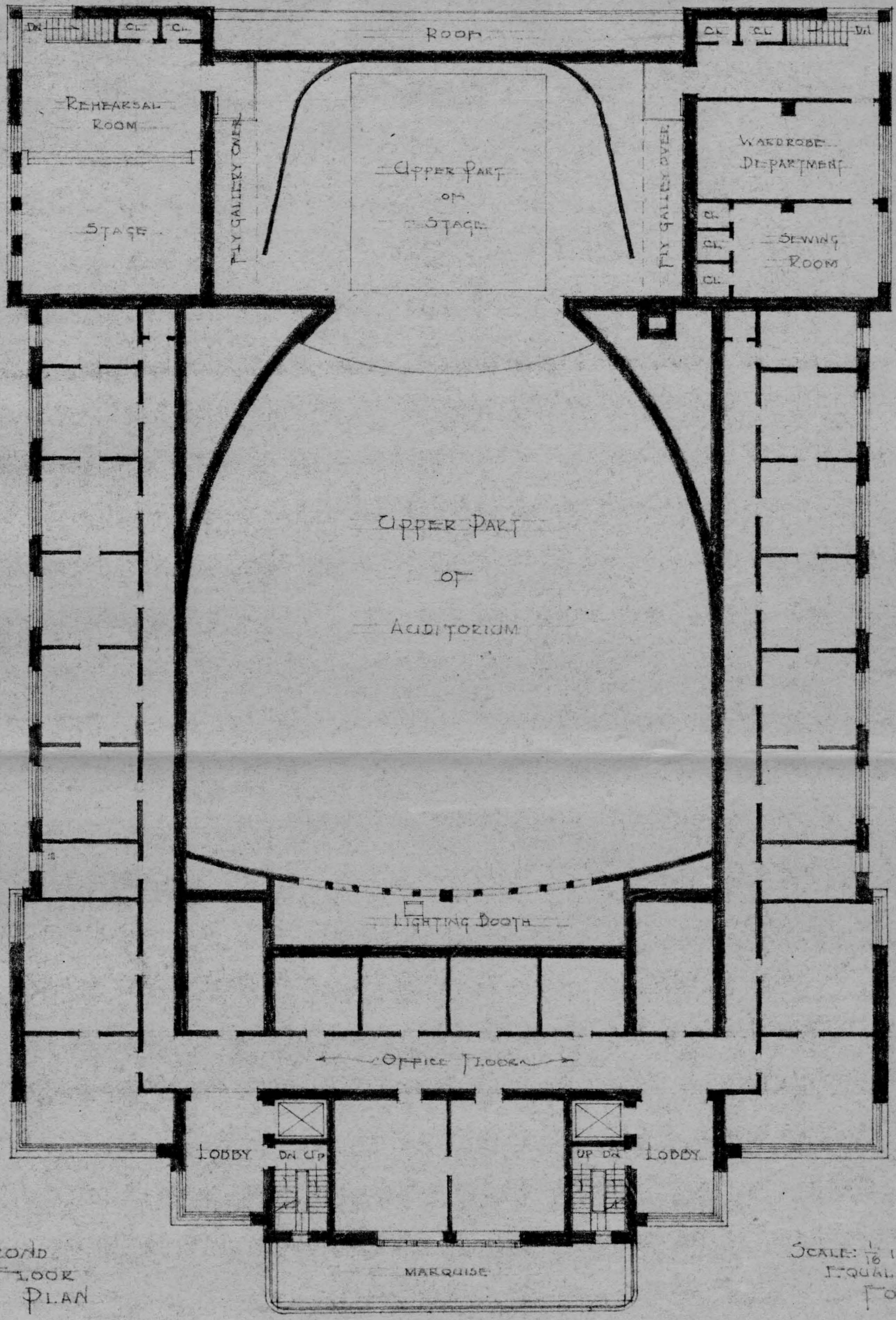
Up

Up

LOBBY

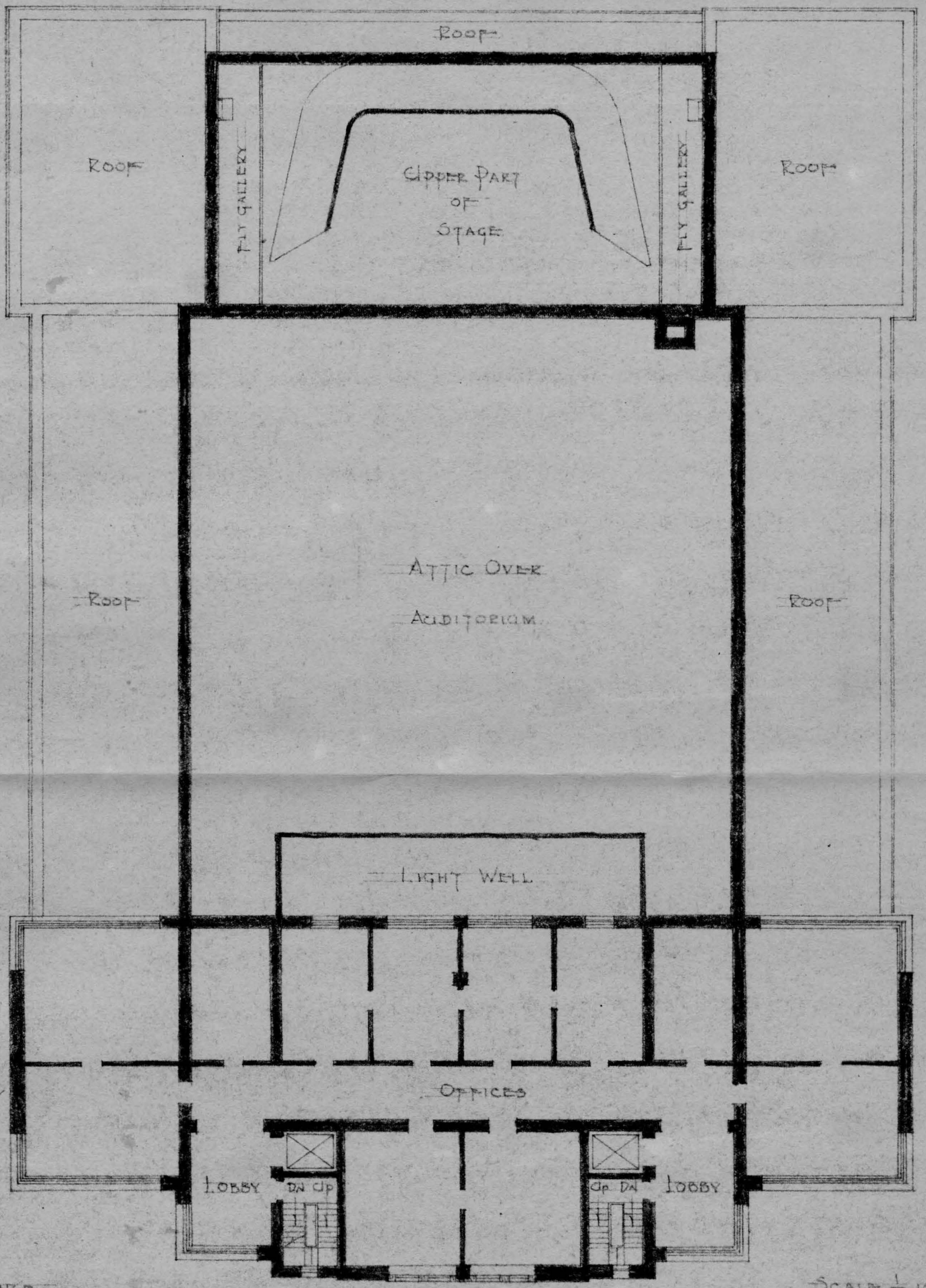
BASEMENT FLOOR PLAN

SCALE: 1/16 INCH EQUAL TO A FOOT



SECOND FLOOR PLAN

SCALE: 1/16 INCH EQUAL TO A FOOT



Third Floor Plan

Scale 1/16 inch equal to a foot

Roof

Roof

Upper Part of Stage

Roof

Roof

Roof

Roof

Dn

Up

Upper Part of Property Room

Storage

Second Floor Plan of Stage

Up

Dn

Cl

Dressing Room

Toilet

Cl

Dressing Room

Toilet

Roof

Roof

Roof

Offices

Lobby

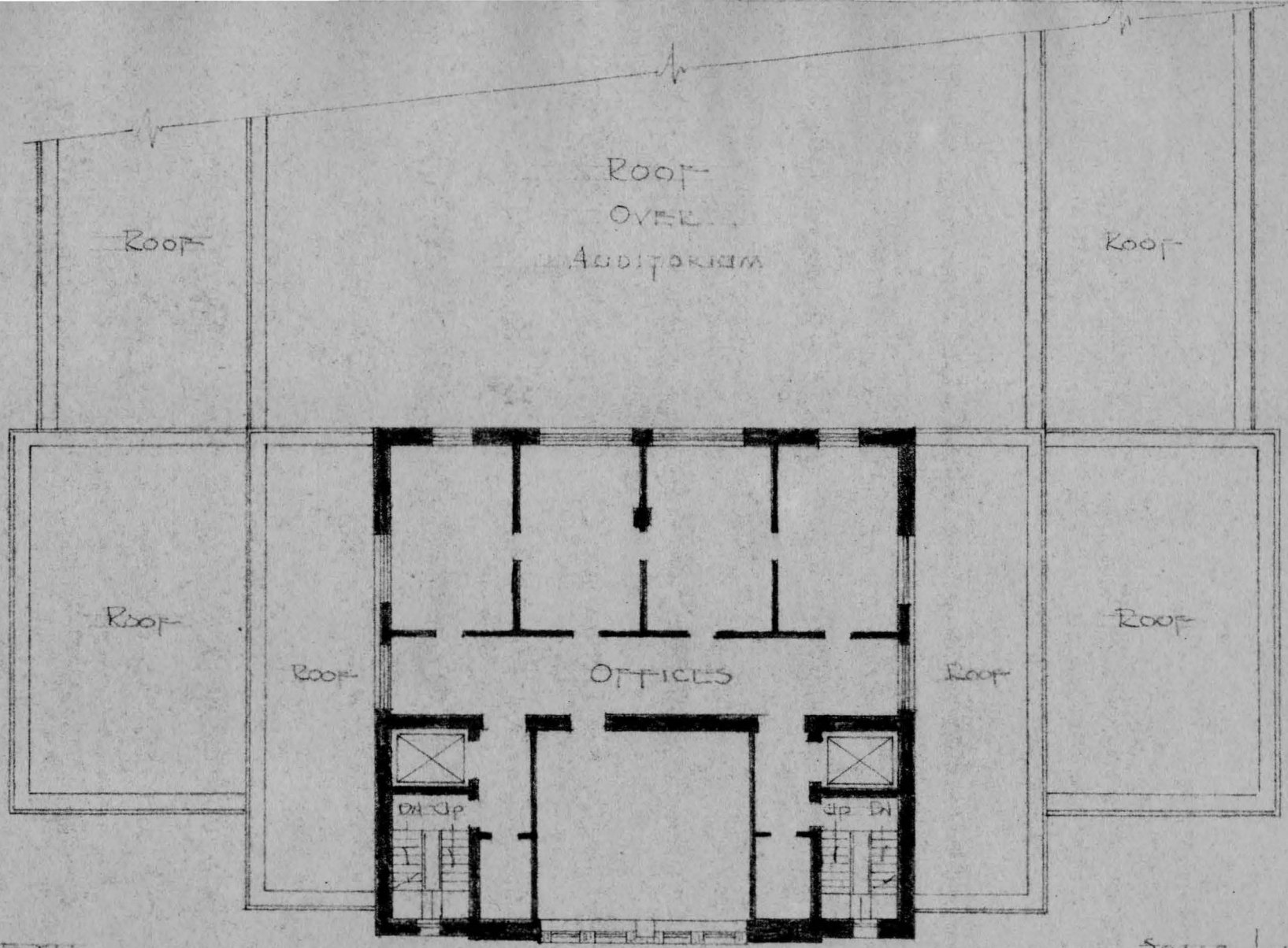
Dn Up

Up Dn

Lobby

Forth Floor Plan

Scale 1/16 inch equal to a foot



Fifth Floor Plan

Scale 1/16 inch equal to a foot