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FOREWORD

TO THOSE who plan and construct buildings, they are living things possessing individual character and expression. Their personality is as varied as that of humans. They utter a voiceless message that is clear to us who would listen and endeavor to understand. But like us humans, they can have form and substance and be without life—like the statue of supreme beauty, a thing of lifeless marble, or as an embalmed cadaver.

The building is finished, equipped and furnished. It stands in all its beauty and strength, a thing of dignity and simplicity and yet intimate and engaging where appropriate. But it is without voice and life. Those organs that constitute life are not functioning. It is not habitable. And yet it has all of the elements of life.

When the boiler is fired and steam generated, the power generators in turn activate the motors—then is felt the quickening pulse of life. Heat and light are born to make brightness and warmth; frigidity is made to serve our needs; absent friends talk to us; we listen to the word, the song and the music from far places; we are elevated to high places without effort; food is prepared and served to satisfy us; cleanliness is everywhere; food and shelter make life possible and desirable.

All of these elements of life are hidden from us—to most of us they are not attractive. Perhaps they are uncouth, crude and barbarous looking things—noisy and ill-smelling. Or they may be things that revolve with incredible speed—silent, shapely and beautiful. Some of the parts move, open or close without the intervention of man. They do this to serve the needs of the moment, do this automatically even as some of our parts do without effort or direction. All are as well balanced, proportioned and harmonious as are the life giving elements of a normal man. From them radiates all that vast network of pipe

and wire that circulates life to the remotest parts.

What constitutes the analogy? The huge, ungraceful, hot and greedy furnace and boiler is the source of all this life. The pulsations of the generator are as the heart from which flows the life giving currents that energize the structure even as the life blood in the arterial system energizes the human body. Those hidden wires are as nerves bearing messages from one part to another, activating those organs and things that otherwise would be lifeless.

To those of us who have learned the unspoken language of the building that lives, these things are a source of wonder and beauty because they serve—serve faithfully without evasion, serve in fullness of power and when well cared for they sing of power, joyousness and constancy in harmony with themselves and those who are fit for their service.

Even as we care for and maintain those parts of our bodies that make normal living possible, we should care for those similar parts of the correctly constructed building so that it may have a normal life and serve us as well. To do this, these parts must have room in which to do their work, for they do work. And in working they expand and contract, push and pull, raise and lower, all under tremendous strain and stress. We never hear them complain except when we neglect them; then they speak in an unmistakable language that is plain to the ear that is properly attuned.

With these things in mind and having an appreciative understanding, why do we relegate them to improper quarters, engage in false economies in vital and minor parts, leave untended to hasten decay—these things that serve well and faithfully to their utmost?

That you may better know them, the following pages are presented to you.

The MECHANICAL EQUIPMENT of HOTELS

Its Relationship to the Total Cost of the Building

BY F. S. MARLOW, Architect, S. W. Straus & Co.

DO architects as a whole appreciate the relative importance and cost of the mechanical work for plumbing, heating, ventilating, electric wiring, laundry equipment, etc., in investment buildings? The majority undoubtedly do, but apparently only a few give it the office attention its initial cost justifies or its ultimate importance makes imperative.

Architects fully realize the importance and value of the steel framing and, as a rule, give it proper attention. Yet the plumbing installation, the elevator equipment or the ventilating system seldom receive their share of his attention and are usually accepted as recommended by the individual contractor. It is not expected that an architect should have the knowledge necessary to cope with the details of specialty problems but it is essential that he should know the relative costs, values, and importance of the principal equipment in order to complete his store of information indispensable to an efficient development of all investment projects.

The analyses of many different types of buildings develop startling figures as to the importance and cost of mechanical equipment when compared with those of other necessary parts. We find this equipment responsible for 20% to 35% of the total net cost of many modern fireproof investment buildings such as lofts, offices, apartments and hotels. Naturally, the individual item cost varies for each type and class but the fact to be realized is that the total percentage in any case is much greater than many seem to appreciate.

Consider these facts. The plumbing in the average modern fireproof hotel will cost approximately the same as the steel frame. The heating and ventilating equipment for this building will just about equal in cost the face brick curtain walls having a fair share of limestone ornamentation. The interior marble work will hardly exceed the cost of electric wiring, nor will the interior doors, trim, etc., exceed the cost of an efficient elevator installation. The equipment for the kitchen and laundry will demand a greater expenditure than a normal amount of sheet metal work.

The following table presents the low and high percentages of net cost for mechanical equipment for several hotels. Naturally, none conform in detail to the low or high list. For example, a hotel only a few stories high with a bath for every room will be high in plumbing but low in elevator cost. Much of the equipment depends upon the class of hotel under consideration. However, the table

presents general averages that should impress us with the importance and cost of the mechanical equipment when compared with the other material required in their construction.

Plumbing	7.0% to 11.0%
Heating and ventilating	5.0% " 9.0%
Electric wiring and fixtures	3.0% " 4.0%
Elevators	3.0% " 5.5%
Refrigerating Plant	.5% " 1.2%
Laundry Equipment	.2% " .3%
Kitchen Equipment	.3% " .5%
Finishing Hardware	1.0% " 1.5%
Miscellaneous	0.0% " 2.0%
	20.0 " 35.0%

While the above table is compiled from hotel data, analyses of relative cost of other types of investment buildings produce equally impressive results. It is a poorly equipped and an inferior class of office, loft or apartment buildings which shows mechanical equipment costing less than 18% of the net cost of all labor, material and equipment. Subnormal equipment very often nullifies the value of other superior qualities and generally reacts harmfully on both rental value and operating expense. The saving of 1% in building cost by the installation of an inferior elevator equipment or an inadequate service may prove not only expensive in annual operation but may easily lower the income. Immediately upon the completion of buildings of every type there is daily evidence that the equipment directly affects both the operating cost and the building's reputation.

As a rule, so much time is spent on plans and architectural design without any preliminary consideration for the equipment installation that often investors are actually proceeding with their operation without adequate facts concerning their equipment requirements. When we consider that this equipment, unlike much of the other material used, is constantly affected by use and that its maintenance and operation absorb a large percentage of the annual operating cost, we should be doubly impressed with its value and its relation to the ultimate worth of the building.

While the architect's efficiency in planning may produce the estimated gross income, his apathy in dealing with the mechanical equipment may not only increase the initial cost but also the expense of operation and thus to a greater extent than is usually appreciated, tend to decrease the otherwise satisfactory ratio of income to cost.

ELECTRICAL EQUIPMENT *for* MODERN HOTELS

BY OTTO E. GOLDSCHMIDT*

THE rapid progress in the development of electrical equipment is naturally taken up by our modern hotels and now requires a most careful study to insure the equipment meeting the special demands of the hotel service. The electric wiring equipment for light and power service pertaining to our modern fireproof hotels is therefore of particular interest.

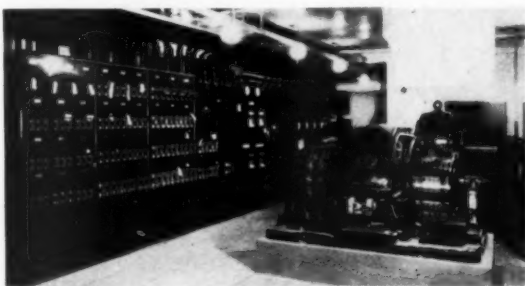
The current supply for a modern hotel is one of the first problems that should be given consideration. There are generally two sources, that is, either the current is obtained from some power company and the current is paid for on a meter rate or a generating plant is installed in the building itself for producing the electric power. The advantages of either one of these systems are entirely dependent upon local conditions and vary with almost every hotel operation. The cost of current supplied by the local power

company is, of course, the basic factor. The size of the hotel is also a very important factor. The dependability of outside supply, the cost of coal and labor, the possibility of using exhaust steam for heating during the winter months and for producing hot water throughout the year are all important factors which enter into the consideration of this problem and very careful study must be given each to arrive at a correct final analysis. As a general proposition there is no building which lends itself so favorably to an electric generating plant as a hotel, principally owing to the fact that all or at least a considerable amount of the exhaust steam can be utilized throughout the year for which, without a generating plant, live steam would have to be furnished. During such periods when all the exhaust steam is utilized the electric power is really a by-product. In some localities a very satisfactory arrangement has been worked out where the hotel was able to purchase its electric power during the summer months and to generate its own power during the winter months when all exhaust steam can be utilized for heating purposes. The necessity of a break-down service, where a power plant is installed, is now not considered essential as with reasonable care by the operating

force there should be no occasion for a shut-down of any kind in the generating plant. Where current is supplied from hydro-electric plants and the power is transmitted by overhead lines an occasional shutting off is unavoidable especially during the summer months while electrical storms prevail as lightning frequently strikes the wire and poles and causes power to be shut off for periods from a few minutes to several hours.

Where the service is taken from some outside source the system of electric light and power wiring as now usually installed consists of the

necessary service mains from the street which are brought in to a main distribution switchboard. When the current supply is 220 volts, 3 wire, direct current, is carried directly to this main switchboard and distributed from the same by feeders to the various panelboards for light and power distribution.



Main Switchboard, Hotel Statler, Buffalo, N. Y.

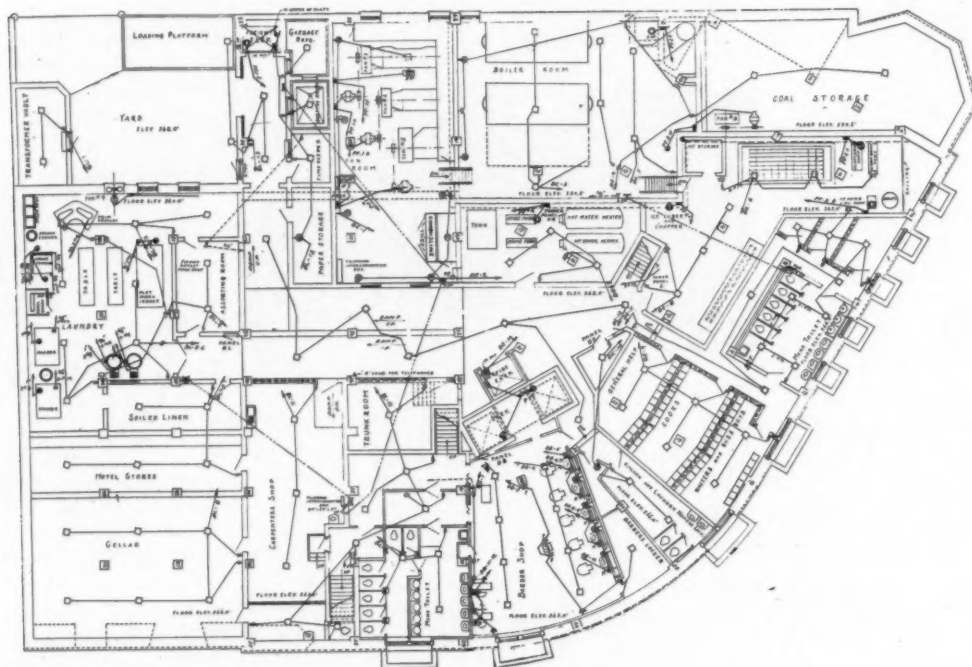
Where the current supply is alternating current, the supply may be brought in in two different ways. If the power company furnishes its own transformers mounted either on a pole or in a street vault the supply is carried in from these transformers at low tension through service mains which are connected into the main distribution board as in the case of direct current supply. If the current supply is brought into the building as high tension current, above 500 volts, it must be transformed in the building itself to low tension current. It is then necessary to provide in the basement of the building or some adjoining separate building a transformer vault in which the various transformers for light and power are placed and in which all the high tension connections are made. The low tension service mains are carried from these transformers to the main switchboard as above described. The selection as to whether the current is to be brought in as high tension or low tension is generally dependent upon the difference in rate at which the local company supplies its power. The high tension current can usually be purchased more cheaply than the low tension but the added first cost of transformers, connections, etc., must be given consideration. The transformer vault must be of fireproof construction, provided with outside ventila-

*Consulting Engineer, New York City.

tion, fitted with a fireproof door and have a suitable floor drain connected to the sewer in order to meet the requirements of the Underwriters' Association.

The main switchboard placed in some convenient point in the basement is usually constructed of slate or marble panels mounted on an angle iron frame set far enough from the wall to give working space behind the board. On the panels are mounted the switches, circuit breakers and instruments to control the distributing feeders to the various panelboards throughout the building. The bus-bars and connections for the feeders are placed on the back of the board and should be worked

the size of the hotel. The number of panel boards to a floor varies with the floor area on the typical floors and with the departments or character and size of the main rooms on the public floors. In the working departments and public floors the panelboards are usually placed in such positions as are most practicable for access and so that the branch runs will not be too long. For the public rooms the locations of panels are again dependent upon the size of the room and the general arrangement of the same. It is usually desirable to have a separate panel for a ballroom, for a main dining room, for a grill room and so on, if these are sufficiently large to warrant the same. These panels



Electric Wiring Plan, Basement, The Niagara, Niagara Falls, N. Y.

out so that there will be no confusion in the arrangement or unnecessary joints. The size of the switchboard, the number of switches, circuit breakers and instruments are dependent upon the size and character of the hotel building and whether the current supply is taken from an outside source or from a generating plant within the building. Where alternating current is supplied to the building and a transformer vault is provided the switchboard can sometimes be placed directly outside of the transformer room wall and the control levers for the oil switches on the high tension lines can be mounted on the main switchboard.

The distribution system from the main switchboard is, of course, very largely dependent upon

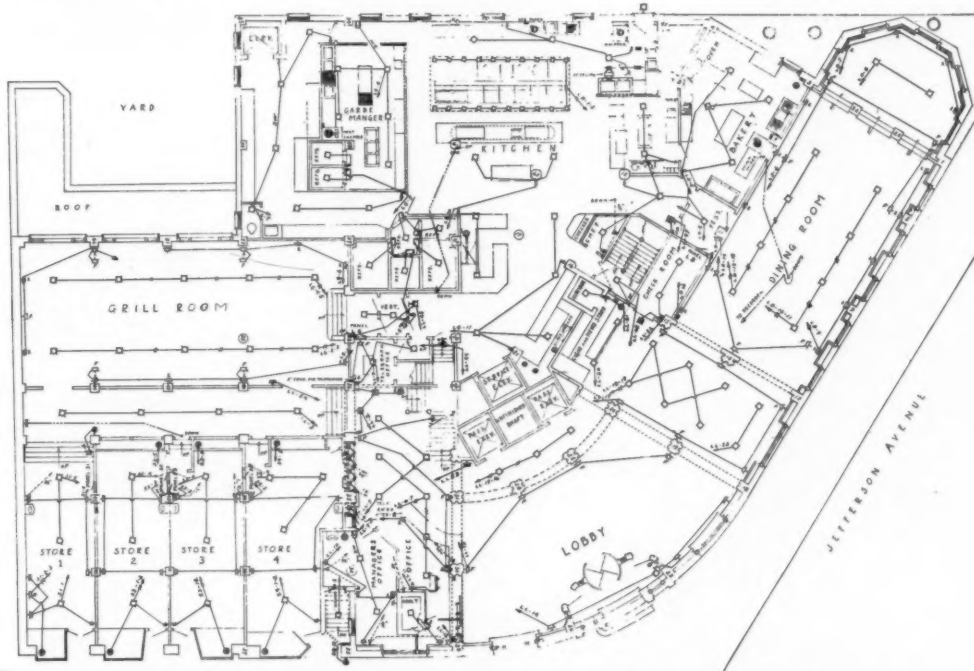
are placed in an inconspicuous location, as a passage just outside, so as not to mar the architecture of the room itself. Yet, if possible, they should be located in such a position that the room is visible by the person operating the boards, as for instance, just outside of a service door to a ballroom. These panels, in the working departments and public rooms, are very frequently used for the control of the lights and what is known as the safety type of panel is desirable for these locations.

On typical floors the panelboards are usually located in the corridors, preferably on a shaft so that the panels will be one above the other and the shaft then makes it possible to carry the feeders straight up and down. Care should be used in

locating these feeder shafts so that it is possible to carry the main conduits supplying the panels down to the basement and main source of supply. Very frequently the lobby and dining room ceilings are furred down for other purposes, which permits of carrying conduit to different shafts for this purpose. The number of panelboards on typical floors is dependent upon the size of the floor, but each floor should have at least one panel. These panels are usually of the knife switch pattern with cartridge fuses as they are not used for the control of lights. They should be locked and only accessible to the house electrician. Generally, panels

in a hotel many of these switches are operated by an unintelligent class of help. A very desirable arrangement is to provide separate meters on these group panels as this enables the owner to determine the cost of current required for operating the various departments which, in hotels, are frequently operated on a separate basis and the meter readings are a great aid for the bookkeeper in the distribution of his costs.

The sizes of feeders for the various panels are, of course, dependent upon the size of the panels. On typical floors it is very general practice to include from three to five panels on one vertical



Electric Wiring Plan, Lobby Floor, The Niagara, Niagara Falls, N. Y.

are placed from seventy-five to one hundred feet apart.

Separate lighting panels are installed for each store or similar rentable space and these are arranged for separate metering. It is customary to install a meter for each tenant in a hotel as very generally the cost of the electricity is not included in the rent and the tenant pays the customary rate for whatever current he consumes.

Separate power panels are generally provided for various groups of motors, such as elevators, fans, kitchen motors, laundry motors, etc. Feeders are carried to these panels and sub-feeders from the panel to each motor. These sub-feeders are controlled by switches and fuses on the panelboards and two main switches which should preferably be of the safety type are provided at each motor. These safety type switches are desirable because

feeder. Thus if it was determined that three panels should be on one feeder the panels on the first three floors would be supplied by one feeder, those on the next three floors by another and so on.

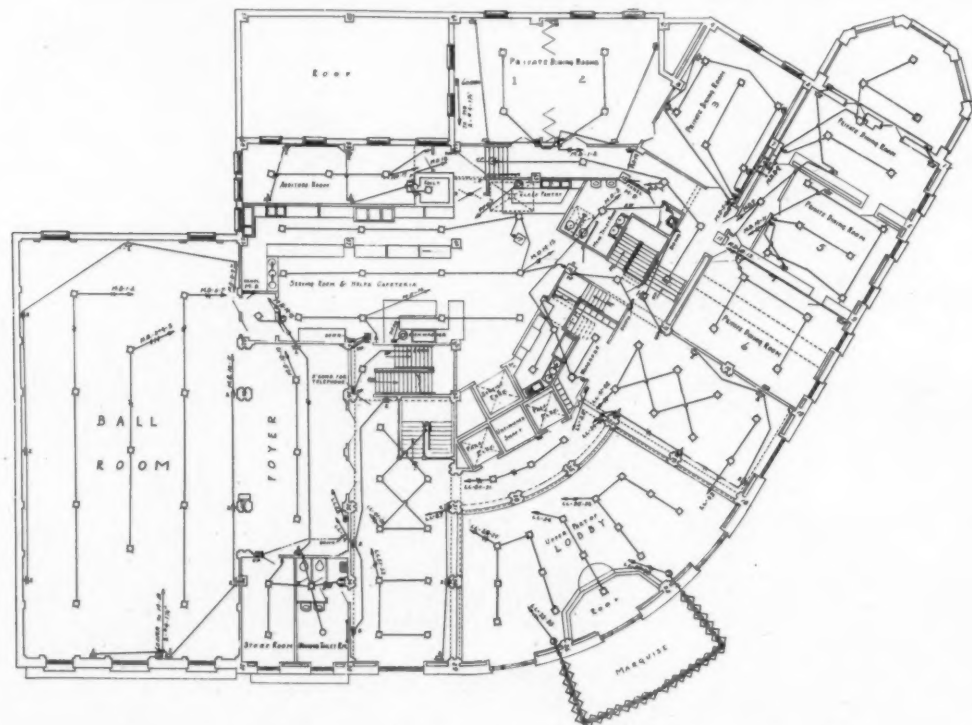
A very desirable arrangement is to have the corridor lights on the guest room floors on alternate circuits so as to obtain half or full illumination as may be required. It is also desirable to have the control of these lights under the supervision of the room clerks. This is obtained by having the circuits supplying the corridor lights independent of the main bus-bars of the guest room floor panel on which they occur. These circuits will then be supplied by two sub-feeders from the lobby panel, each sub-feeder supplying half of the corridor circuits. Local wall switches should also be used on each floor. In arranging the alternate circuits in the corridors care should be used to insure that

the lights near the windows may be cut out in the daytime when one-half the illumination is used in the corridors and thus save current. A separate feeder is generally carried up to the roof of a hotel building to supply the electric sign. This feeder is controlled directly from the main switch-board.

There are many special outlets which are necessary in modern hotels and great care must be taken to get these properly located so as to avoid changes when the construction work is completed. Exit lights are required by law over all doors leading to fire stairs and similar fire exits. These exit light circuits should be placed on one of the lower panels which is accessible and the control of all exit lights in the building should be from this point. Fan outlets for the use of electric fans in the public rooms should be provided and located seven or eight feet above the floor. The arrangement of rooms should be studied and these outlets installed in the most suitable locations for electric fans. Small electric signs are now very generally used to indicate location of, for instance, the barber shop, the public stenographer, the cafeteria, the cigar stand, etc., so that the public may be directed more readily, and outlets for these must be provided. Portable vacuum cleaners are used to a considerable extent in some hotels and it is the practice to install special receptacles at various points on the typical floors where these may

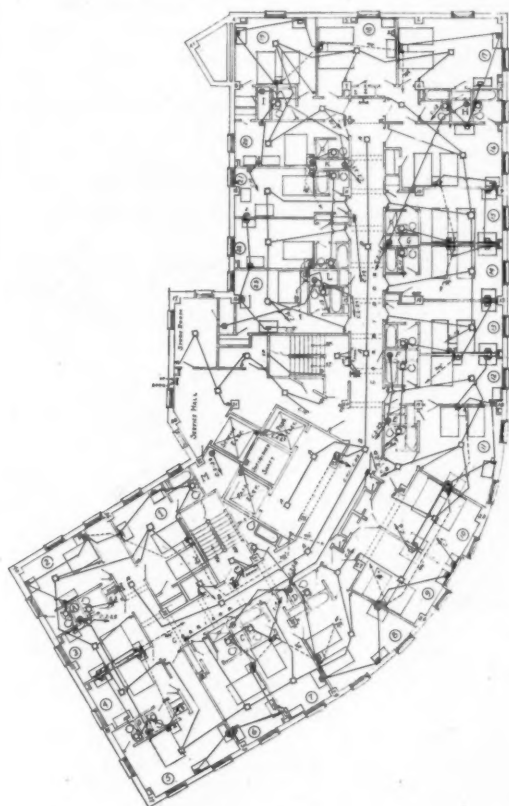
be used. Special heating outlets are required in the barber shop to operate the various devices which are now in very common practice, such as the electric sterilizer, at each chair, for the barber's razor, and for the manicure instruments at the manicure tables. Outlets are also necessary for the vibrator which the barber uses and special receptacles should be provided for both the sterilizing unit and the vibrator for every barber chair. In the valet's room and in the laundry where hand work ironing is done, electric irons are now in general use and outlets for this purpose should be provided. These heating outlets should always consist of the combination unit made up of a switch, a receptacle and a small pilot lamp which indicates whether the electric current is switched on or off.

The lighting of the public rooms is a matter which requires a very considerable amount of study if good results are to be obtained and it is necessary for this purpose to have the co-operation of the architect, the electrical engineer and the fixture designer. The results which are to be obtained are, of course, dependent upon the size and character of the rooms and the amount of money available for the furnishing of lighting fixtures. Every room must have individual study and great care should be given to the location of outlets to meet the requirements of the particular room and the architectural treatment of the same.



Electric Wiring Plan, Mezzanine Floor, The Niagara, Niagara Falls, N. Y.

In our modern ballrooms and dining rooms it is now frequently necessary to provide special lighting effects and outlets for spotlights, moving picture machines, etc. Dimmers are also installed in the lighting circuits of these public rooms so that the lights may be thrown on and off gradually. It is good practice also in ball and assembly halls to provide extra wall receptacles for special affairs and displays during conventions, fairs, or other



Electric Wiring Plan, Typical Floor,
The Niagara, Niagara Falls, N. Y.

similar attractions. One or two floor receptacles in the center of the room for table decorations, during banquets or similar festivities, are also provided. Careful study should be given in each case for the proper switching and control of lights in these public rooms. Large lighting fixtures are very generally supplied by two or more circuits. These should be on separate switches so that partial or full illumination may be obtained as desired.

The illumination of guest rooms should also be given very careful study. General practice is to provide a center outlet in each guest room controlled by a switch placed just inside of the corridor door. Care must be used to locate the switch

in accordance with the correct swing of the door. The lighting fixture in the guest room should be such as to avoid direct rays and the lighting effect should be cheerful and without glare. There are many fixtures on the market now which give very satisfactory results in this direction. Outside of the center light there are usually three receptacles provided in each guest room, one of these being used to supply a bed light, the fixture of which is directly attached to the head of the bed, another is used for supplying a fixture attached to the dresser and a third for a fixture attached directly to the desk. Where a dressing table is provided in a room it is desirable to provide a separate duplex receptacle for this to supply two small candelabra lamps placed directly on the dressing table. It is also possible to utilize brackets for the illumination of bedrooms but the location of outlets must be very carefully determined so as to be central over the furniture which they are supposed to serve or if the walls are paneled that they will be located properly within the panels.

The bathroom illumination now generally consists of one electric outlet directly above the mirror and over the lavatory. This outlet is fitted with a very simple fixture and shade which may be controlled by a pull switch on the socket. In some cases where the bathroom is large a ceiling outlet is provided controlled by a wall switch in addition to the bracket outlet over the mirror.

Electric cooking apparatus of all kinds is now on the market and is coming into use to a considerable extent where the low cost of electric current will warrant its adoption. This includes the large kitchen ranges, bake ovens, pastry ovens, broilers and similar appliances. All of this apparatus requires a considerable amount of current especially in starting, and particular care must be given to the fact that the feeders for these appliances must be heavy enough to carry the maximum demand in current. Separate cabinets for the necessary circuits, switches and fuses should be provided for these heating units and these should be independent of the panels for light or power.

In conjunction with the telautograph and teletype installations a pneumatic tube system is now practically essential. Such a system is used in many different ways such as for the transmission of charge slips between the restaurant cashier and the front office cashier, from the telephone switchboard operator to the front office cashier, for the distribution of mail to the floor clerks and other similar purposes.

Owing to the general use of rugs and carpets in every hotel it is necessary that some form of vacuum cleaning equipment should be provided. Vacuum cleaner installations where the machine is placed in the basement have undergone a considerable change and of this type the only systems

which are now considered desirable are those which operate with a centrifugal exhaustor and utilize pipes not less than two and one-half inches in size. This type of vacuum cleaner handles a very considerable amount of air and the pipes are of such size that hair-pins, matches and other similar objects which may be picked up by the operator will not lodge in the pipe at the turns or any other point. Vacuum cleaning systems of the high vacuum type have practically been eliminated. This is due mostly to the fact that the pipes which were considerably smaller than two and one-half inches were continually becoming stopped up and the time and expense in cleaning them out was such that the installation was out of service for a considerable period. The centrifugal exhaustor system above described and as now installed gives very satisfactory service providing a sufficient number of riser lines are provided so that the length of hose is not excessive.

The portable type of vacuum cleaner has been adopted by a number of hotels and a sufficient number of units are provided so that several cleaners may work simultaneously. These portable cleaners consist of a small vacuum cleaner equipment mounted on a portable truck and the current requirements for the same are such that it can be operated from the ordinary lighting circuit providing no lights are burning at the same time. The best practice is to provide special receptacles for these cleaners in the corridors providing a considerable length of flexible cord so that the machine may be wheeled into the adjoining rooms without difficulty. While this type of machine has a number of advantages over the central type of installation it has the disadvantage of creating some noise when in operation which may bring about the complaint of a guest who is sleeping late in the adjoining room. The cleaning is not quite so effective as with the other form of machine, yet very serviceable results are obtained from the portable machines.

The small portable vacuum cleaner as used generally in the home is also used by some hotels but only to a very limited extent.

Outside of the light and power wiring there are a considerable number of other electrical appliances for which provision must be made in our modern hotels. A telephone is required in each guest room, in a number of the working departments and provision must also be made for public telephones. These telephone installations in our modern hotels are equal to the telephone exchange in a moderate sized city and a very considerable amount of study must be given to the proper arrangement for the equipment in the larger hotels. It is customary to provide a separate room for the telephone switchboard. This should preferably be in a location where there is ample light and air for the operators. A location on or near the roof

of the building is frequently now selected for this purpose. All calls from guest rooms and other parts of the house except by public telephone are handled on this switchboard. The public telephone operators are usually located in some convenient place in the lobby.

In the smaller hotels where only one or two operators are required the switchboard is very frequently located convenient to the front desk of the hotel and the operator handles all room as well as the public calls. It is customary practice for the owner to provide all conduits and boxes for the telephone cables and wires. The telephone company provides and installs all its own cable and wires and furnishes its own instruments. In some parts of the country it is necessary for the owners to furnish and pay for cables, wires and all telephone apparatus but this work must be installed in accordance with the telephone company's requirements.

The telephone outlets in the various guest rooms are usually located so that the telephone instrument which is now always of the desk type is placed on the somnal adjoining the bed and if no somnal is to be used it is located so that the instrument will be on the writing desk. If the instrument is to be placed near the bed care must be taken to locate the outlet so that the bell box of the instrument, if placed on the wall, will not interfere with the space required for the bed.

It is again desirable to provide a vertical shaft which is free from plumbing or steam pipes and extending through the guest room floors of the building for the main telephone risers. The number of risers is dependent upon the size of the floors and as in the case of electric light panels it is desirable to place them about one hundred feet apart. Access from the corridors to the telephone cable shafts should be provided. It is preferable in these shafts to arrange them so that the cable can be carried through without any conduit as it simplifies the telephone construction.

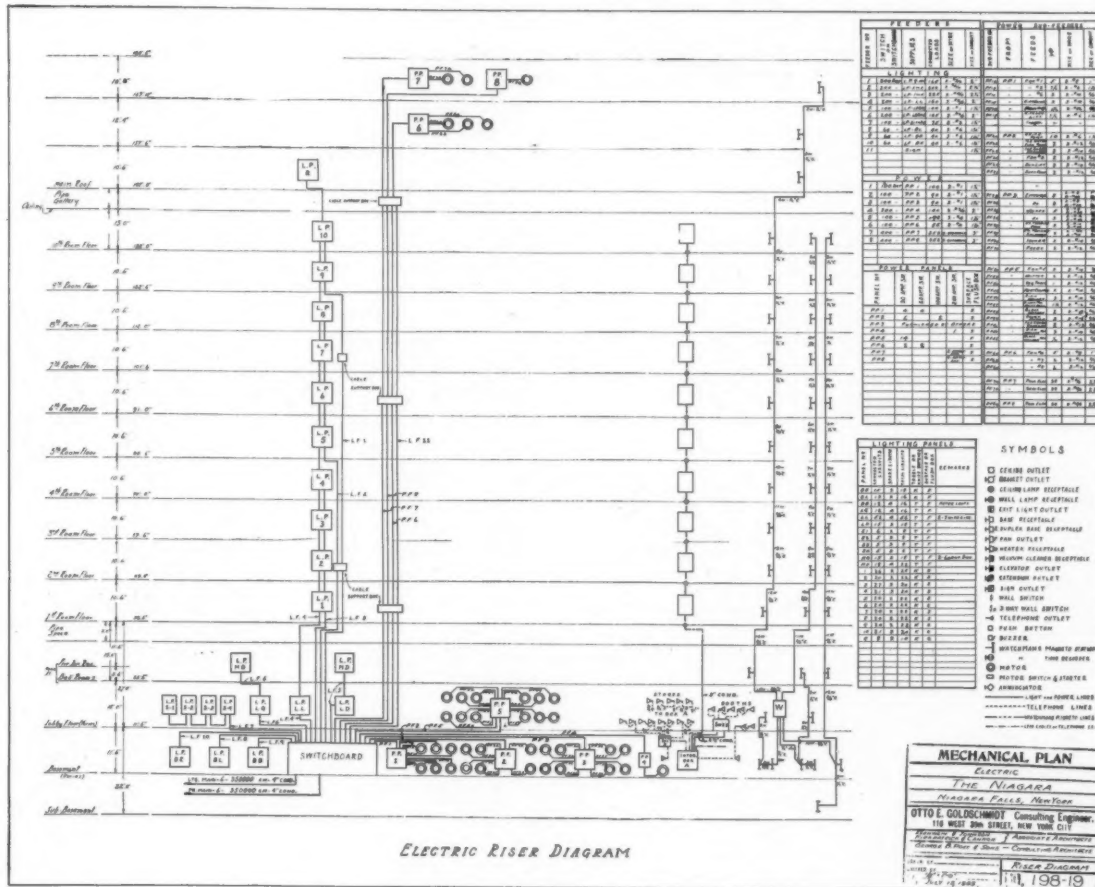
In the larger hotels it is often desirable to relieve the main switchboard of the inter-department calls. In such cases an interior system of telephones is installed. These systems may be one of two types, the push button type or the switchboard type. The push button telephones can only be used for a limited number of stations. The switchboard systems are divided into two types, the manually operated switchboard and the automatic switchboard. The latter type is very desirable as it does not require any operator and is, therefore, less expensive to run and the service is quick and dependable. This system also has the advantage that as the switchboard operator is eliminated the conversations are private. Push button types of telephones may be arranged so that the manager and other departments may hold strictly private conversations.

Interior systems reduce the possibility of employees in the working departments making or receiving outside calls which interfere with the house service. Some hotels install a coin box instrument for the exclusive use of the employees.

Conduits and boxes must be provided for telegraph service as required by the telegraph company who will provide all wire and instruments.

In the smaller houses which are operated without floor clerks on each floor it is desirable to have some form of maids call system on the guest room

in charge of this department may be out of his office. The use of this apparatus is very diversified and a number of stations necessary. The location and arrangement of the same require very careful study. This apparatus is used for transmission of messages between the various departments, such as the front office, the housekeeper, the laundry, the chief engineer, the cashiers, the telephone switchboard, etc. All the conduit, terminal boxes, wires, etc., for this apparatus are usually provided by the owner and the company which



floors. A very simple system to enable the housekeeper to call a maid on any floor should be provided.

Telautograph and teletype systems are now in very general use and one or the other is essential in all of our large hotels. Special wiring provisions must be made for either of these systems. Both telautograph and teletype systems are used for transmitting messages from one department to another where it is desirable to have a record so as to fix responsibility in the case of neglect or that a message may be delivered even if the person

furnishes the instruments will install and connect same.

Each of our modern hotels should be equipped with a watchman's time recording system, in fact it is demanded by insurance requirements. The watchman's system consists of stations placed throughout the building on which the watchman must "ring up" on each of his rounds through the building. The stations are placed so that it is necessary for the watchman to travel over the entire public space of the building. Each station is connected to a central time recorder placed

either in the manager's office or in the chief engineer's office which contains a paper chart on which is recorded the exact time at which a watchman "rang up" at each particular station. The entire apparatus is automatic and the only attention required is that the paper chart be changed at regular intervals and that the clock be wound up once a week. In locating these stations on the guest room floor it is desirable to place them vertically one above the other to reduce the conduit and wire expense to a minimum. The entire watchman's clock system is installed by the owner.

Electric time clocks and time stamps are most generally installed in our modern fireproof hotels. The number and location of these are, of course, dependent upon the size of the hotel. There are a number of companies who furnish this equipment which usually consists of a master clock placed in the manager's office or the chief engineer's office which is regulated to keep accurate time and sends out the regular impulses to the various secondary clocks and time stamps and keeps them in unison with the master clock. A storage battery equipment with necessary charging devices is necessary for this installation. With a small amount of attention these systems are now very dependable.

Push buttons, annunciators and similar equipment are used only to a small extent in present hotel installations. The telephone has come into such general use for purposes of this sort that the very elaborate annunciators and call systems which were formerly in vogue has been practically eliminated. Push buttons for the private dining rooms to summon a waiter or in the manager's office to summon office help is about the extent of their use.

In our large hotels, especially those which cater

to social functions, the carriage call should not be overlooked. The carriage call is usually placed directly over the marquis or in some other location visible from the thoroughfare convenient for the taxi and automobile service. This carriage call is operated from a position located just inside of the entrance and indicates the number of each call in illuminated numbers outside.

It is evident from the above that the requirements of the electrical equipment of a modern hotel are such that each particular installation must be given thorough study so that there may be no confusion in the work as it is installed nor in the mind of the contractor who bids on the work and who is to execute the installation. The location of all outlets with symbols indicating their use, the size of all feeders and conduits, the location of panels, the number of circuits on the same, the number of wires in conduits, all of these and many more items should be clearly shown on the plans and described in the specifications. Another very important factor is that this equipment be planned so as to be in conformity and consistent with the general character of the building itself. For instance, it would be out of place to have a very elaborate electrical equipment where the hotel is to be built on an economical basis. While the equipment in all cases must be made so that it will be safe against all fire hazards and must be practical in its operation, certain economies can be followed to meet the general conditions upon which the architect is planning the building. The execution of the work should be carefully supervised to see that the equipment which is called for by the plans and specifications is installed in accordance therewith. In all cases this should be under the direction of an engineer who is thoroughly familiar with this class of work.

REFRIGERATION for HOTELS

BY STEWART T. SMITH, Architectural Engineer*

THE installation of a refrigerating plant is becoming the universal practice in new and old hotel buildings. Even though natural ice may be comparatively cheap in some localities, it is generally found that a refrigerating plant proves to be a good investment. Aside from the investment aspect, there is the matter of convenience in having the service within the building and under control at all times as well as the dependability of modern installations. Natural ice refrigerating involves the handling and distribution of a bulky commodity, whereas mechanical refrigeration can be distributed and redistributed to other points at will.

The refrigerating requirement of any hotel is particular to itself. It cannot be standardized on any unit basis of number of rooms or persons to be served in the dining rooms. These requirements are based largely on the character of the dining service which is to be rendered. This service has no fixed relation to the size of the hotel, it is rather a thing apart. The refrigerating requirements do have, however, a distinct relation to the kitchen equipment and layout. In fact the two, the kitchen and refrigerating equipment, have an intimate relationship and are best planned together in order to secure a satisfactory result.

It is then apparent that the first step is for the hotel operator to decide on the character and extent of the dining service and with this in mind, the architect will be able to develop a satisfactory

Mechanical refrigeration is accomplished by the vaporization of a chemical which is called the refrigerating medium. These mediums are chosen for their ability to absorb a large amount of heat during their vaporization and for having a low liquefaction point—in other words a low temperature at which the gas or vapor will be converted to a liquid. For commercial purposes ammonia



Refrigerating Plant, with Compressor, Condenser, Receiver and Electric Cabinet

(NH_3) and carbon dioxide (CO_2) are the mediums most used.

The objection to ammonia is its odor if leakage occurs and the danger if present, through accident, in sufficient quantity in the air. In modern and properly designed and installed plants this danger is practically overcome. The advantages of using ammonia are a slightly lower initial and operating cost and the fact that leakage from the system is easily detected. The objections to carbon dioxide are its slightly higher initial and operating expense due to the high pressures required, not easily detected loss of the refrigerant with the attendant danger of asphyxiation. The advantages of this medium are that it is odorless, nonexplosive and noninflammable. Ammonia has been used much longer and to a far greater extent in this country than carbon dioxide and is more familiar to architects.

The purpose of a refrigerating machine is to recover the medium and to again make its use possible. They are of two types, absorption and compression.

The principle of the absorption method is that ammonia is soluble in water and can be driven therefrom by heat. The absorption machine has an absorber where the ammonia comes in contact with water, a generator where the ammonia and water is heated by exhaust steam derived from other apparatus and a mass of pipe used for rectifiers, coolers, heat exchangers and condensers. This mass of pipe, the generator and absorber take up



Freezing Tank and Ice Storage Room

scheme with the collaboration of the refrigerating and the kitchen equipment engineer. Like the other mechanical features involved in hotel construction and operation, these factors must be fully considered in the initial planning of the building. Their importance is so great that they cannot be made to "fit in" at a later stage of the project development.

*Of Van R. H. Greene, Refrigerating Engineer, New York City.

a considerable amount of space. This type of apparatus is rather complicated in construction and operation and requires a more skilled operator.

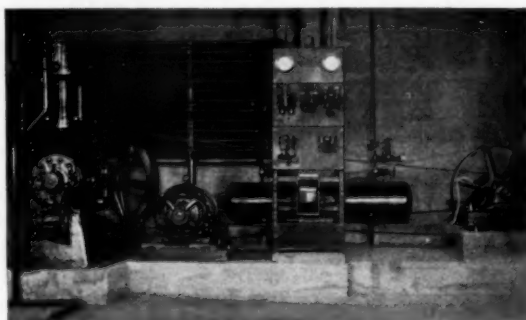
The compression system is the more generally used. In this method there is employed a compressor very similar to an air compressor. The compressor receives the gas from the cooling coils and puts it under pressure and then passes it to the condenser where it is cooled by water. In cooling, the ammonia is reduced to liquid form. The condenser consists of a group of horizontal pipes in which the ammonia is circulated through a large pipe in the center of which is a smaller pipe through which passes the cold water. This form of condenser is commonly used in hotels. Other forms consist of a set of ammonia pipe coils placed on the roof usually and over which water flows and is collected in a pan. This form is used largely in ice making plants. In this case the large volume of warmed water is cooled by passing through a cooling tower. Tubular condensers are used and they consist of a round tank in which is placed a coil. The double pipe type of condenser, first described, is the most practical for hotel use. The condenser water is heated to about 80° F. and is perfectly good and is usually piped to the hot water heating and storage tank for use in the hot water supply system.

From the condenser the liquid ammonia passes to the receiver, still under pressure. The cooling or refrigeration work is done by allowing this liquid ammonia to flow into the refrigerating pipes and coils at a reduced pressure through an expansion valve. This sudden release of pressure causes the ammonia to boil away in the pipes and in so doing heat from the air or brine is absorbed.

There are two methods of applying refrigeration for hotel work, they are known as the direct expansion and the brine circulating systems. In the direct expansion system the expansion coils are placed in the refrigerator boxes or cold rooms. There is an economy in this system compared with the brine circulating system in that no circulating brine pump is required. The machine can operate at higher back pressure and greater efficiency in both capacity and power consumption and eliminate the waste of refrigeration of the brine pump, brine tank and additional lines. The elimination of this equipment reduces the operating and maintenance cost. Lower temperatures can be produced in the refrigerated spaces. This is particularly desirable for the ice cream box where a coil can be submerged in still brine and easily held at 10° F., which would be difficult to accomplish with the same brine circulating system that would be used for the higher temperature rooms. When the system is not under automatic control, a brine hold-over tank in the cold rooms is used to maintain the temperature when the compressor is not operating.

The brine circulating system is that one in which cold brine is circulated in pipes to the vari-

ous cold rooms and refrigerator boxes by means of a brine pump. In this system the expansion coil is submerged in an insulated tank full of brine. This brine is reduced to any desired temperature and distributed to the various cold rooms and boxes by the pump. Lower temperatures are produced in certain rooms by providing additional brine coils. This is, in a way, similar but converse to a heating apparatus where higher temperatures are secured by using additional radiating surface. This system is usable for cooling remote boxes on upper floors in which ice is sometimes used in lieu of mechanical refrigeration. Sometimes in far distant places, such as roof gardens, a small plant is installed and operated with less expense than that incurred by the long line of circulation piping with its loss in temperature



Refrigerating Plant, Showing Compressor, Condenser, Receiver and Switch and Gauge Board

and cost of pumping against the hydrostatic pressure. Due to its high specific gravity brine changes temperature quite slowly. Usually the brine pump is operated continuously.

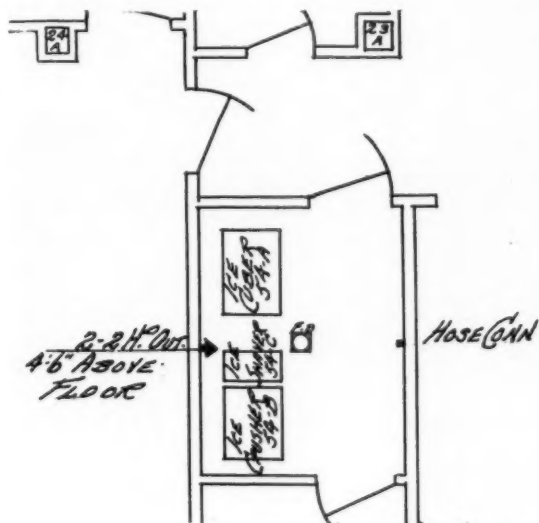
Ammonia compressors are of the vertical and horizontal types operated at either high or low speed. In these the principle of compressing is the same but there are variations in the details of construction and kinds of metal used in certain parts. The liquid receiver is a horizontal cylindrical tank and should be of sufficient capacity to hold the entire charge of required ammonia. Brine pumps are usually of the centrifugal type and have the motor direct connected on the same base plate. For high heads a triplex pump is sometimes used. The centrifugal pump is quiet in operation and requires little attention. Like all other operating machines, they should be installed in duplicate. The units in a refrigerating plant requiring power to operate are the compressor and the pumps. These are generally motor driven. Compressors are either direct or belt connected. The belt connected drive is usually the more quiet in operation and better adapted to medium and slow speed machines.

The installation and operation of a carbon dioxide system of refrigeration is practically the

same as the ammonia system above described.

The refrigerating machine room should be separated from the boiler room by a fire-resisting wall in which doors, if any, should be approved automatic fire doors. This room should be ventilated by a ventilating duct or preferably windows. Fire departments usually regulate the layout of these plants and in planning them the architect should inform himself as to these regulations.

The cold rooms are generally three or four in number for the average hotel. The vegetable room is kept at a temperature of 35° to 40° F.; at this same temperature is kept the milk, butter



Ice Preparation Room, Ambassador Hotel, New York

and egg room; the meat room is kept 34° to 36° F.; a fish room has a temperature of 30° to 35° F. These rooms are usually located in the basement and often so located as to open to an insulated vestibule. The rooms should be insulated on all six sides with two layers of 2" cork board laid with broken joints in cement mortar and plastered with Portland cement. Over the floor insulation place a 3" concrete finished floor. Refrigerator doors, frames and hardware are built to standard dimensions and details. The rooms should be high enough for storing and placing the contents with added height for the cooling coil bunker or brine tank as the case may be. The smallest practical dimension for these rooms is 4' x 6'. Rooms 6' x 6' or larger are better. In the larger hotel rooms sufficient to hold carload lots are often installed.

Where a hotel makes 75 gallons or more of ice cream per day a hardening room should be provided. But where a less quantity is used a hardening box is satisfactory. The hardening room is usually about 4' x 6' in size with the butter, milk

and egg room often used as an anteroom or vestibule. The larger hotels have another cold room used for the storage of garbage thus eliminating flies and disagreeable odors.

In addition to the refrigerated rooms there are numerous refrigerator boxes in different places but generally in or about the kitchen and pantries. Each of these boxes should contain a pipe coil connected with the refrigerating plant. The sizes of these boxes vary with their use and location, from the small household refrigerator to the many section refrigerator 20'-0" or more long. Each kitchen has a main refrigerator, in addition each baker and chef has a box with additional short order box for the latter. Salad boxes, the cold bain marie, soda fountains, ice cream cabinets and floral stands require refrigeration as well as the serving room for each banquet hall. The number, size and location of the refrigerator boxes vary with each installation and each should have its own coil and be provided with a drain connected with the drainage system. Ample and accessible space should be provided for installing the connecting lines of the piping, all of which must be heavily insulated.

When a cold drinking water service is installed in each guest room, a cooling tank with the circulating pumps is located in or near the machine room.

When cake ice is made, the freezing room should be in the basement and used for no other purpose. Ice is made by filling cans with water and immersing them in a tank of cold brine until the ice is formed. The brine is kept cold by means of a cooling coil placed in the tank. The ice may be pulled as needed or pulled when frozen and placed in ice storage rooms. These latter are usually found in medium and large sized hotels. Sometimes the ice making brine tank is also used as the brine cooler, thus serving a double purpose. In this case a larger tank is required but the temperature may vary considerably due to the filling of the ice cans and affect the temperature of the extreme low temperature rooms.

The methods of determining the amount of refrigeration needed for various purposes are set forth in such works as Hool and Johnson's Handbook of Building Construction to which the writer of this article contributed the section devoted to Mechanical Refrigeration and to Harding and Willard's work on Mechanical Equipment of Buildings, Volume II. In these the units of heat transmission through walls and materials, losses due to opening and closing of doors, line losses, the specific heat of materials to be cooled and other data is given. The architect can well afford to have a usable knowledge of these things to aid in analyzing and evaluating the data submitted by the persons with whom he collaborates in the designing of the refrigerating plant.

HOTEL ELEVATORS

THE designing of the modern hotel is a complex problem due to the present day standards of living which require, not only adequate housing facilities, but also every comfort and convenience for the benefit of the guests. Every hotel owner and manager realizes the necessity of having the mechanical equipment of his hotel absolutely safe and reliable so that there shall be no interruption of service to the guests. The elevator installation comes into closer contact with the guests than any other portion of the mechanical equipment and, therefore, the selection of the elevators should be given most careful consideration when designing the hotel, so as to provide guests with the best type of vertical transportation.

The elevator installation in the modern hotel is an individual engineering problem rather than the mere duplicating of an installation for a somewhat similar building. This is due to the various features which must be considered, such as the height of building, floor area, character of patronage, that is, whether entirely transient or only partially so, or partially or wholly residential. The immediate neighborhood surrounding the hotel also has its influence, due to the fact that in business districts the hotel may be used as a meeting place by outsiders. Another important feature in connection with the modern hotel which must be given careful consideration is the location of ball rooms, private dining rooms and restaurants, and whether there is a roof garden in the hotel, as such features may require additional elevator service.

Modern hotels of the larger size require elevators of moderate capacities, traveling at high speeds and operating at frequent intervals. The capacity best suited for most hotel elevators is about 2,500 pounds and for all except the smaller hotels, the speeds should range from 400 to 600 feet. In the largest modern hotels it has even been found that the elevators should travel at least 700 feet per minute. In residential hotels the speed should be more moderate as the traffic conditions are not as severe. The elevator car platforms should be comparatively broad and shallow with wide opening doors so as to facilitate movement of the passengers in and out of the car.

All hotel elevators should be provided with every possible safety device to protect passengers and prevent possibility of injury. These devices should include car safety device to prevent falling of the car in case of breakage of the ropes, speed governor to operate the safety device, hatchway slowdown and limit switches to prevent overtravel of the car, emergency switch in the car, safety potential switch on the controller, and car and

counterweight buffers in the pit. A most important safety feature is also a gate on the car platform, which should be equipped with an electric contact to prevent starting of the car until this gate is closed. An additional safety feature which should be provided is a system of electric contacts for the hatchway doors, so arranged that the car cannot be started until the hatchway door is closed. This is very necessary as practically all accidents which occur on passenger elevators are due to attempts of passengers to enter or leave the car while it is in motion. With these two safety features and consequent necessity for closing both the hatchway door and the car gate before the car can be started, possibility of accident at the doors is almost entirely eliminated.

One of the latest improvements in elevator service is an automatic leveling device which is rapidly coming into general use and which is peculiarly suitable for hotels. This device automatically brings the car platform to an exactly level landing with the floor, independent of the operator after he has centered his car switch to stop within the leveling zone above or below the floor. When the car does not land exactly level with the floor there is a tripping hazard which is quite serious, especially in the case of women and children. Accurate leveling eliminates this hazard, the disagreeable fluctuations in movement often encountered at a floor level stop, speeds up the service and reduces power consumption. It permits the operator to devote his entire time to the handling of the gates and passengers. After the elevator has stopped at the floor, the car floor level is maintained.

In modern hotels the service elevators perform an important work which is large in proportion to the passenger service. The nature of service transportation is such that the installation varies from the passenger installation only in the size and shape of the platforms, design of the cabs and enclosures. The same safety devices, speeds and other characteristics are employed. Indicators are common to both services except that those showing the location and travel of cars is confined, when used, to passenger service.

In many instances there is a service which can be accomplished by a dumbwaiter installation. The high speed and automatic electric control of movement which characterizes the best installations make their use satisfactory and economical.

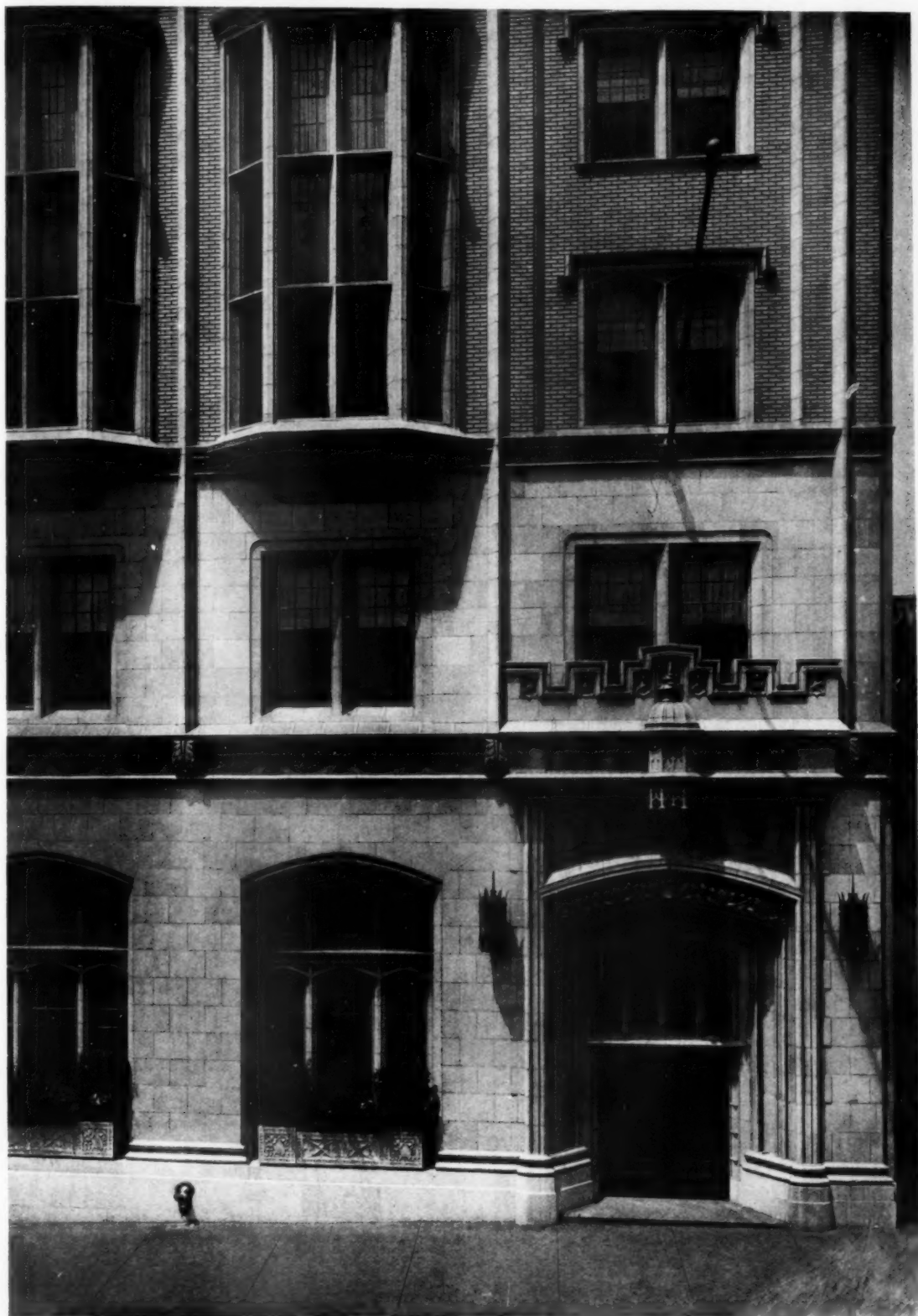
The larger elevator companies have accumulated much valuable information on the various problems involved in selecting types of equipment for different classes of hotels, and they are always ready to assist architects and owners in solving problems.



KANSAS CITY CLUB, KANSAS CITY, MO.

SMITH, REA & LOVITT, ARCHITECTS

(Erected under the direction of Chas. A. Smith, Successor)



MAIN ENTRANCE

KANSAS CITY CLUB, KANSAS CITY, MO.

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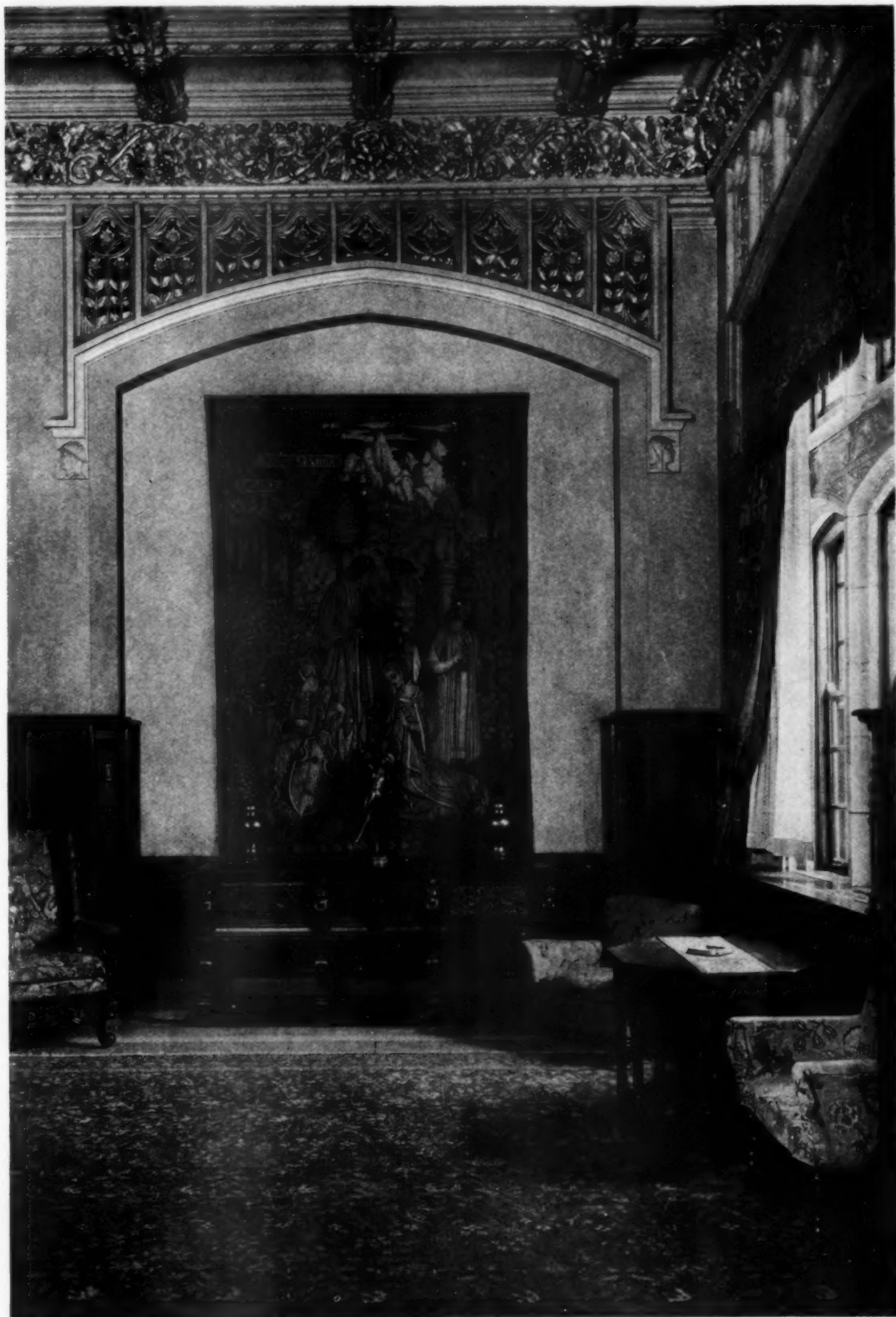


MAIN LOBBY

KANSAS CITY CLUB, KANSAS CITY, MO.

SMITH, REA & LOVITT, ARCHITECTS

(Erected under the direction of Chas. A. Smith, Successor)



DETAIL IN MAIN LOBBY

KANSAS CITY CLUB, KANSAS CITY, MO.

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THE LOUNGE

KANSAS CITY CLUB, KANSAS CITY, MO.

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MAIN DINING ROOM



LADIES' DINING ROOM

KANSAS CITY CLUB, KANSAS CITY, MO.

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BANQUET ROOM

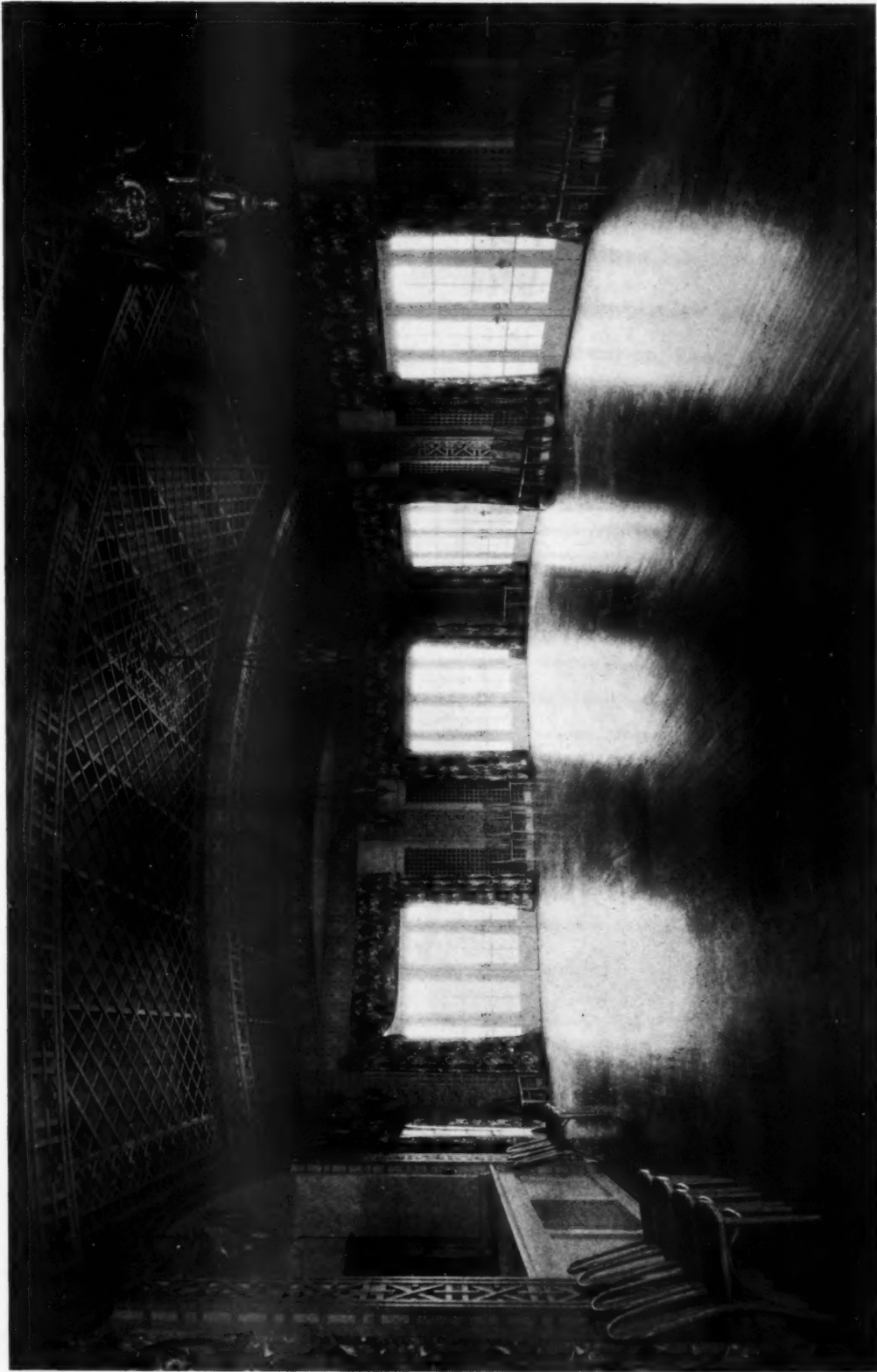


LADIES' PARLOR

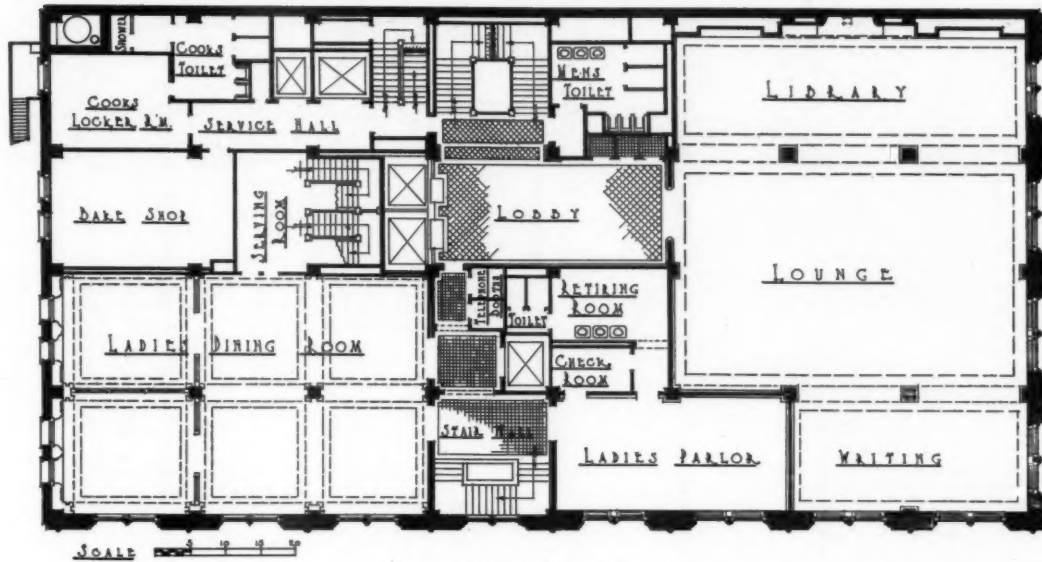
KANSAS CITY CLUB, KANSAS CITY, MO.

SMITH, REA & LOVITT, ARCHITECTS

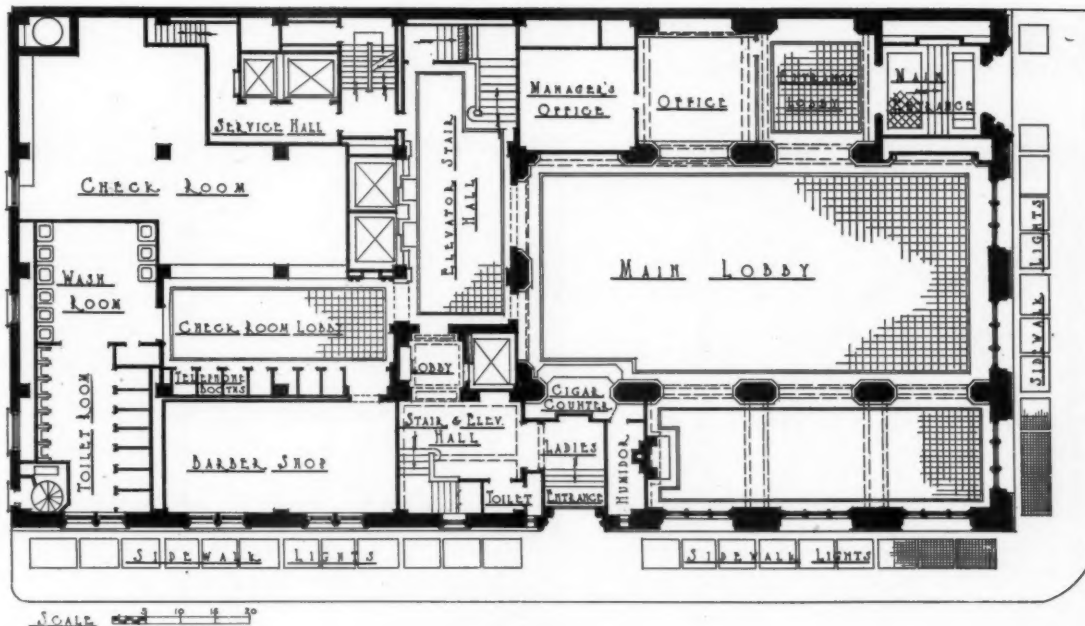
(Erected under the direction of Chas. A. Smith, Successor)



BALL ROOM AND ROOF GARDEN
KANSAS CITY CLUB, KANSAS CITY, MO.
SMITH, REA & LOVITT, ARCHITECTS
(Erected under the direction of Chas. A. Smith, Successor)



SECOND FLOOR PLAN

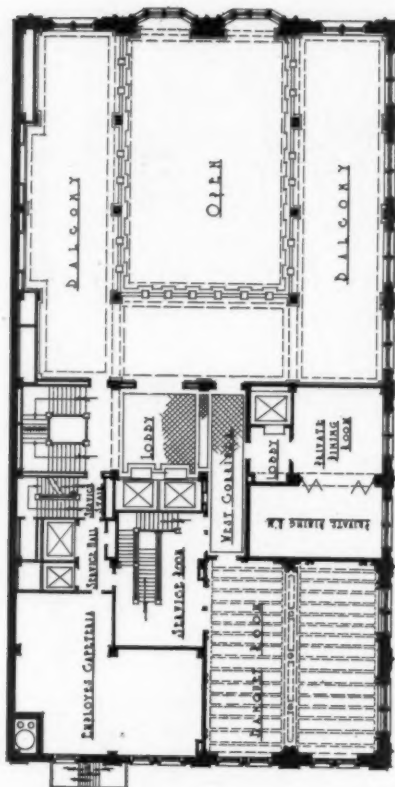


FIRST FLOOR PLAN

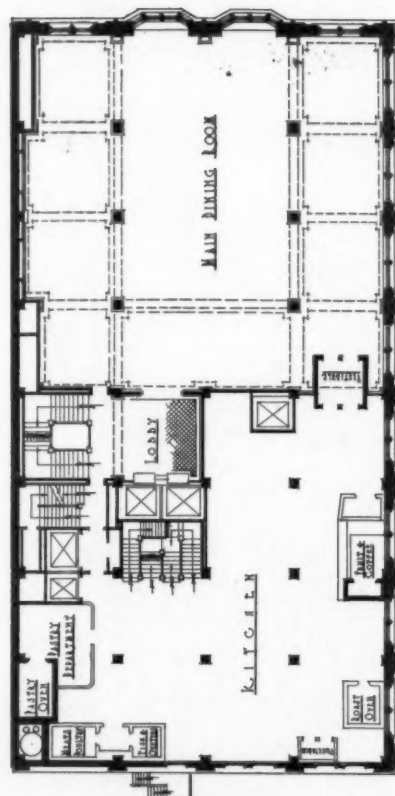
KANSAS CITY CLUB, KANSAS CITY, MO.

SMITH, REA & LOVITT, ARCHITECTS

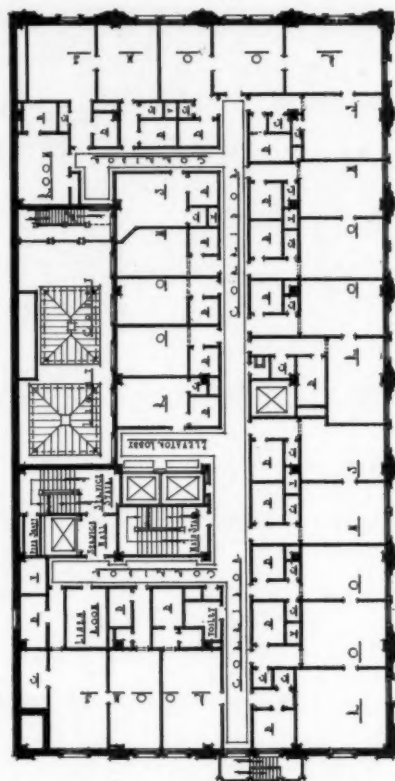
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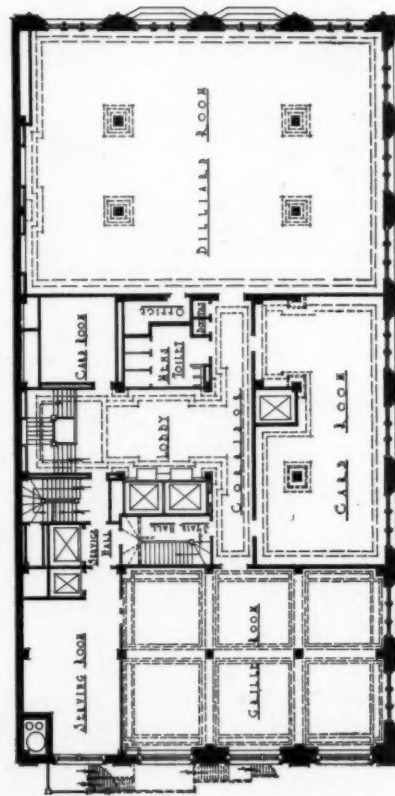
FOURTH FLOOR PLAN



THIRD FLOOR PLAN



6th TO 10th FLOOR PLAN

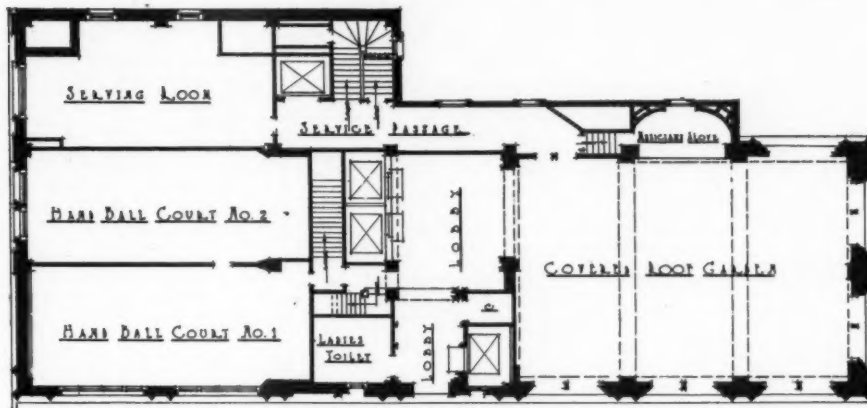


FIFTH FLOOR PLAN

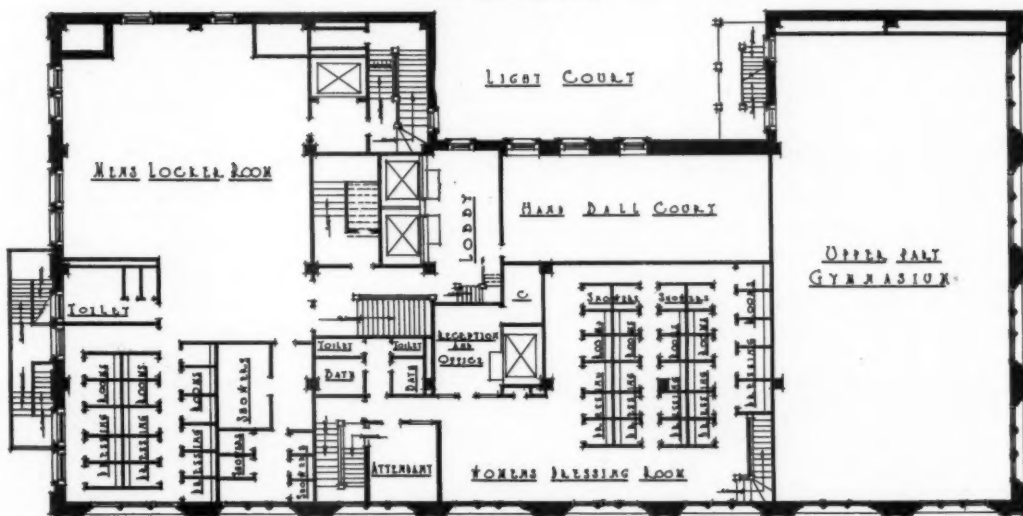
KANSAS CITY CLUB, KANSAS CITY, MO.

SMITH, REA & LOVITT, ARCHITECTS

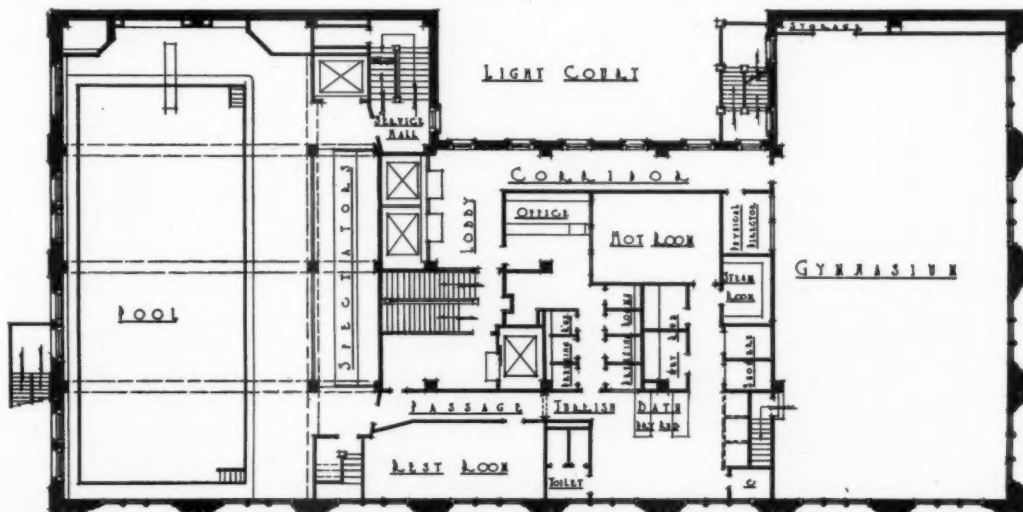
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ROOF GARDEN PLAN



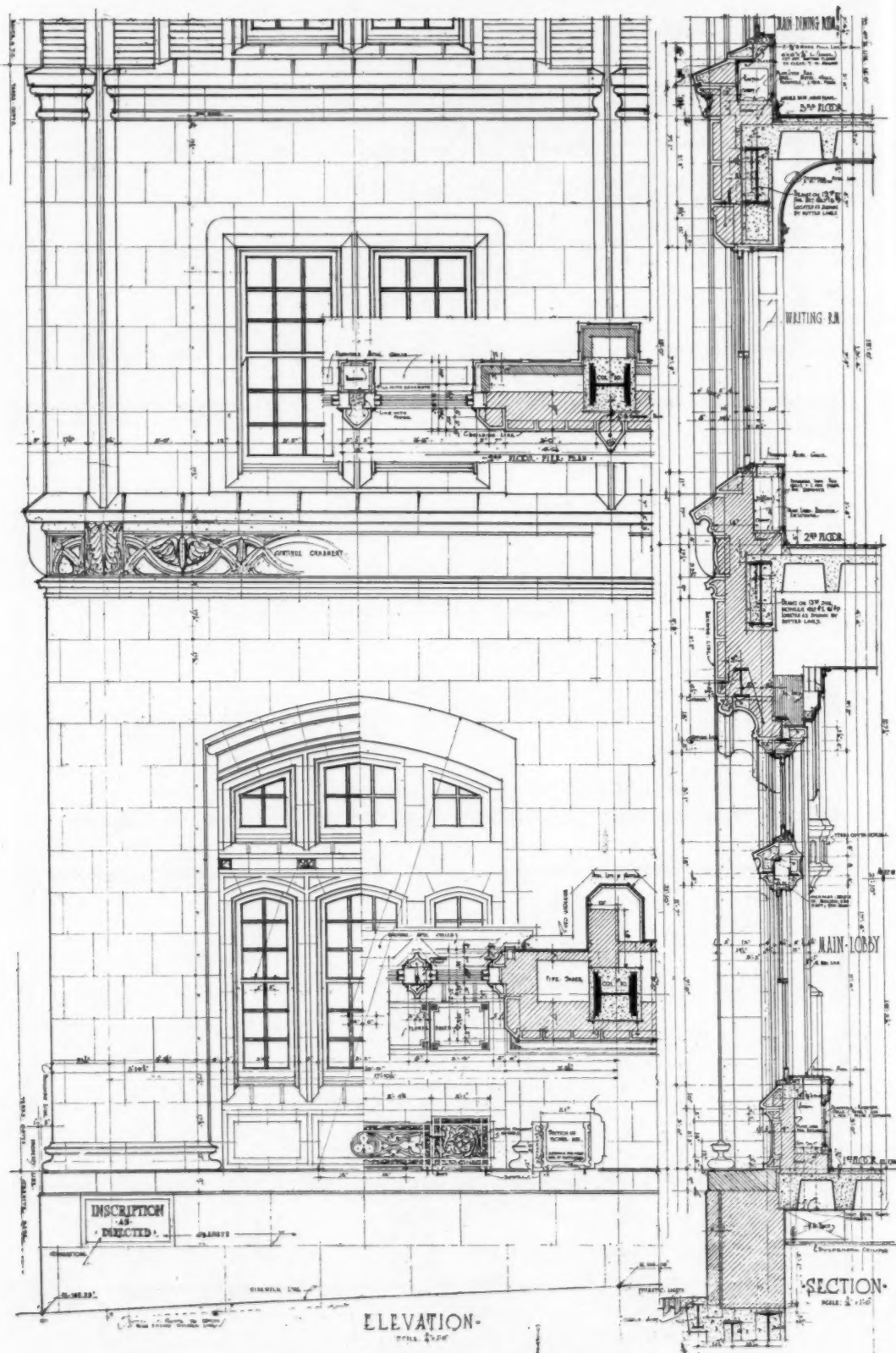
THIRTEENTH FLOOR PLAN



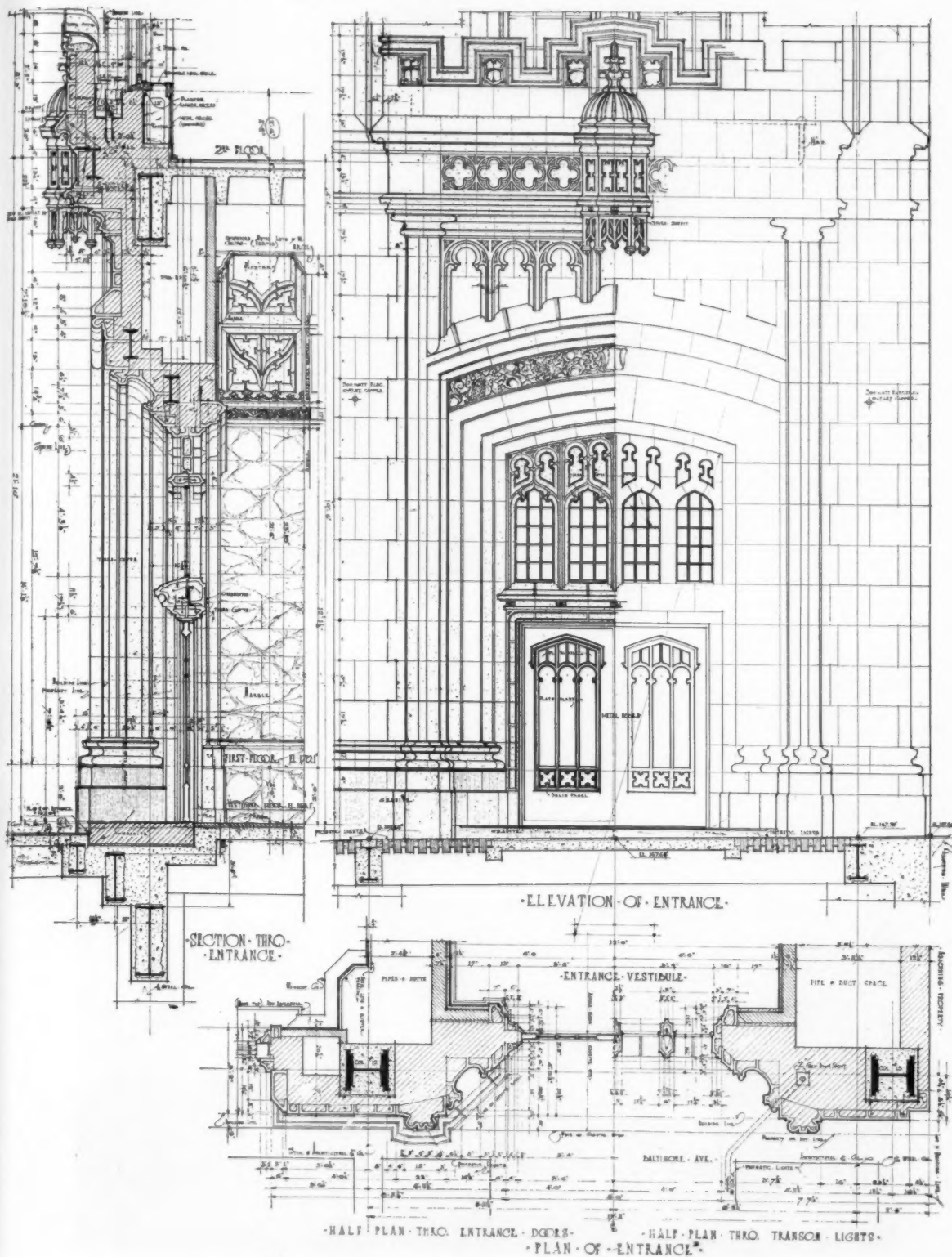
TWELFTH FLOOR PLAN

KANSAS CITY CLUB, KANSAS CITY, MO.

SMITH, REA & LOVITT, ARCHITECTS



LOWER STORY DETAILS
KANSAS CITY CLUB, KANSAS CITY, MO.
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KANSAS CITY CLUB, KANSAS CITY, MO.

SMITH, REA & LOVITT, ARCHITECTS

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KITCHEN EQUIPMENT FOR HOTELS

MANY hotels, not particularly attractive in some respects, are very successful owing to the dining room service which is maintained. This service is of such importance that it finds a prominent place in the hotel scheme. It is impossible to standardize kitchens for hotels rated by the number of rooms or seats in the dining rooms. This is because the dining service varies with the class of guests that patronize the hotel, the amount of patronage attracted from nearby places of business and service given to organizations, banquets and conventions. It is reasonable to expect that the equipment and service necessary to satisfy patrons who average twenty-five minutes for a meal will be entirely different from that needed for patrons who will average one hour for a meal. So many things enter into this phase of hotel operation that each case must be considered individually.

There are, however, certain underlying factors that are common to all cases and it is to these that attention will here be given. The kitchen is similar to a manufacturing plant where raw materials are received, processed and distributed. To do this, various kinds of cooking apparatus are employed, storage space for foodstuffs provided and facilities for food distribution and consumption furnished. The three elements involved in this

service are mechanical, human and food material. With the latter we have nothing to do in this article. The mechanical element has been so developed that suitable apparatus for every purpose is procurable. The efficiency of the human element, while influenced by proper mechanical devices, is controlled largely by a plan arrangement which permits of an easy and rapid execution of the orders. With these two requirements satisfied, economical operation is assured.

The square kitchen is ideal as in it the travel of the employees is reduced to a minimum. It is possible, however, to secure very satisfactory results from a rectangular plan. For economy of operation the kitchen should be on the same floor as the main dining room and adjoining it. When the size and shape of the room are determined, the height of the room, the

kinds of finish for floors and walls, the location of doors, windows and flues are to be considered. All of these have important bearing on the arrangement of fixtures. The kitchen should be 14'-0" high, but 12'-0" would be the minimum for satisfactory results. Temperature, ventilation and light are important. High temperature and odors must be prevented from escaping to other portions of the building. This is best effected by providing sufficient height to permit the instal-



Kitchen in Chase Hotel, St. Louis, Mo.



Kitchen in Chase Hotel, St. Louis, Mo.

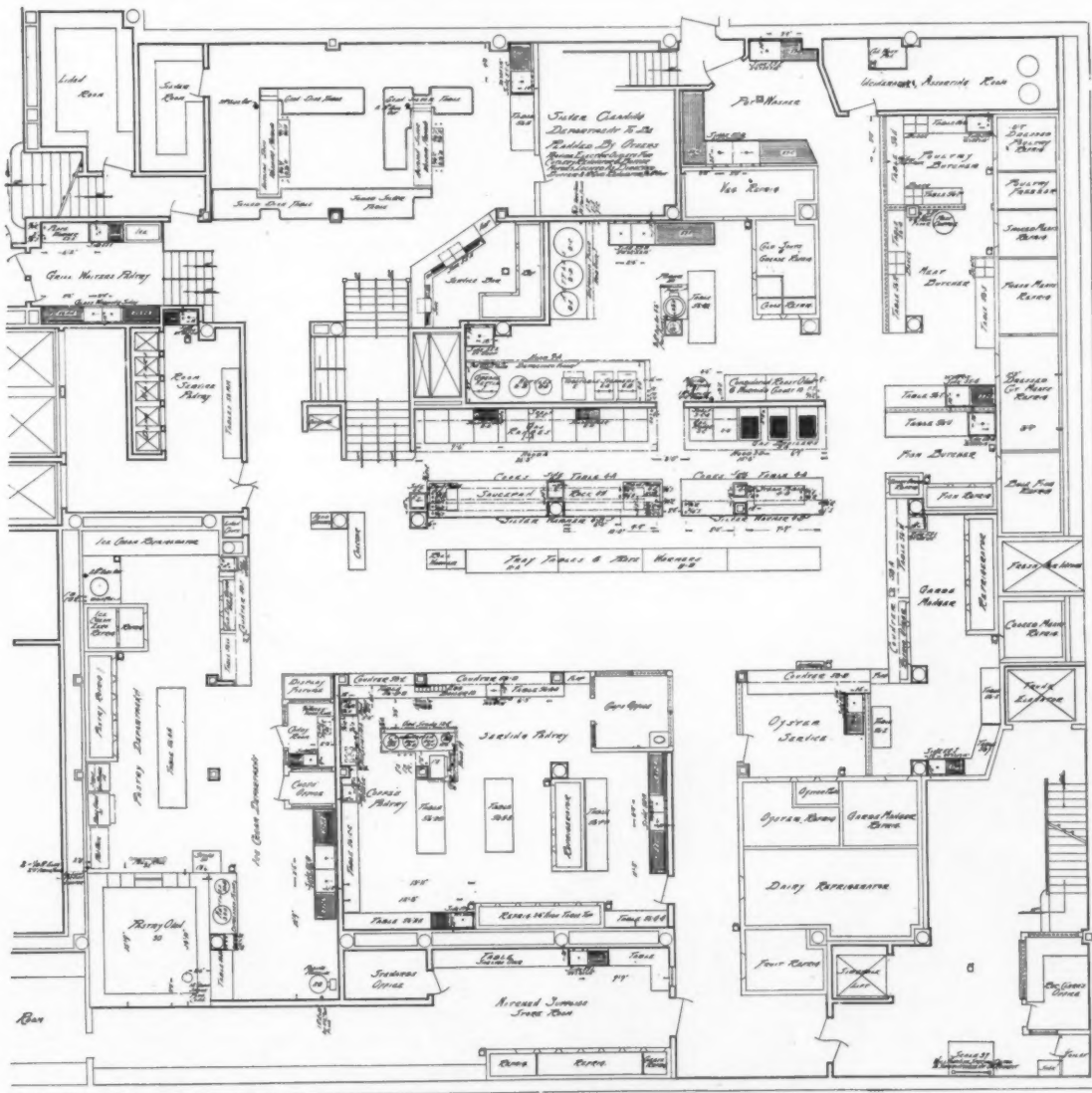
lation of suitable hoods over all ranges and steam tables which are connected by ducts which discharge into a suitable vent shaft. In most cases inducted draft is necessary and is produced by exhaust fans.

The range is the most important feature of a kitchen, the greater part of the food is cooked on it; every waiter must come to its serving table; everything in the kitchen must have a correct position in relation to it. The location of the range has an important relation to the doors leading to the dining rooms and to the smoke and vent flues. These three features must be considered together in order to secure the best results. The location of a dining room door leading to the

kitchen is of far more importance in a business sense than the location of the door in relation to the symmetrical development of an architectural decorative scheme in the dining room. The position of the range is of paramount importance and is the objective of all kitchen operations.

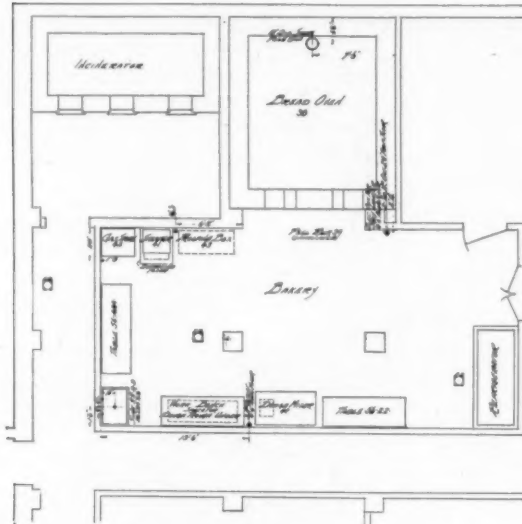
In front of the range is located the cooks' steam table. There should be at least 4'-0" between this table and the range to allow the cooks ample working space. In front of the steam table and about in the center of the kitchen is located the waiters' tray table, heaters for silver and plate warmers. This should be accessible from both sides.

To the back or side of the ranges should be located the vegetable preparation department pro-



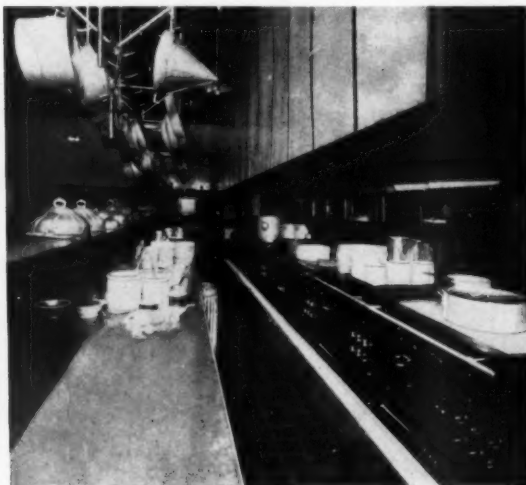
Main Kitchen Plan, Ambassador Hotel, New York

vided with as much light and ventilation as possible. Here are located the vegetable parer and steam cooker. Near the range and as close as possible it is desirable to locate the pot and pan sink. Here the big pots, pans and kettles are cleaned and passed on to the range with a minimum of travel.



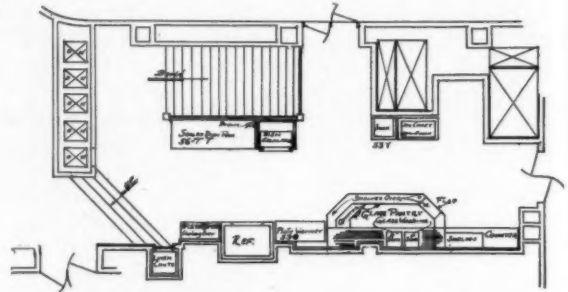
Bakery, Ambassador Hotel, New York

The accommodations for the butcher should be conveniently located. His refrigerators should be as close to the kitchen as possible and on the same floor. This also applies to the general refrigerator. In small and medium sized hotels the butcher is also an assistant chef and convenient location of his refrigerator is necessary to efficient operation.



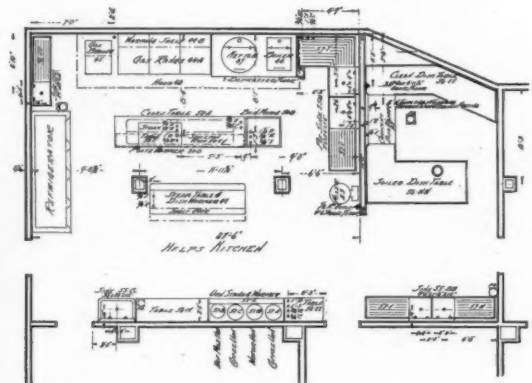
Battery of Electric Ranges, Chicago Athletic Association

Ample space should be allowed for the dishwashing department. A large soiled dish and scrap table is essential. In this department there should be ample storage space for clean dishes



Main Dining Room Pantry, Ambassador Hotel, New York

from which they are distributed to the plate warmers and other places. When dishwashing is not done in the banquet hall serving room, the storage capacity for dishes in the kitchen department should be ample for all banquet requirements. The glass and silver washing department, the silver cleaning and storage department should adjoin and connect the dishwashing department. The ideal situation for the dishwashing department is in the far end of the kitchen. This may mean more travel for the bus boys, or waitresses in the small hotel, but this labor is more than compensated for by the facility with which the cleaned silver and dishes may be distributed to their proper places.



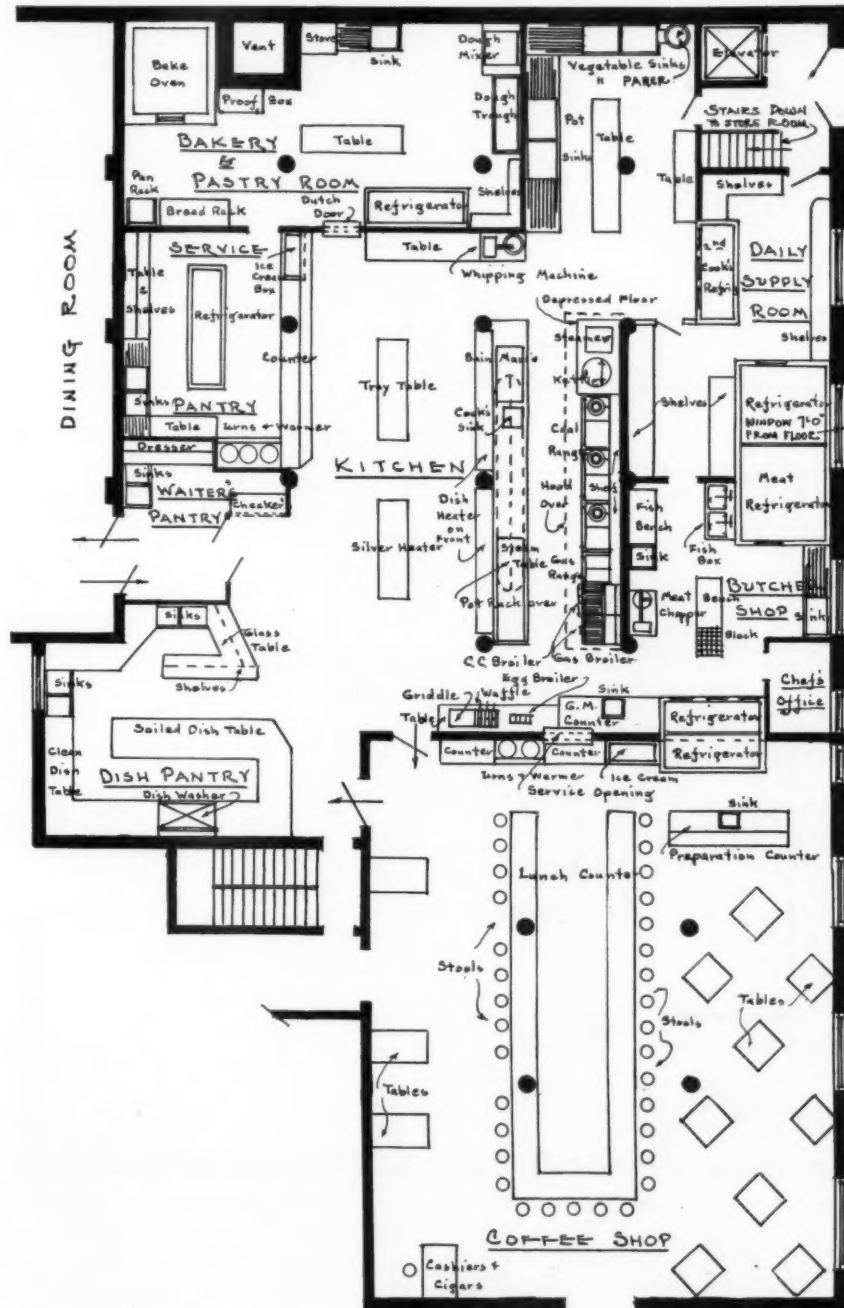
Help's Kitchen, Ambassador Hotel, New York

In large hotels the pastry and bake shop are entirely separate departments from the kitchen and operated by separate crews of help. In moderate sized hotels the bake and pastry shops are controlled by the same person and located within the kitchen space. The output of these shops is served to the waiters through the pantry in which are placed refrigerator boxes. The pantry is essentially a serving place from which ordinarily is dis-

tributed all of the pastry and bake shop provisions, ice cream, salads, coffee, tea and other foods not originating at the range.

The ranges are heated with coal, gas or electricity. All are equally efficient. The selection is sometimes controlled by the chef's department which usually has personal preferences. With

equal efficiency in producing a satisfactory product, the selection of kind may depend on the cost of operation based on fuel consumption. In some localities electric ranges and cookers are more cheaply operated than gas or coal consuming ranges. There are other features of operation other than the cost of fuel, which are important



Kitchen for a 200 Room Hotel, to Serve a Main Dining Room and a Coffee Shop

and should be considered in the final selection of this important equipment.

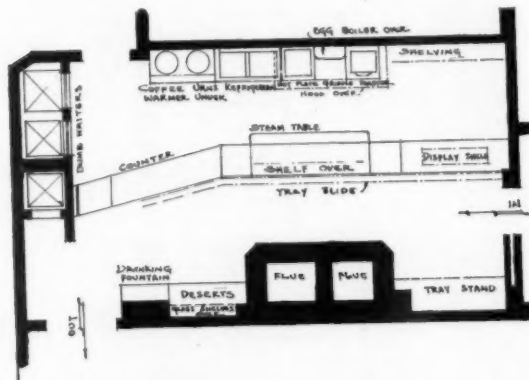
Banquet hall service pantries have various amounts of equipment. It should have refrigerator boxes in which the cold foods and desserts are stored. Often a steam table service is installed and in large hotels certain cookers and ranges are used. If there is no dishwashing equipment, the cleaning and scraping table is provided. In any event this serving room must have close connection

that case refrigerators and coffee urns with serving tables constitute the equipment.

Of late years the coffee shop has become an important feature of hotel operation. In the majority of hotels this department operates after the main dining rooms are closed and affords an entirely different kind of service. The coffee shop should be located with a direct connection to the main kitchen if possible. The service pantry is the principal feature opening into the shop and also into the kitchen as near the main pantry as possible. This effects certain economies of operation. For this service are usually provided an electric stove and hot plate for griddles and waffles, coffee urn, complete pantry and refrigerator facilities sufficient to carry over after the main kitchen is closed.

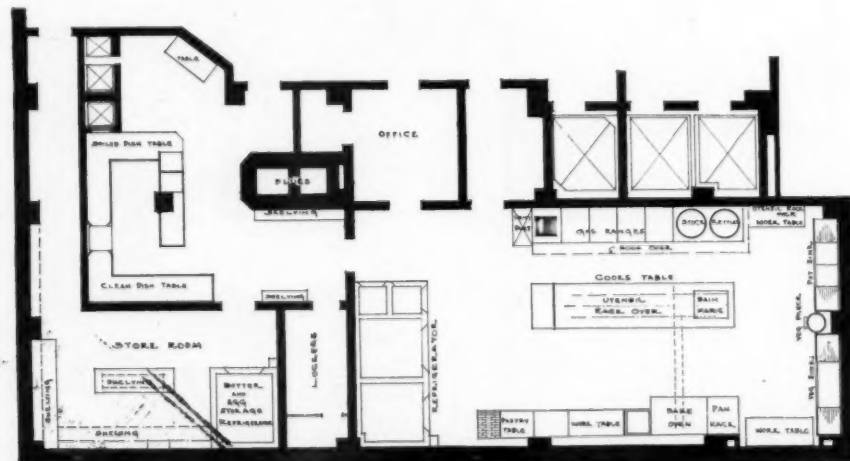
There is a great variety of equipment which enters into the furnishing of a complete kitchen. As before stated, its selection depends on the kind of dining service to be rendered. Economies in cost of installation and in available space demand the utmost care in selection and planning. While architects should possess a certain general knowledge of what constitutes essential kitchen equipment and its arrangement for use, it is reasonable to expect them to avail themselves of the services of those expert in this work. Competent engineers are employed by equipment manufacturers for this purpose.

Acknowledgment is made to Bramhall Deane Company and Duparquet, Huot & Moneuse Company of New York and the Edison Electric Appliance Company of Chicago for data and illustrations.



First Floor Cafeteria. Allerton House, Lexington Avenue and Fifty-seventh Street, New York City

with service elevators which are also convenient to the main kitchen. Often the subveyor equipment is sufficient to transport the food and dishes from the main kitchen to the serving pantry and thus eliminate the steam table and cooking equipment. In



Basement Floor Kitchen, Allerton House, Lexington Avenue and Fifty-seventh Street, New York City

PLUMBING and WATER SYSTEM in HOTELS

BY E. A. BERNSTROM, Sanitary Engineer, of Clyde R. Place, Consulting Engineer*

WATER in some form is used in the hotel solely for sanitary purposes. Its use for the extinguishment of fire is the exception. It is thus apparent that the treatment and distribution of water are things of the utmost importance. While a multitude of things is done to and with water, a water system is made up of but a few general divisions. Although a vast amount of material and machinery is used in such a system, its designing is a logical process of analysis of the two elements—the required service and the means of its accomplishment. It may be thought by some that the selection and placement of the usually visible plumbing fixtures are the most important things that constitute the design of a water system. This is not true either from the consideration of cost or operation.

Before a design can be outlined two points must be established: the normal dependable water pressure in the street mains and the necessity or desirability of softening and filtering the water. There is sometimes sufficient initial water pressure to flush sanitary fixtures up to certain elevations and if the water is soft and clean, with this pressure it can be circulated direct to all points where cold water is used. This condition is not usually found.

Most sources of water supply, except from some deep wells, are such that filtering is necessary at the building. Municipal filtration plants remove the bulk of the mineral, vegetable and bacterial impurities to the extent that the water is sanitary but even with this condition it is often advisable to install filters better to prepare it for use.

Unless the water is practically free from hardness, it should be softened. Water hardness affects every portion of the system where hot water is used and every place where cold water is used except the flushing of water closets and urinals. Hard water deposits scale in steam boilers, causing the heating value of the coal to be greatly reduced, liability of burning out flues or boiler sheets and a continual expense of removing accumulated scale. Hardness also deposits scale in the hot water heater or generator and in the hot water system of piping leading therefrom and affecting the action of all hot water valves. This results in slowing up the heater or generator, retards the circulation of hot water and the eventual necessity of installing a new system of piping in order to secure satisfactory circulation. Hard water makes necessary the use of an excessive amount of soap and fabric destroying chemicals in the laundry.

Hard water in the lavatory and bath is never satisfactory to guests. It is a source of expense in that the cleaning of these fixtures requires the use of strong cleansing compounds which quickly destroy the enamel or glaze finish. Water softening apparatus employing the use of zeolite in some form is well adapted to hotel use, but sometimes conditions warrant the use of a lime-soda system.

The water usually will pass from the meters to the water softening plant, thence through the fil-



Typical Bathroom, Hotel Statler, Buffalo, N. Y.

ters to the surge or suction tanks. (Such water as may be used for flushing the lower story water closets and urinals can be piped direct from the meters. From the surge tank the water passes to the house pumps and the "underwriters' fire pump," all of which discharge into the house tanks which are located in the penthouse on the roof or elevated above the roof on a supporting structure.

The house tanks are then the source of supply for all water service except as mentioned. At this point the water is separated for the cold and hot water service.

The cold water service is drawn from the house

*Grand Central Terminal, New York City.

tank through overhead mains from which runouts connect with vertical service pipes which supply the water closets, baths and lavatories. These pipes decrease in size toward the bottom and terminate at the lowest fixture. A service pipe is installed to supply cold water to the kitchen, barber shop, laundry, refrigerator condenser and ice freezing cans and drinking water cooling tanks and coils. From the overhead cold water supply connection is made to the fire standpipes to which fire hose is attached on each floor. These standpipes are also connected at the bottom with a main to which is connected the Underwriters' fire pump and the Siamese valves placed on the exterior walls at the sidewalk for the Fire Department connection. Check valves are placed in the connections from the Siamese valves to the main which supplies the standpipes, having a drip valve between them so as to drain this intervening pipe. Check valves are placed at the head of the standpipes and in the discharges from the fire pump to the house tank and to the standpipes. They are set so that when the pressure from the fire pump and the fire engines exceeds that of the house tank, the house tank is closed to the standpipes.

Dry standpipes are often installed on the outside of the building, usually on fire escapes. They have a Siamese hose connection at the sidewalk, hose valves at each floor and extend over the top of the wall with valve at the top.

The drinking water system consists of water coolers located near the refrigerating machine. These coolers are steel tanks in which is placed a coil into which ammonia is expanded or through which cold brine is circulated. The cooled water is drawn from the cooler by circulating pumps which discharge into a main riser to the attic from which point it is distributed through mains, branches and supply risers to each faucet which is usually installed at each lavatory. Connections are also made to public drinking fountains in the corridors, lobbies, kitchens, laundries and other work places. The bottoms of the risers connect with a return system of piping to the coolers. At the base of each riser a check valve is installed against the circulating pumps to insure the proper movement of the water. A balancing tank with ball cock, vent pipe and overflow is provided in the attic. In this system the cold drinking water is continuously circulated by the pumps, insuring service at each outlet.

A water service is furnished at the sidewalk and in the alleys with sill cocks to which hose is attached for washing the sidewalks and pavements.

A separate cold water pipe connects the house tanks with the hot water heaters. The hot water heater is a large steel cylindrical tank in which is inserted a removable steam coil usually made of copper tubing. The work is based on heating a certain volume of water from 50° to 180° F. per hour with steam at 50 pounds gauge pressure

at the heater. The heater should be large enough to provide sufficient storage capacity of hot water to supply the demands of the peak loads. From the heater a hot water riser extends to the attic at which place horizontal mains and branches connect with the vertical hot water supplies to the lavatories and baths. The bottoms of these vertical supplies are connected into a return system of piping to the heater. In this way the hot water is made to circulate continuously by house tank pressure and provide immediate hot water service at all fixtures. Hot water service is extended to the kitchen, barber shop, laundry and other places.

In addition to the hot and cold water service to the laundry, high pressure steam is supplied to the washers, tumblers, flat work ironers and presses. Steam is also supplied to the kitchen steam tables, serving pantries, warming ovens and garbage can sterilizer.

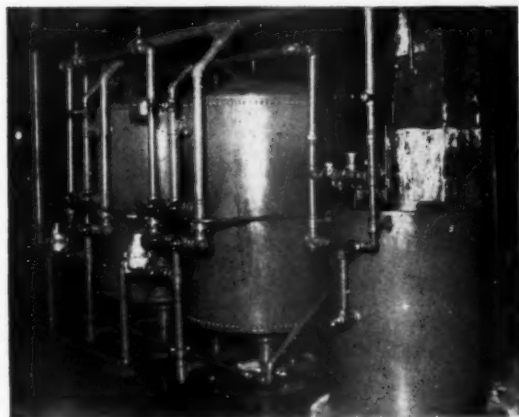
If a sprinkler system is installed in the boiler room and basement carpenter, paint and repair shops the supply can be taken direct from the street supply. If a system is installed for shops and storage rooms in the attic the supply can be taken direct from the house tank. In either case the minimum required pressure must be maintained. If this pressure is not furnished for an attic sprinkler system by the house tank, it is necessary to furnish a storage tank maintained under a specified pressure by an automatic air compressor.

The plumbing, in general, consists of two parts: the supply and waste systems. The supply system has been described. The waste system consists of two services, sanitary and storm water.

The storm water drainage conducts the rain water from the roofs, open loggias, balconies and marquees to the street, alley, storm sewer or cistern as the final disposal demands. At the top of each of these downspouts or leaders is installed a suitable downspout head with strainer. These should be selected with care, the principal requirements being ability to strain out all solid matter washed off the roofs and a construction that permits of a perfectly watertight connection to the roofing material and a removable gravel or sediment basin.

The drainage from the sanitary fixtures is made through traps into the horizontal wastes leading to the vertical soil pipes. Each trap is ventilated through a pipe connecting with a vertical vent pipe which enters the soil pipe above the highest fixtures, the soil pipe extending through the roof as may be required by local regulations. The soil pipes are connected under the basement floor with an underground drainage system discharging into the sewer. When the sewer level is above the basement floor level, the drainage system is suspended from the first floor construction, discharging into the sewer. Under these conditions the waste from toilet fixtures containing solids and from the laundry washers and extractors is conducted to auto-

matic ejectors operated by compressed air discharging to the sewer. Liquid waste from the refrigerating machinery, boiler blow-off and seepage is conducted to a sump from which it is discharged to the sewer by automatic sump pumps. The compressed air storage tank also serves as a source of supply for the pneumatic tube system, the elevator door operating devices and for cleaning machinery. The laundry washers and extractors usually waste into a trough or gutter formed in the concrete floor and pitched to the outlet. This waste with the water used in washing base-



Water Softening Plant, Hotel Patten, Chattanooga, Tenn.

ment floors is conducted to a trap with strainer. The connection between these drain traps and the floor must be watertight.

The wastes from the showers and urinals are important. These, of course, have strainers covering the opening. Under the receptacles there is usually placed a safe made of sheet lead or a built-up membrane. The better types are known as double drainage fixtures. The bottom of all pipe shafts which are not carried through to the basement should have waterproof floors with drains, to provide for any leakage from the hot or cold water supplies. Imperfect drainage results in unsightly stains and damage and is usually extremely difficult and costly to correct.

Where vacuum cleaning systems are operated from a central plant, pipes must be run to stations on the various floors with outlets generally located in the corridor baseboards or in utility closets opening to the corridors. This system of piping must be tight, made with long sweep fittings to prevent obstruction and clogging and have special caps on the outlets. At the machine in the basement is installed a dust separator. In some hotels an electric cleaner is used with the dust receptacle and motor on castors, operated through electric outlets placed in the baseboard of the rooms.

The plumbing fixtures, in the main, consist of those in connection with the bathrooms. The lavatories are either made of vitreous china or enamelled iron. The cost generally decides which kind is to be used. They should be of ample size to permit of comfortable use. The pedestal or wall bracket type is used, the selection depending on the cost. Sanitary open overflows, combination single stream hot and cold faucets, chain and plug stopper, with ice water faucet when used, are most satisfactory. The plug and stopper with running water are essential to the most sanitary conditions. A combination of faucet discharge and lavatory bowl such as will prevent splashing is essential and best determined by trial. Less expensive lavatories are usually provided for the help. Special shaped lavatories with shampoo fixtures and manicure tables with bowl, faucets and waste are provided in the barber shop.

Bath tubs of the built-in corner or recess type are used to save space. They are made of either vitreous china or enamelled iron. The open overflow and waste with chain and plug are preferred as being more sanitary. The style of faucets is immaterial as their durability is the important factor. The shower should have a properly designed receptor of tile, terrazzo or porcelain with non-slip features. It should be so shaped that water cannot escape to the adjoining floor. Waterproof safes should be placed under the receptor made either of sheet lead or membrane waterproofing and a non-leaking floor drain with strainer should be used. A hot and cold water mixing device is used which discharges the water through a spray head which should have a removable face so that it can be cleaned of corrosion. If the compartment is of sufficient size, fixed heads are desirable as jointed heads require care to maintain in working condition. The mixing mechanism and floor drain are the important details of the shower bath. The plate glass door with brass frame and jamb, in lieu of the canvas curtain is desirable in every way.

The water closets should be of the extended-lip siphon jet type with maximum water surface and minimum soiling surface and operated with a flush valve. The seat should be of the two piece open front and back type. The flush valve is the important feature and should be durable, economical in water and noiseless in operation. If tanks are used, the low down tank is preferable.

Urinals are of two types. One is the siphon jet vitreous china one-piece stall with receptor, flush valve and drain. In this type the floor drain is very important and it should be of the double drain type to prevent leakage. The other type consists of urinal bowls in stalls made of marble, slate or metal, having concealed wastes and supplies. In some localities water is so inexpensive that automatic flushing apparatus is used in lieu of the hand operated flush valves. A very

important factor in connection with the urinal is so to detail the floor that perfect drainage is secured.

All water supplies of whatever kind should have valves at the fixture, all service risers should have valves at the top or both top and bottom so that they can be cut out for repairs. All heaters, filters, water softeners, pumps and other equipment should be by-passed so that service can be maintained at all times.

The gas piping system connects with the street mains and from the meter is distributed to the stairways for exit illumination; to kitchens, baking ovens, garbage incinerator, serving pantries and grills; for cooking, warming and destruction purposes; to cigar stands and the machinery rooms.

The kind of pipe used depends largely on the cost. Galvanized steel or wrought iron is used for the cold water service, fire standpipes, pump discharges, downspouts or leaders, soil and waste

pipes, vent stacks, house drains, cooled drinking water system and compressed air system. Black pipe is used for the gas and vacuum cleaning systems. Brass pipe used for the hot water service is annealed seamless drawn tubing subjected to test. The brass fittings are usually of the extra heavy pattern. Lead pipe is only used for short length wastes from water closets and back vents. A deactivating device is used to eliminate oxygen from the hot water service, thus preventing corrosion in pipes other than brass.

Horizontal downspout lines and drains and horizontal cold water lines between street and house tanks and water lines exposed anywhere or in ceilings over rooms should be enclosed in a covering designed to prevent sweating. All hot water pipes and fittings should be covered in order to prevent loss of heat through radiation and all cooled drinking water pipes should be covered with a cork covering made and finished for this purpose.

The SUBVEYOR SYSTEM

BY F. W. HEATH, Mechanical Engineer*

SERVICE is the one thing paramount to all others upon which the successful restaurant manager depends to attract patrons to his dining room. Each type of restaurant has its standard of service. Whatever can be added to this service to expedite the handling of trays to and from the tables, without adding to the cost of the service pleases the patron that much more. Quiet, efficient serving of the food; the attention of the waiter or waitress during the meal, and the removal of used dishes without confusion are some of the things to be desired. Probably the most important item being the elimination of the noise occasioned through the rehandling of soiled dishes by the bus boys. It was to facilitate the latter operation that led to the designing of the subveyor.

It was formerly thought necessary to have the kitchen and dishwashing department located adjacent to the dining room, where the noise, confusion, and odors necessary in such a place was transmitted direct to the dining room. It has been the aim of all architects and engineers, when designing new hotels and restaurants, to eliminate as far as possible these unpleasant conditions.

The subveyor has made it possible for the kitchens, bakeries, and dishwashing department to be located on floors below or above the main dining room. Serving pantries take the place of the

kitchen. The materials are brought from the kitchen to the steam tables by means of the subveyor. Trays, pans, bus boxes, etc., are conveyed to the serving pantries and are returned again to the kitchen by the same means. The clean china



Descending Subveyor at the Left, with Conveyor to the Scrap Table; Ascending Subveyor at the Right

and silverware are conveyed by the same method from the various dishwashing and silver cleaning departments to the pantry. The soiled dishes are returned to the scrapping table where they are sorted, the china going to the dishwasher and the silver to the department for cleaning, buffing, etc.

The subveyor systems are so flexible that all conditions arising as to the locations of subveyors and dishwashing department can be met satisfactorily. The machine itself runs continuously, being motor driven and direct connected to worm and worm wheel operating in a cast iron housing, subjected

*Samuel Olson & Co., Chicago and New York.

to a continuous oil bath. The subveyor is built as fool proof as it is possible to make it after years of experience. The trays, pans, bus boxes, etc., are centered on the carrying flights automatically and limit switches, so located at top and bottom of the vertical travel, automatically stopping the machine in event the trays or boxes do not deliver off or are not removed at the various discharges.

A new device in connection with the subveyor has recently been perfected so that trays can be

the waiter depositing the tray of soiled dishes in the subveyor; the trays are lowered to the underside of floor, transferred to belt conveyor and in turn the belt conveyor redelivers the trays to another subveyor located in some other part of the building by which means the trays are elevated to the level of the soiled dish table and delivered to same automatically and without rehandling. All belts and other mechanisms can be hung from ceiling without interfering with head room.



Top of a Subveyor Before the Enclosing Partition is Installed



Top of a Subveyor



Bottom of a Subveyor Before the Enclosing Partition is Installed

loaded or unloaded automatically. This permits of locating the subveyor in the most convenient place in or near the dining room for the removal of soiled dishes. The waiter or bus boy delivers the trays to the subveyor and the trays are then lowered to the floor below or elevated to the floor above as desired. If the dishwashing department is not located immediately under or over the subveyor, the trays are conveyed by means of belt conveyors to any part of the building. This also permits of having the dishwashing department on the same level with the restaurant in which case the subveyor is located at the most convenient point in the dining room for the reception of trays,

Cost of operating is dependent on the size of the system. The power cost for one subveyor will not exceed thirty cents a day. The cost of upkeep is almost negligible. All bearings are either of the babbitted type or roller bearings equipped with "Alamite" grease cups throughout.

The fact that most of the larger hotels planned and built in the last year have installed systems of subveyors and that the smaller restaurants working on a small margin of profit find them necessary, proves that the subveyor is the most efficient means of transferring materials between the kitchen, pantries and restaurant.

The Fire Loss in 1922

THE current report of the Committee on Statistics and Origin of Fires of the National Board of Fire Underwriters gives the estimated fire loss in the United States for 1922 as \$521,860,000. This is a per capita loss of \$4.75. The fire loss and the per capita loss for 1922 surpass any fire loss figures yet recorded, even exceeding the loss in 1906, the year of the San Francisco conflagration. No large conflagrations occurred during 1922, but the reports bear evidence that there were more fires last year than in any preceding year.

As a striking contrast to the losses in the United States, the Committee presents the three-year record for Great Britain, as compared with the United States:

Year	Great Britain	United States
1920	\$42,445,000	\$447,886,677
1921	38,820,000	495,406,012
1922	30,812,000	521,860,000

From the best information obtainable, the population of Great Britain in 1922 was approximately forty-three million people, and the population of the United States for the same year was about one hundred and eleven million. The per capita loss in Great Britain last year was 72 cents and that of our own country for the same year was \$4.75. These figures are interesting as showing a continuing decrease in the British loss, while the reverse is apparent with respect to losses in the United States.

Tests Point Way to Safer Elevators

ABOUT three-fourths of all fatal elevator accidents are found to occur at the hoistway door, either because of the door being open when the elevator is not there or because of the elevator starting when the door is open. These accidents can be prevented by a reliable interlock, as when such a device is used the elevator must be stopped at the floor before the door can be opened, and

the door must be closed before the car can be started again.

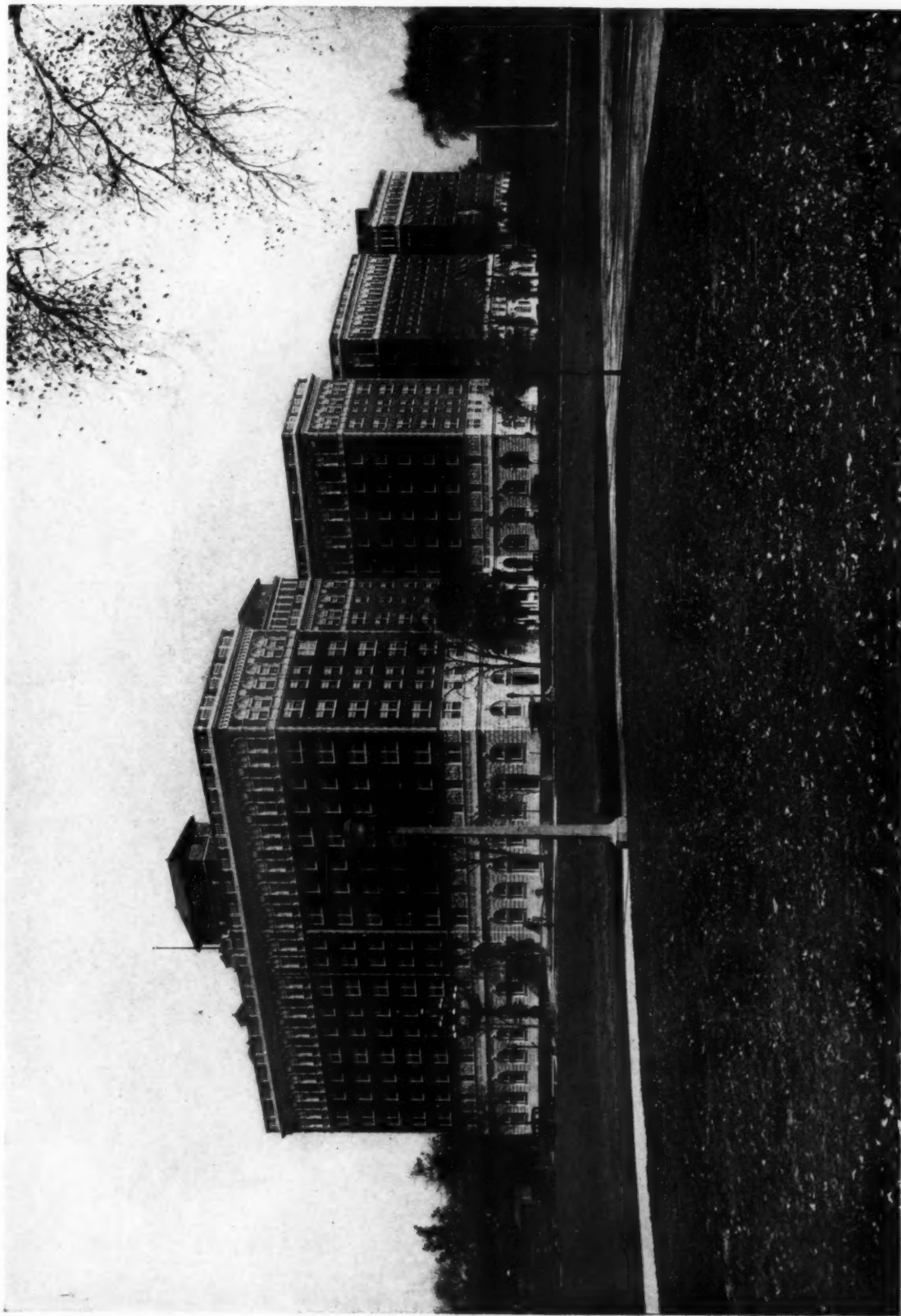
During the past year the Bureau of Standards has been conducting tests to determine the reliability of the various types now on the market. The devices have been given endurance tests under normal conditions, they have been tested in a corrosive atmosphere, in a dust laden atmosphere, without lubrication, and under conditions of misalignment likely to occur in practice.

The tests were conducted at the request of the City of Baltimore, and will permit city governments to base their approval of such devices on actual performance tests instead of on visual inspection alone. The results have also been made available to the manufacturers of the devices tested, and in most cases they have improved their designs in accordance with the suggestions offered.

Heat Transmission and Paint

THE aluminum or bronze paint generally applied to radiators greatly reduces their effectiveness and makes it necessary to have a larger surface for the same heating effect, according to experiments performed by Dr. W. W. Coblentz of the Bureau of Standards. Dr. Coblentz finds that the heat radiated from an aluminum painted radiator surface is less than a third of that emitted by a radiator of the same size painted with a non-metallic paint, enameled, or simply allowed to rust.

On the other hand he finds that aluminum paint is a very effective means of reducing the amount of heat transmitted through a thin material. Applied to the under side of a tent or awning it reduces by three-fourths the amount of heat from the sun which gets through the cloth, while if used on the cover of an automobile or ice wagon it cuts in half the heat let through and makes the temperature inside the vehicle more nearly that found in natural shade, thereby making it much more comfortable.



THE CHASE HOTEL, ST. LOUIS, MO.
PRESTON J. BRADSHAW, ARCHITECT



DETAIL OF LOWER STORIES

THE CHASE HOTEL, ST. LOUIS, MO.

PRESTON J. BRADSHAW, ARCHITECT



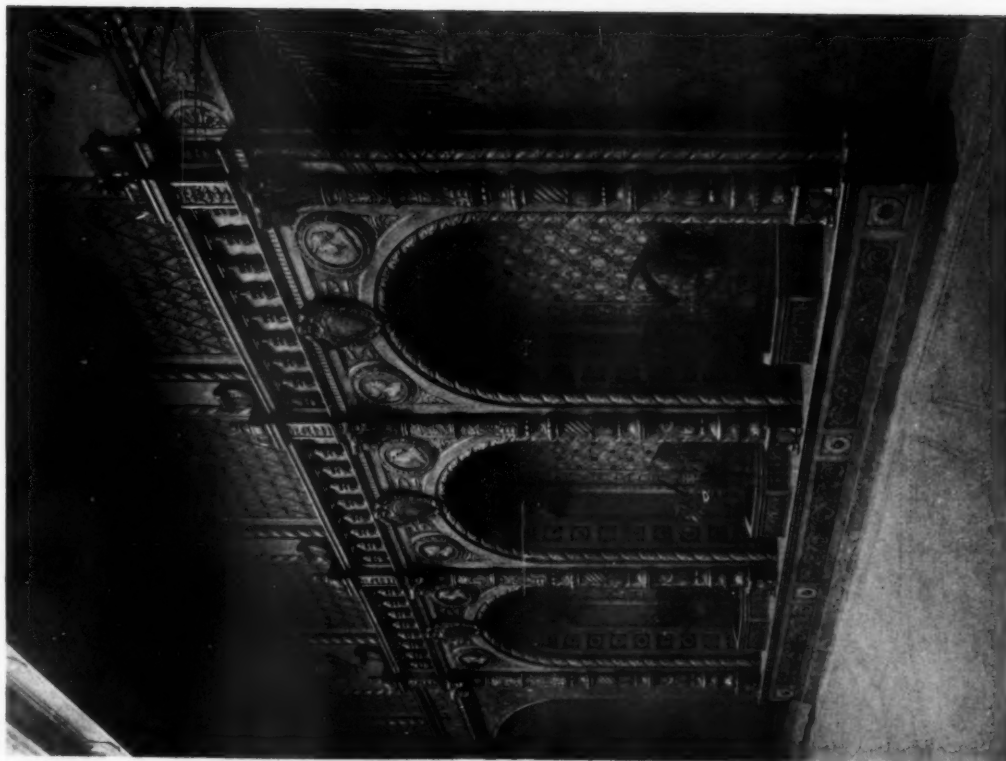
DETAIL OF UPPER STORIES
THE CHASE HOTEL, ST. LOUIS, MO.
PRESTON J. BRADSHAW, ARCHITECT



DETAIL IN COURT

THE CHASE HOTEL, ST. LOUIS, MO.

PRESTON J. BRADSHAW, ARCHITECT



THE CHASE HOTEL, ST. LOUIS, MO.
PRESTON J. BRADSHAW, ARCHITECT

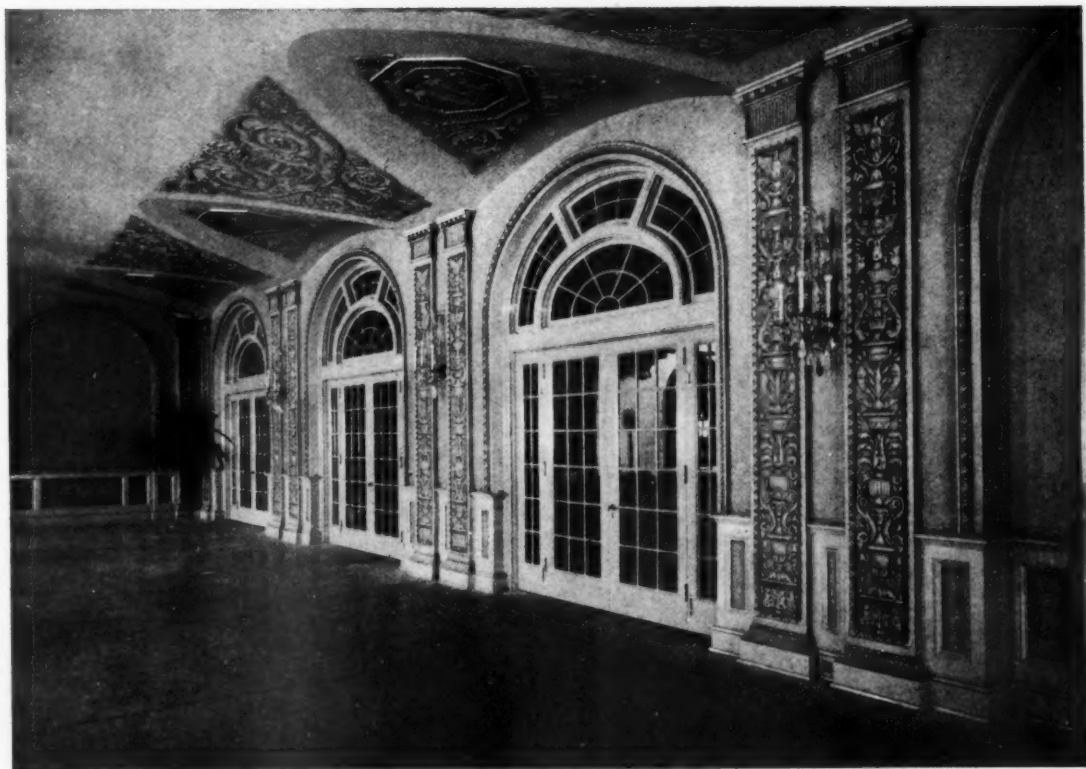
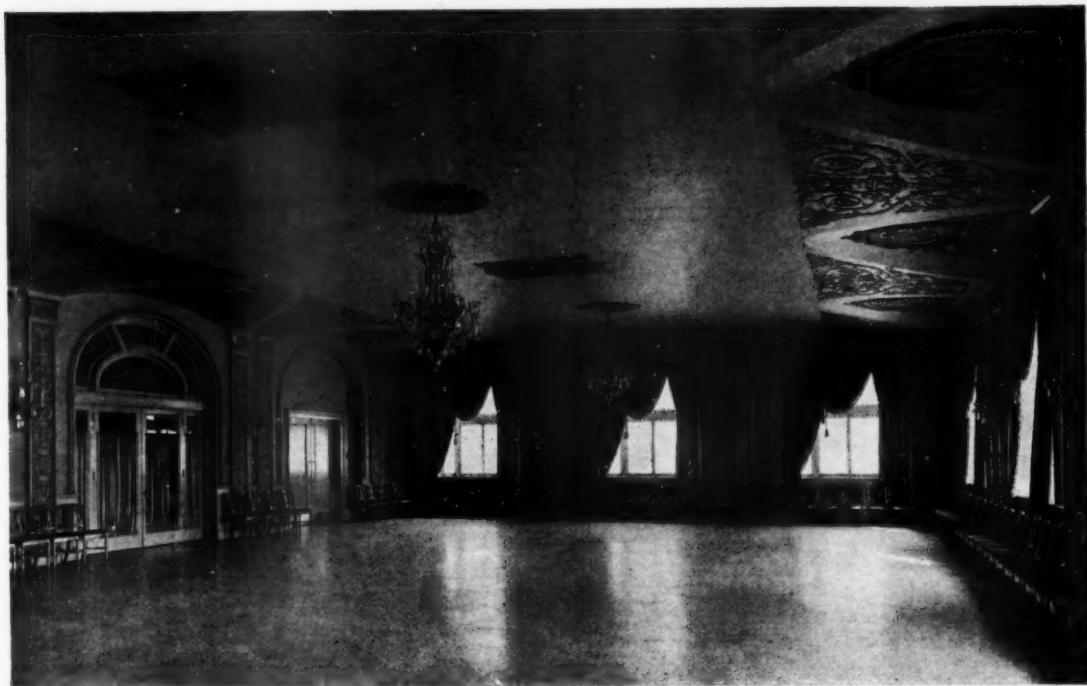


THE CHASE HOTEL, ST. LOUIS, MO.
PRESTON J. BRADSHAW, ARCHITECT

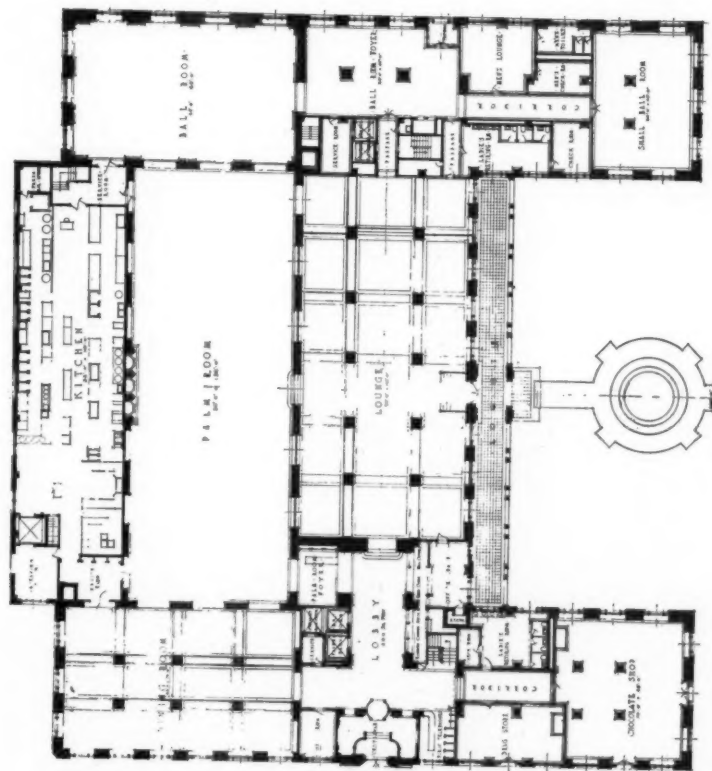


THE CHASE HOTEL, ST. LOUIS, MO.

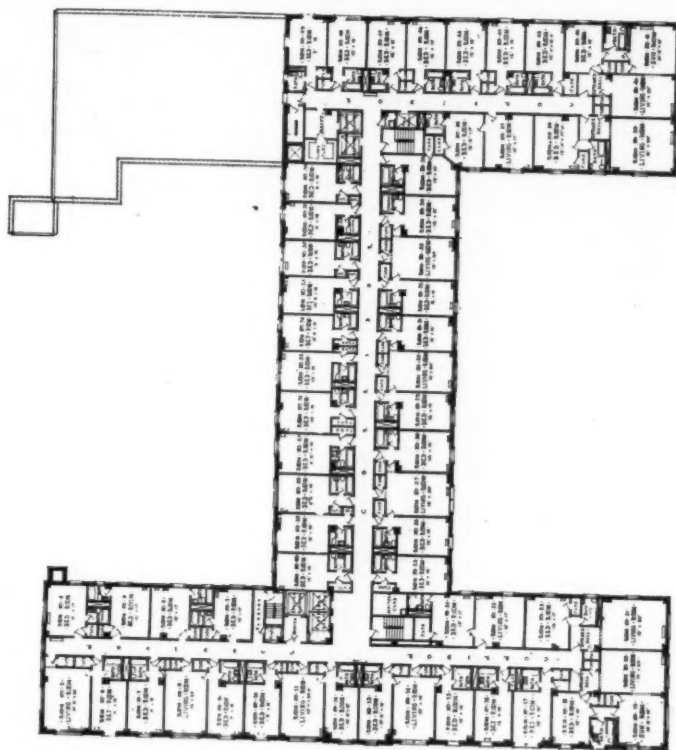
PRESTON J. BRADSHAW, ARCHITECT



THE BALL ROOM
THE CHASE HOTEL, ST. LOUIS, MO.
PRESTON J. BRADSHAW, ARCHITECT



GROUND FLOOR PLAN



TYPICAL FLOOR PLAN

THE CHASE HOTEL, ST. LOUIS, MO.

PRESTON J. BRADSHAW, ARCHITECT

BEAUX-ARTS INSTITUTE of DESIGN

ACTING DIRECTOR OF THE INSTITUTE—WHITNEY WARREN

ARCHITECTURE, RAYMOND M. HOOD, DIRECTOR—SCULPTURE, JOHN GREGORY, DIRECTOR

INTERIOR DECORATION—ERNEST F. TYLER, DIRECTOR

MURAL PAINTING—ERNEST C. PEIXOTTO, DIRECTOR

OFFICIAL NOTIFICATION OF AWARDS

JUDGMENT OF JUNE 5, 1923

CLASS "B"—V PROJET

"BUILDING FOR THE BEAUX-ARTS
INSTITUTE OF DESIGN"

There are three interrelated departments of the B. A. I. D.—Architecture, Sculpture and Painting. The exhibition room and the services are used in common.

The site, which is rectangular, is the end of a block; the length on the avenue is 200'-0" and the depth on the side streets is 150'-0". In addition to this there is a public service alley at the rear of the property running from street to street and 10'-0" wide.

The requirements are:

- 1—An entrance vestibule giving easy access to all floors and direct access for the public to the exhibition room.
- 2—Two offices for the administration of the school.
- 3—A large public exhibition room, common to all departments.
- 4—A sculptors' studio.
- 5—A studio for ornamental modelling.
- 6—A painters' studio.
- 7—A studio for mural painters.
- 8—An architectural atelier.
- 9—A library.
- 10—A series of 5 studios for the Paris Prize logists.
- 11—A series of 5 studios for advanced sculptors or painters.
- 12—A small apartment for a janitor.
- 13—Toilets, cloak rooms, freight elevators, etc.

In the basement (plan not required) will be the receiving and shipping room, storage, locker room, kitchen, etc.

Above the basement there will be two main floors, but a portion of the building may have a mezzanine if so desired.

JURY OF AWARDS:—W. Lamb, P. A. Cusachs, W. Warren, J. H. Freedlander, B. W. Morris, H. R. Sedgwick, E. S. Hewitt, G. H. Edgell, F. C. Hiron, H. W. Corbett, J. J. Haffner, A. Ferran, H. Gardner, S. Stevens, F. C. Hitchens, E. A. Park, O. Faulton, F. C. Disque, and W. J. H. Hough.

NUMBER OF DRAWINGS SUBMITTED.—209.

AWARDS:—

FIRST MENTION PLACED:—G. F. Trapp, Columbia Univ., N. Y. C.; W. C. Pyle, Carnegie Inst. of Tech., Pitts.; R. I. Powell and F. W. Roudebush, Princeton Univ., Princeton; H. B. Hoover, Univ. of Washington, Seattle; W. Faulkner, Yale Univ., New Haven.

FIRST MENTION:—A. E. Klueppelberg, Columbia Univ., N. Y. C.; J. F. Taylor, F. J. Taylor and W. W. Hibbs, Carnegie Inst. of Tech., Pitts.; S. Baum, J. Gambaro and W. Ferrari, Atelier Hiron, N. Y. C.; L. W. Ross, Harvard Univ., Cambridge; E. H. Potvin, H. G. Ripley, Jr., J. H. Raftery, Miss R. Hampson and Miss E. F. Cope, Mass. Inst. of Tech., Boston; E. O. Holien, W. A. Backstrom and R. P. Hennessey, Univ. of Minnesota, Minneapolis.

SECOND MENTION:—D. W. Barber, Atelier Barber-McMurry, Knoxville; J. E. Lambert, Catholic Univ., Wash., D. C.; H. H. Rabin, H. P. Maas, R. H.

Walter, E. C. Morris, D. E. Milone, A. Grossman and A. Goodman, Columbia Univ., N. Y. C.; J. R. Reed, S. Fiodelise, J. S. Wood, J. D. Mawhinney, H. L. Carter, W. F. Koppes, H. H. Thayer, A. H. Rousseau, A. M. Ham, G. O. Schoonover, A. B. Lowstuter, B. G. Martin, J. S. Douglass, A. D. Reid, D. C. Doig, M. A. Brace, J. A. Deacon, R. R. Young, E. M. McMillin, J. P. Crowley, A. K. Goehring, P. H. Slood, U. Schoenberger, J. Tiltotson, H. I. Lynch, L. Coussins, E. M. Plant, D. S. Garber, E. M. Gearhart, D. M. Patterson, G. B. Allison, C. A. Lundquist, W. S. Forsyth, Elizabeth Constantine, A. S. Vincent, G. D. Schade, M. B. Parker and K. O. Sonnemann, Carnegie Inst. of Tech., Pitts.; R. Frazier, Cleveland Sch. of Art, Cleveland; Mary McCullough, Atelier Denver, Denver; J. M. Leonte, Atelier Fougner, Newark; Dorothea Porter, E. Moore, C. M. Woodward, F. A. Elliott and F. Leota Soars, George Washington Univ., Wash., D. C.; H. W. Swenson, G. E. Kirkpatrick, H. Silverman, J. M. Judge and J. J. Murno, Atelier Hiron, N. Y. C.; H. J. Powell, W. T. Bogner, W. R. L. Josten, T. F. McDonough and D. B. Wetherell, Harvard University, Cambridge; H. A. Dallwigk and A. B. Mitchell, John Huntington Poly. Inst., Cleveland; G. B. Briney, Los Angeles Archtl. Club, Los Angeles; S. E. Davidson and S. Vogelgesang, Mass. Inst. of Tech., Boston; J. S. Shanley and A. P. Davis, Princeton Univ., Princeton; E. R. Willson, H. D. Davies and J. F. Mullins, Atelier Penn State-Penna. State College, State College; I. L. Johnson, H. F. Bossert and F. Eiseman, Atelier Parsons-Chicago Archtl. Club, Chicago; A. E. Hansen, Southern Branch-Univ. of California, Los Angeles; F. C. King, Jr., Syracuse Univ., Syracuse; G. E. Koster, San Francisco Archtl. Club, San Francisco; D. L. Bartels, Univ. of Southern California, Los Angeles; E. P. Newbury, T. Jacobsen and E. W. Osgood, Univ. of Washington, Seattle; E. C. Johnson, J. W. Radotinsky, W. P. Cunningham and M. L. Sorey, Univ. of Kansas, Lawrence; E. D. Stevens, Univ. of Virginia, Charlottesville; E. Hawkins, M. J. Markuson, E. L. Johnson, T. L. Sime, J. A. Walquist, E. V. Nielsen and H. H. Witte, Univ. of Minnesota, Minneapolis; R. H. H. Hugman, Univ. of Texas, Austin; W. E. Herrick, Atelier Wynkoop-Seymour, N. Y. C.; W. H. Schilling, S. C. Haight, I. Horton-III, W. O. Williams, L. B. LaFarge, C. F. Ferrari, H. P. Staats, R. W. Ramsdell, M. B. Smith and F. C. Johnson, Yale Univ., New Haven.

H. C.:—H. T. Turner, L. Perry and A. I. MacDonald, Columbia Univ., N. Y. C.; V. A. McGowan and V. Galier, Carnegie Inst. of Tech., Pitts.; C. H. Kellogg, Atelier Denver, Denver; L. A. Whelan, Harvard Univ., Cambridge; S. Pokalsky, Atelier Penn State-Penna. State College, State College; S. M. Cundiff and G. V. Palmer, Univ. of Southern California, Los Angeles.

CLASS "A" AND "B" ARCHÆOLOGY—VI PROJET
"A SALON IN THE STYLE OF THE
GREEK REVIVAL"

The Greek revival in the United States may be said to be due to the influence of a work on Athens by Stuart and Revett, which was published the latter part of the eighteenth century. Early in the following century Greek monuments began to influence European architecture, and about a quarter of a century later this influence made itself felt on this side of the Atlantic.

Latrobe designed the first Grecian portico in the United States in an edifice in Philadelphia, which is now the Girard Bank. This portico was universally admired and created its influence by immediate imitation. This

style became an official one throughout the country and remained so until about 1860. States and cities followed the lead of the Federal Government. Private dwellings, both in town and country, appeared in this style, the distinguishing feature being a Greek order accurately proportioned, but executed in wood. Later there appeared from France the Empire and Neo-Grec variations, which were combined with the later American interpretations. Unsuitable for wooden forms, this style served the purpose nevertheless of familiarizing the public with an orderly and harmonious assemblage of studied architectural compositions.

Throughout the South examples are found grouped around Savannah, Baltimore and Charlottesville, and in the North around Philadelphia and New York and throughout the New England States. New York City is rich in examples particularly around Washington Square and Old Chelsea. The Southern examples are inferior for in most cases their originators were dependent on their own scanty knowledge and the assistance of unskilled slave labor, while the North had access to publications and trained artisans, at least in the large cities.

Summing up, the most notable characteristics of the Greek revival are the use of the Greek orders and proportions, with architraves, ornaments and mouldings inspired by Greek tradition.

This problem is to design a salon in a private dwelling. The room is 36'-0" long, 24'-0" wide and 14'-0" high in the clear. On one of the long sides occurs a fireplace flanked by two windows.

JURY OF AWARDS:—P. A. Cusachs, W. Warren, B. W. Morris, E. S. Hewitt, H. W. Corbett and A. E. Flanagan.

NUMBER OF DRAWINGS SUBMITTED:—25.

AWARDS:—

SECOND MEDAL:—S. R. Moore, Columbia Univ., N. Y. C.; J. D. Tuttle, E. V. Gauger and H. R. Russell, Univ. of Illinois, Urbana.

MENTION:—L. Timotheeff, Columbia Univ., N. Y. C.; E. E. Lundeen, A. Fordyce, R. Billerbeck, C. O. Beeson, Alberta Raffl, Elizabeth Kimball, A. S. Phillips, C. G. McTaggart, Fay N. Harris, W. D. Sorgatz, C. L. Martin, R. D. Henderson, J. A. Drielsma, C. A. Kissinger, J. D. Jeffers and J. H. Chance, Univ. of Illinois, Urbana; J. L. Evans and T. Wharton, Univ. of Pennsylvania, Phila.

The New School of Fine Arts at New York University

THE first university instruction in Fine Arts given in the United States was inaugurated by New York University on its foundation, through the appointment to its faculty in 1832 of Samuel F. B. Morse, then President of the National Academy of Design. Now, through the generous support of the Altman Foundation, the chair has been established.

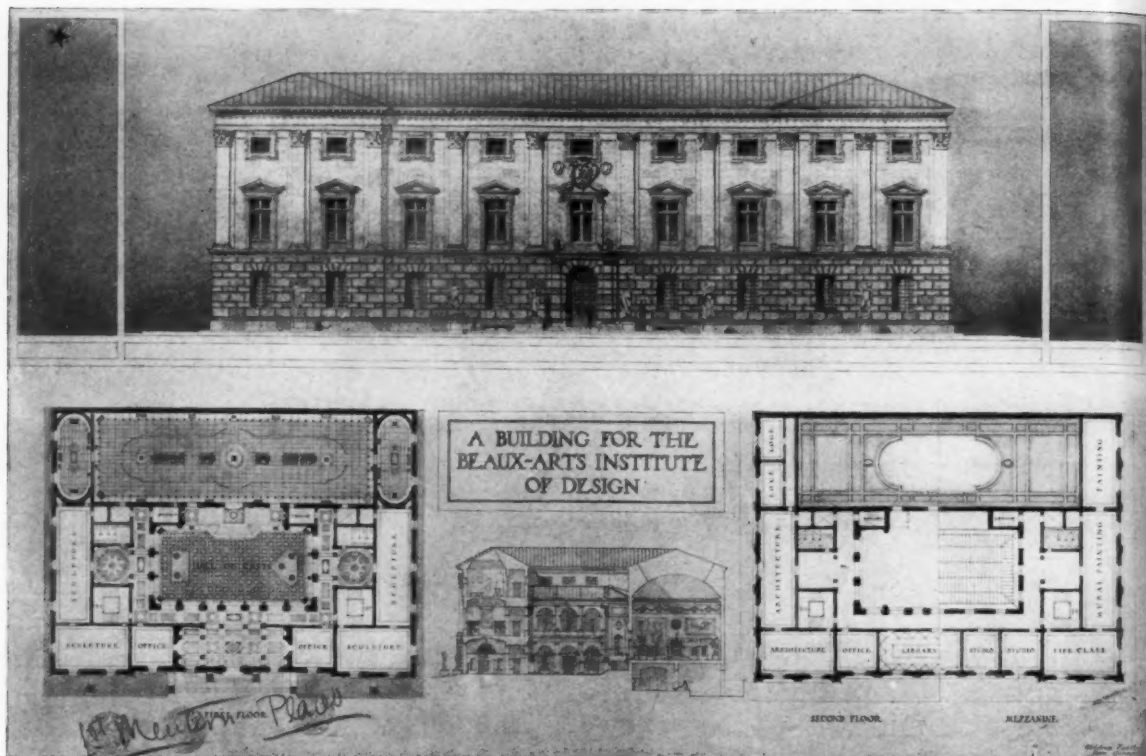
A faculty has been assembled under the direction of Fiske Kimball, formerly head of the School of Fine Arts at the University of Virginia, who will hold the Morse Professorship. The study of Italian art will be in charge of Dr. Richard Offner, who now returns after some ten years devoted to research in Italy. Dr. R. M. Riefstahl, known for his writings on textiles and Mohammedan art, will lecture on historic textile fabrics, on tapestries, and on oriental rugs; while Mr. William M. Odom, author of the "History of Italian Furniture" and director of the New York School of Fine and Applied Art in Paris, will give a series of lectures on interiors and decoration in France. A

course in the design of interiors and furniture will be under the general supervision of Mr. Francis Lenygon.

There will also be a number of special lecturers, headed by Edwin H. Blashfield, President of the National Academy of Design.

Through an agreement recently ratified, the old relation between New York University and the National Academy of Design has been restored and extended. The two institutions will offer a combined course for art students who wish also to secure a liberal college education. This will involve a college course of four years, of which the first three will be spent in the study of academic subjects in one of the colleges of the University, and the fourth year will be devoted exclusively to the study of drawing and painting at the Academy.

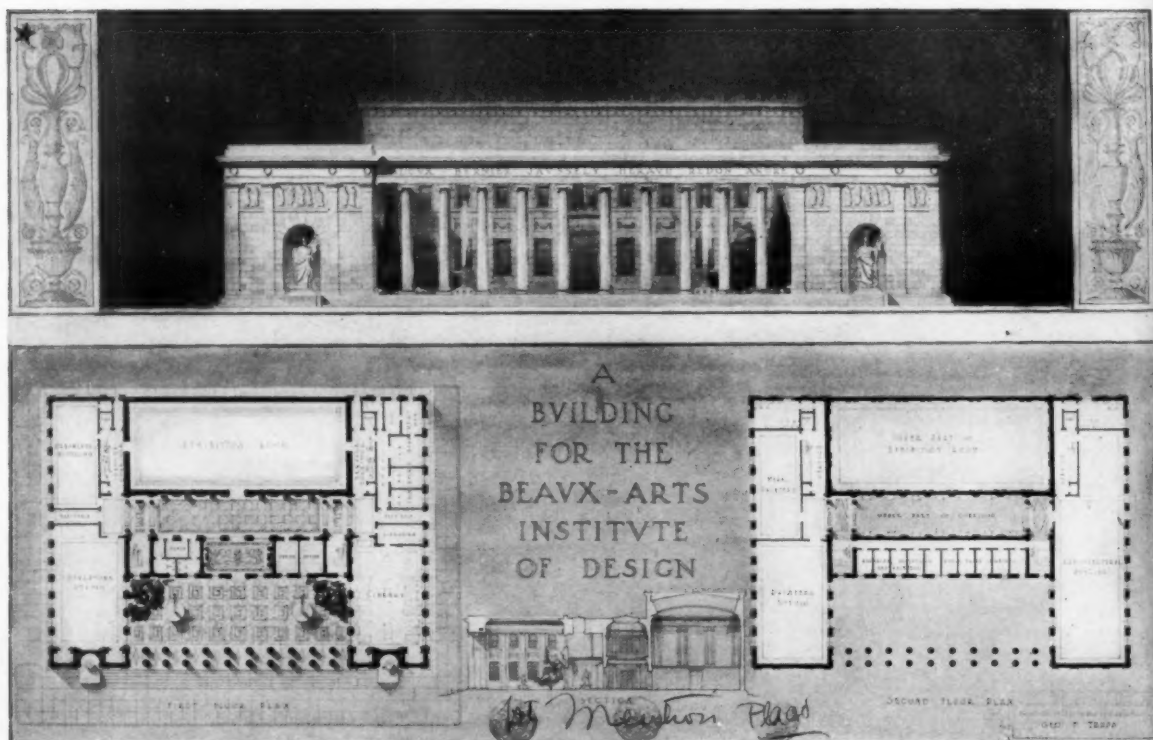
It has seemed an anomaly that in the city of New York with its valuable artistic sources, its public and private collections, and the display, constantly in progress throughout the city, of paintings, sculpture, and the decorative arts, there should not have been until now a great university department of Fine Arts. The need seems at last about to be filled.



W. FAULKNER

FIRST MENTION PLACED

YALE UNIVERSITY

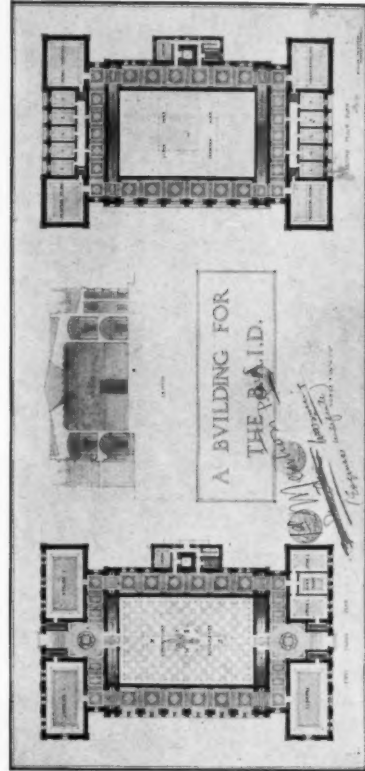
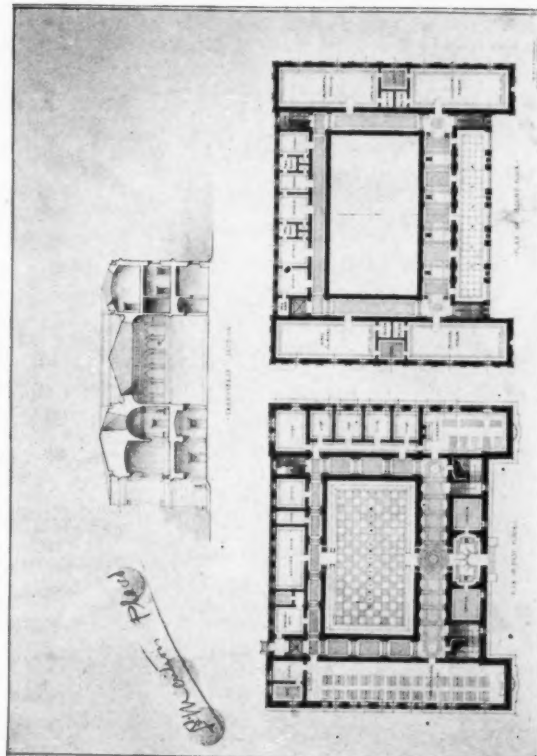
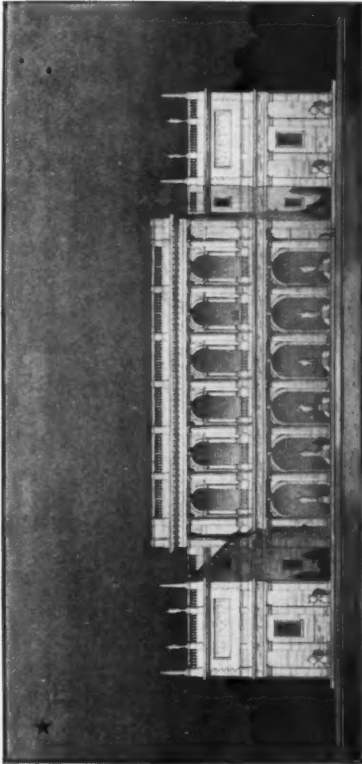
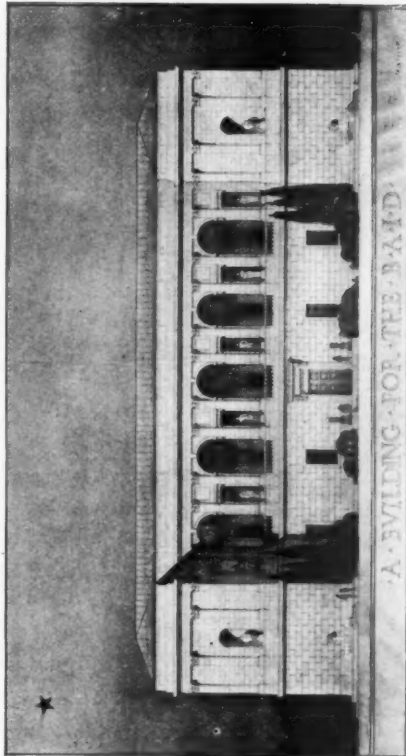


G. F. TRAPP

FIRST MENTION PLACED

COLUMBIA UNIVERSITY

CLASS "B"—V PROJ—A BUILDING FOR THE BEAUX-ARTS INSTITUTE OF DESIGN
STUDENT WORK, BEAUX-ARTS INSTITUTE OF DESIGN



F. W. ROUDEBUSH

FIRST MENTION PLACED

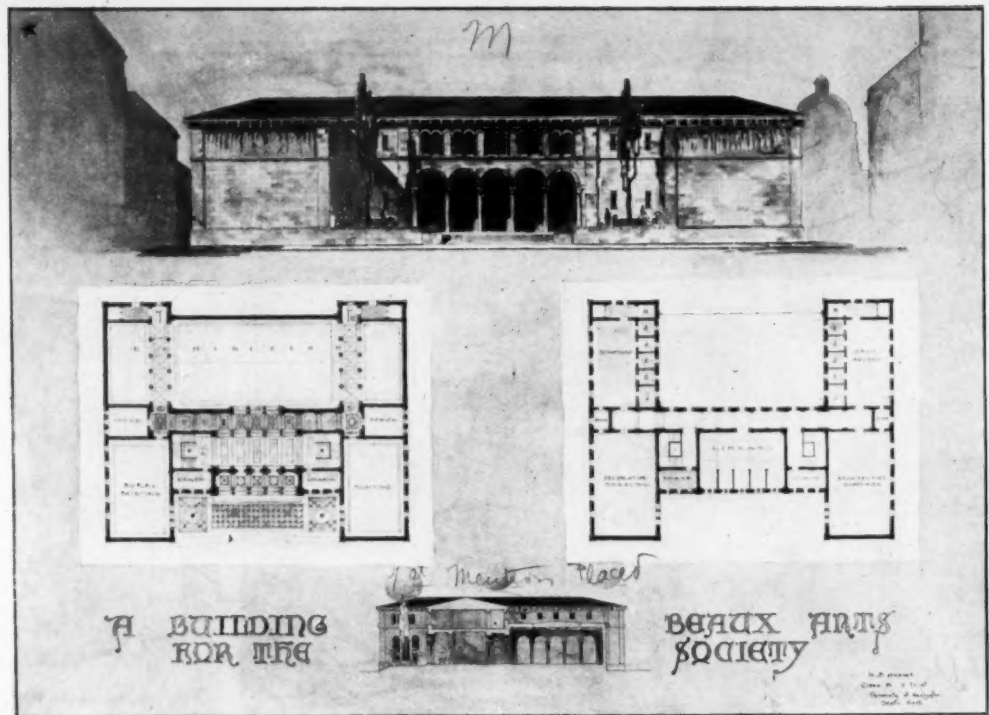
PRINCETON UNIVERSITY

CLASS "B"—V PROJET—A BUILDING FOR THE BEAUX-ARTS INSTITUTE OF DESIGN
STUDENT WORK, BEAUX-ARTS INSTITUTE OF DESIGN

R. I. POWELL

FIRST MENTION PLACED

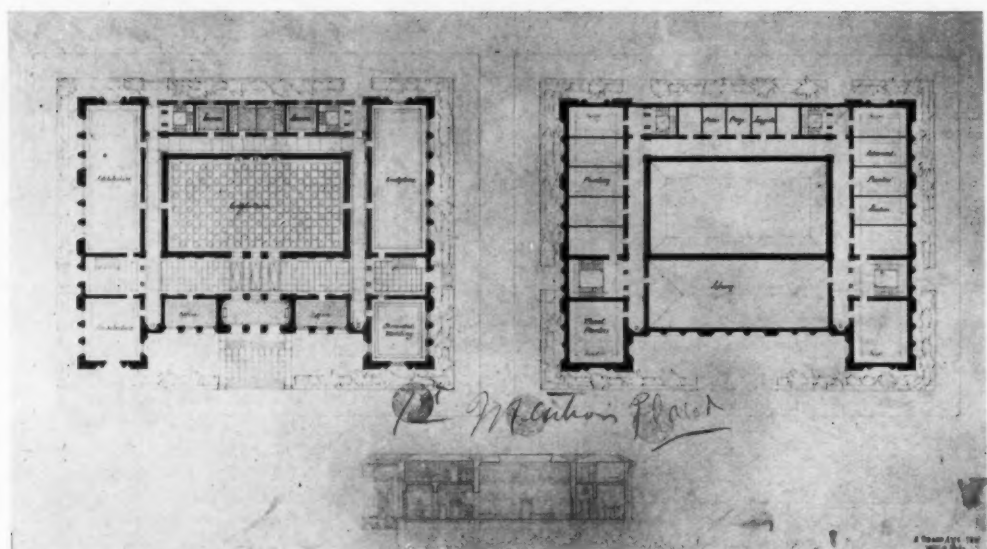
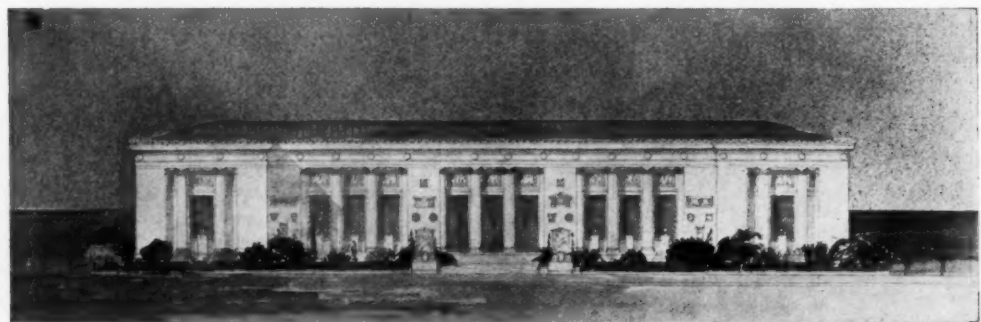
PRINCETON UNIVERSITY



H. B. HOOVER

FIRST MENTION PLACED

UNIVERSITY OF WASHINGTON

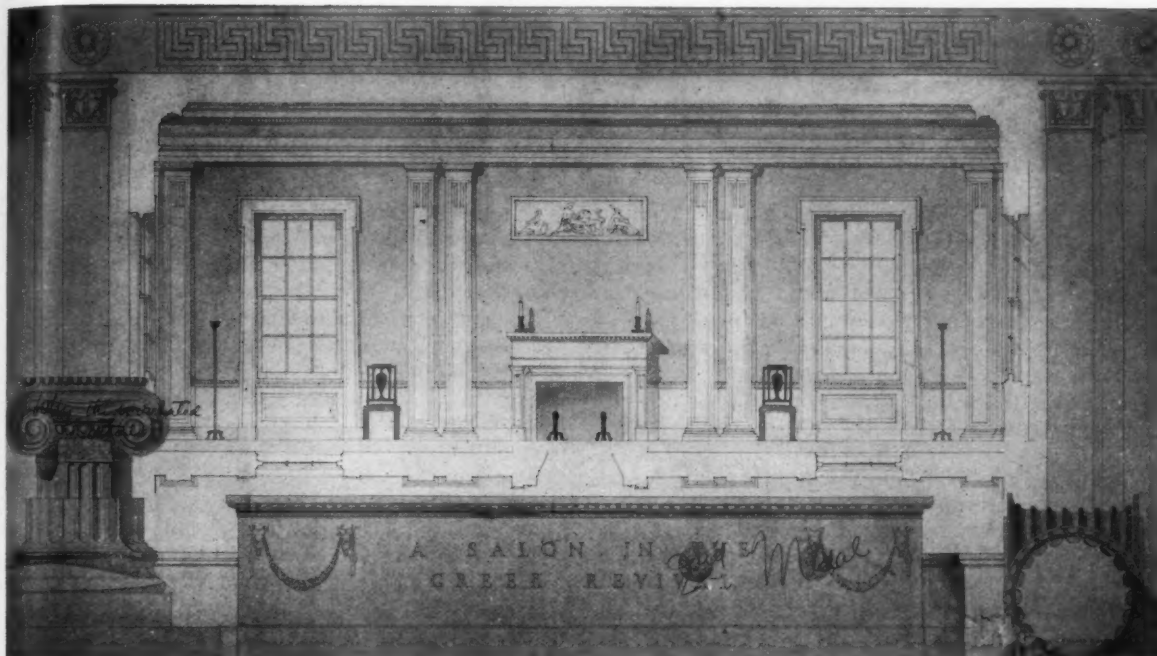


W. C. PYLE

FIRST MENTION PLACED

CARNEGIE INSTITUTE OF TECH.

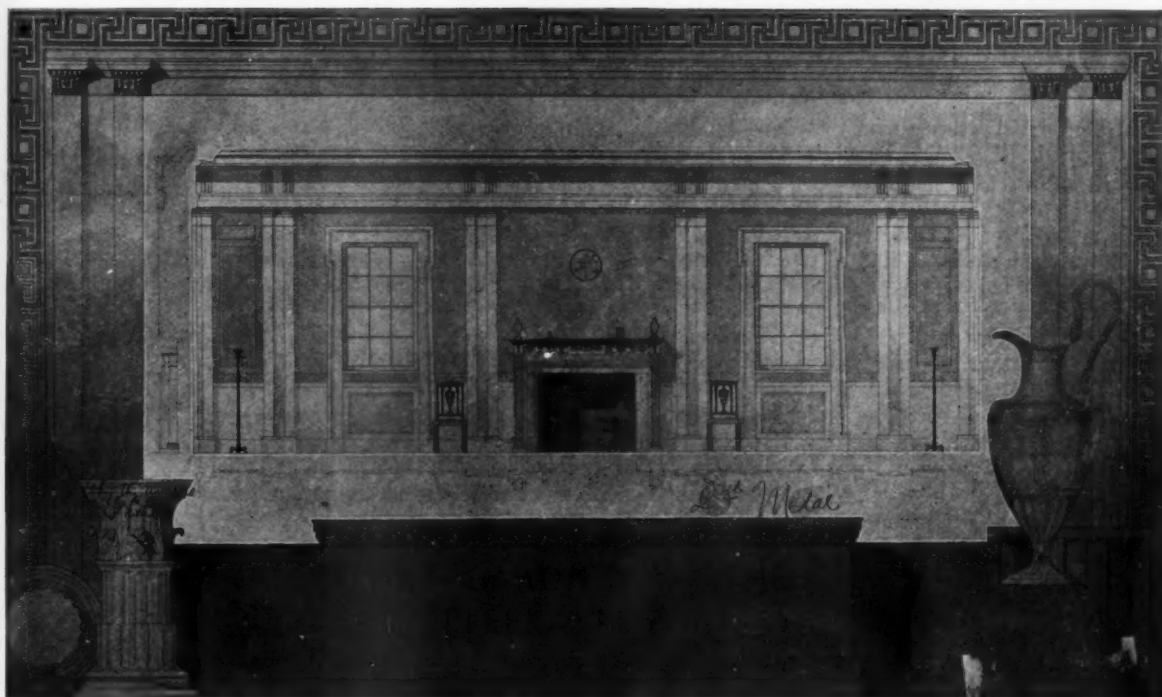
CLASS "B"-V PROJCT—A BUILDING FOR THE BEAUX-ARTS INSTITUTE OF DESIGN
STUDENT WORK, BEAUX-ARTS INSTITUTE OF DESIGN



H. R. RUSSELL

SECOND MEDAL

UNIVERSITY OF ILLINOIS



J. D. TUTTLE

SECOND MEDAL

UNIVERSITY OF ILLINOIS

A SALON IN THE STYLE OF THE GREEK REVIVAL
CLASS "A" AND "B" ARCH/EOLOGY-VI PROJCT
STUDENT WORK, BEAUX-ARTS INSTITUTE OF DESIGN

The HEATING and VENTILATING of HOTELS and CLUBS

BY A. L. BROWNE, Member American Society of Heating and Ventilating Engineers

THE conditions which control the designing of a heating system are, as a rule, similar to those of any equally large inhabited building. The exception would be the need for mechanical ventilation and medium pressure steam for kitchen, laundry and therapeutic purposes.

Unless the building is very large, a low pressure plant is most desirable. In case the light and power load is insufficient to absorb the K. W. output of a power plant near peak capacity for the greater part of the day, the investment in a power plant, together with operating and maintenance cost, would undoubtedly be greater than the purchasing of the necessary electrical energy from local central station power houses. Exhaust steam available for heating is an important consideration, but if the power load is low, then the exhaust steam would have to be supplemented by live steam through pressure reducing valves. The estimated average hourly power plant requirements together with the overhead and operating expenses of a suitable power plant compared with the central station rates, would indicate which would be the most economical.

Boilers, whether to be cast iron or steel, is a subject leading to an indefinite amount of discussion according to one's experience or predilection, yet a careful study of the conditions will make it possible to determine which selection to make. To a large extent steel fire tube boilers are used for medium sized low pressure installations. The greater uniformity of fire surface and grate area in steel boilers, rated according to accepted standards, undoubtedly is an important factor causing the greater use of this type of boiler. However, the best class of cast iron boilers having approximately the same area of fire surface, grate area and equal rating, would be very satisfactory. However, a cast iron boiler must have a sufficient steam liberating space in order to prevent priming conditions under full draft. This is very important and its lack is a frequent cause of costly reconstructed headers and drips.

If the space available for boiler room requirements is so limited that boiler tubes cannot be cleaned or replaced; or if costly excavation or high sewer levels makes necessary a shallow basement, then the low boiler water line required to permit drainage thereto from the heating system, makes necessary the selection of sectional cast iron boilers. Many other conditions do influence and justify the use of this type of boilers.

In some localities where smoke ordinances are not too severe or where smoke consuming devices are used, bituminous coal burning boilers will show a substantial saving in the cost of fuel. The tonnage of both bituminous and anthracite coal would be approximately the same, but the B.T.U. value of bituminous coal is greater and the ash residue less. It is necessary to have larger and higher chimneys for bituminous than anthracite burning boilers.

Firemen often object to handling soft coal, particularly in small installations where the boiler attendant has other duties to perform because soft coal requires more frequent attention. Many bituminous coal burning boilers are very satisfactory and smoke objectionably only in the hands of inexperienced operators or for a few moments when the fires are cleaned and heavily coaled. Proper coking of green coal will in a large measure prevent this in some types of boilers. Of course, in the double-grate Hawley-type downdraft boiler, the excessive smoking at firing periods is lessened as the gases from the green coal are drawn down through the incandescent fire beneath.

When a low pressure heating plant is used it is necessary also to install a small, medium or high pressure boiler as the case may be, to take care of the steam requirements of the kitchen, laundry and therapeutic departments. The temperatures desired require steam usually from 20 to 40 pounds pressure or 80 to 100 pounds pressure for laundry. In comparison to the total amount of steam required for heating and ventilating, this load is small. Domestic and sanitary hot water may be heated by a steam coil in storage tanks supplied from the pressure boiler, cross connected with the heating boiler header for winter use. In this case, tank coils should be sufficiently large to provide the necessary amount of hot water at the lower temperature and pressure of the heating boilers. At times, in medium sized plants, a hot water boiler is directly connected to the hot water storage tank for summer use—supplemented by steam coil from heating boilers in winter.

In designing plants for hotels and clubs, especially the larger ones, it is the custom of some engineers to lay out a high pressure boiler plant. This requires the installation of additional apparatus. High pressure steam is carried in boilers and header and from this point reduced to various pressures through pressure reducing valves. The reduced pressures to be used for heating, kitchen utensils, hot water and other purposes.

There is required also automatic boiler feed-water regulators, stop and check valves, blow-off or back pressure valves on the various reduced pressure lines, in order to avoid building up pressure beyond a predetermined point. Boiler feed pumps and boiler feed water heater are required and used in high pressure plants in the interest of safety and economy. Where there is no power load, this additional installation and maintenance cost seems unwarranted. It is apparent that, in this case, it is not necessary to install an additional medium or high pressure boiler for summer use as one of the battery of high pressure boilers could be used to provide for all requirements. However, the additional apparatus would more than offset the additional cost of a medium pressure boiler. If the battery of boilers consisted of two or three, it is probable that the one boiler operated in summer would have excess capacity for the requirements.

One and two pipe radiator air valve systems for heating are obsolete. Today the modern building of any size is equipped usually with a two pipe vapor or vacuum system of heating. It is by these means only that complete and rapid circulation of steam with uniform pressure and quietness under absolute control, is secured. These systems usually employ thermostatic radiator return traps, with or without modulation radiator supply valves. First class radiator supply valves of the modulating type seldom, if ever, require attention to their packing glands. Of course, the fresh air fiend who insists on opening windows and keeping the radiator on full blast is a hard nut to crack. By installing a system of temperature control the loss of steam and possible freezing of radiators due to open windows is obviated. The regulation of temperature by automatic mechanical devices is done in a positive, dependable manner. In addition to economy of operation, the greater comfort of the guests, makes temperature control a most desirable feature of a hotel.

Usually, the piping system consists of various circuits of mains in the basement, supplying feed risers. In buildings of low heights, say not over six stories, it is possible to omit the thermostatic dripping of the heels or bottoms of the individual steam supply risers, provided the branches from the steam supply main to the risers are of sufficient size to permit a low velocity steam flow and are pitched back to the main. In this case the mains should be of sufficient size to care for this riser condensation and be provided with ample drip traps. In a down feed system, where the steam is carried to the top of the building and from there distributed through mains and down feed risers, it is necessary to provide thermostatic traps at the heels or ends of these risers. These risers should be provided with either a well constructed mud leg or strainer, which, with the valve should always be easily accessible. Construction problems, such as

partly excavated basement or inability to provide adequate trenches or pipe conduits, often determine whether the heating system shall be up or down feed. Either, properly designed, will operate satisfactorily.

Referring to the usual up-feed system, it will prove more satisfactory if it can be designed upon a three pipe basis—that is, steam mains, dry returns and bleeder line or wet return. If the ends of the steam main can be bled directly into a wet return, directly connected to the return to the boilers, more satisfactory operation is assured. If the end of the steam main is thermostatically bled into the dry return, these valves at times, may become greatly overloaded if the steam is excessively saturated or there is a priming condition existing. In such instances an open pipe would have far greater capacity. The ends of the mains should be sufficiently high above the boiler water line to overcome the pressure drop within the mains and usually 18" or more is sufficient. Where the condensation is returned to the boiler by gravity (vapor type) it has the added advantage of keeping the dry return line considerably higher above the water line than would occur where the main was thermostatically bled into the dry return. The elevation gained would ordinarily amount to 20" or more. In the vacuum circulating system (pump type) this is of no particular advantage.

These systems may be divided into three general types—vacuum circulating (pump), vapor or vapor vacuum and open end atmospheric types.

In the larger installations vacuum circulating systems employing a vacuum pump, usually of the electric drive type, are used. On the positive or steam side, the pressure carried to zero plus, that is a fraction of a pound gauge, although a greater pressure may be readily carried if desired. On the negative or return side, the vacuum carried is usually 5" to 10" mercury reading. If, for instance, the boiler pressure is 1 pound steam and pump pressure 10" of vacuum, the pressure differential inducing circulation would be equal to approximately 6 pounds. This pressure differential assures rapidity in heating, and will overcome in most instances any small water traps in the runouts from the radiator return valves to return risers that may exist. The effective pressure differential at these points is much less than that indicated at boiler and pump, however, on account of the pressure drop on both sides.

Some conditions that would indicate the use of a vacuum pump circulating system, would be a very large installation where the boiler water line was close to or above dry returns, or where limited space in floor construction would permit little, if any, pitch from radiator runouts to risers. It is becoming a growing custom with many engineers to dispense with vacuum pumps in medium sized and small installations, using what may be termed

"vapor-vacuum" and "vapor" systems,— say from 15,000 sq. ft. of radiation down. This, of course, necessitates favorable conditions. The dry returns must be well above water line of boilers, 30" or more. If the three pipe basement system, previously described is used, it often makes it possible to terminate the dry return line well above the boiler water line. Construction conditions must permit sufficient pitch for runouts, mains and returns. The use of boiler return traps is a generally approved method of disposing of the condensation and returning it to the boilers against boiler pressure. These traps are set in parallel with the dry returns and above the water line of the boiler. Condensation fills them by gravity and at this point equalization of pressure in the boiler and return trap takes place, with the result that the condensation is returned in a positive manner to the boiler. The mechanism of these devices is quite simple and the action positive permitting the boilers to be operated at any desired pressure.

Air is either expelled through the return trap, an open vent pipe or an expelling device on a secondary trap having means of preventing the air from returning. In the latter case, the heating system may be operated for substantial periods below atmospheric pressure or at a vacuum. This occurs when the evaporating rate of the boilers is less than the condensing rate of the radiators. The vacuum, under these conditions, extends throughout the system including the boilers. It is periodic in occurrence, that is, when ratio between boiler evaporation and radiator condensation is the reverse from the ordinary condition of greater boiler evaporation than radiator condensation. This condition would occur between firing periods under average weather conditions. During severe weather, any type of system would require more or less constant pressure above atmosphere. Closed systems of these types are very economical in fuel consumption as they maintain a uniform circulation of steam with less boiler attention and fuel.

Atmospheric, or vapor systems that operate at a constant boiler pressure of a fraction of a pound are used, though more generally in smaller installations. They frequently do not include thermostatic radiator traps but use instead union elbows or other devices with restricted orifices. Larger radiators are required. Return traps or pumps are not used, as they are operated with a constant pressure of ounces and any accidental pressure above that would pass steam into the return lines which produces more or less of an equalization and loss of steam.

Where buildings are very high it is necessary to have expansion joints in the risers. When pipes are heated by steam, they expand about $1\frac{1}{2}$ " per hundred feet of run. Risers are securely anchored midway when no expansion joints are

used. This divides the expansion into two parts. Where expansion joints are used, two anchors, each midway between expansion joint and top and bottom of riser, divide the expansion in four parts. These expansion joints are either constructed by making a right angle offset in the riser with swing-joint connections or by using a standard brass sleeve-type expansion joint. The latter require packing and more or less frequent attention. They should always be at or near the floor line in order to be readily accessible and should be provided with liberal sized access doors. The pipe swing-joint type requires from ten to fifteen inches of space and should be situated at the ceiling. This necessitates a furred down ceiling and requires due consideration in the designing of the elevation of the building. Location of expansion joints, as well as control valves, should be plainly charted and in the custody of the superintendent or engineer.

Radiators are sometimes behind enclosures with grilled inlets and outlets. If such is the case, the radiation must be materially increased. If it is at all feasible, these enclosures should be so designed that the entire face can be quickly and easily removed in order to have full face access to the radiator and valves. A hinged top ordinarily will not permit sufficient room in which to use a wrench and it is, therefore, often necessary to disassemble the entire enclosure in order to remove the bonnet of a valve.

Risers should be insulated to prevent undue loss of heat by minimizing the condensation in risers. When they are concealed, insulation tends to prevent cracking of the plastering.

The ventilation of the lobby, dining rooms, ball rooms and other public spaces is done in a manner similar to that employed in other buildings. In some climates, the ventilating system can be used for heating as well. These large rooms, due to their displacement, and relatively limited outside exposure, often require little if any direct radiation. They are under a plenum condition, with more air put in than is exhausted. In the kitchen and laundry it is the reverse with more air exhausted than is put in. Therefore, this slight pressure differential creates a constant flow from dining rooms to kitchen and prevents the escape of cooking odors into other portions of the building. Air cooled by air-washers is circulated during hot weather.

Kitchen cooking apparatus and laundry equipment should have a separate system of ventilation, consisting of exhaust fan located on the roof, as a rule at the end of the main duct. Branch ducts lead to hoods over cooking apparatus and laundry machines. These ducts should be constructed of heavy black iron and be thoroughly insulated for fire protection on account of the vaporized fats and oils which are deposited and are highly inflam-

able. At the base of these ducts, in the branch ducts to the ventilating hoods or in the lower plane of the hoods, it is possible to place a separator screen which will deposit the vaporized grease and oil thereon. This can then be periodically removed. This is accomplished without materially reducing the free venting area. Main duct should be equipped with an automatic damper and fuse link. Wherever possible cleanout doors should be provided. The air change in kitchen is relatively rapid, usually from ten to fifteen changes per hour.

It is becoming the general practice to locate the toilet and bathroom along the corridor walls where they do not have outside window ventilation. It is generally required that these rooms have mechanical ventilation. For this purpose the exhaust fan is placed in the attic or a penthouse, from which ducts lead to vertical vent or pipe shafts which usually serve two rooms on each floor. A register connects the room with the vertical duct. Boiler rooms should have ample fresh air inlets to provide sufficient air to properly support combustion in the boilers. The pipe coil or vent stacks of the ventilating system should be 30" or more above the water line of the boilers in systems not employing pumps.

It is of great importance, though not generally realized, that heating or heating and ventilating apparatus should be most thoroughly cleaned by the contractors before being turned over to the owners. A great deal of trouble, sometimes more or less obscure as to cause, is occasioned by improper cleaning. The gradual working down of the oil, core sand and grease within the piping system will cause very erratic boiler operation. A priming condition is produced which will cause

large quantities of water to leave the boiler with the steam, clogging up the end of steam mains and risers, thus effectively preventing the proper circulation of steam.

It is a good plan to waste the condensation from the heating apparatus to the sump or sewer for ten days or two weeks. In this way a large amount of oil and grease will be removed. This requires a boiler attendant to supply make-up water at more or less frequent intervals. This troublesome condition can usually be detected by pulling open the safety valve and if considerable water is passed with the steam, it is a sure indication of priming. This will sometimes occur at one pressure and not at another. Obviously, with this mixture of water and steam, proper heating cannot be expected. Caustic soda, washing soda, or other agent introduced into the boiler and the mixture allowed to boil out of the top of the boiler and then subsequently blown down with clean water will help a great deal. It is sometimes necessary to repeat this cleansing several times before normally proper operation is secured.

The writer is more or less prone to emphasize the importance of proper cleaning as excessive priming has been invariably prevalent in all kinds of installations during the past few years.

If one is sufficiently interested, this condition can also frequently be detected by ear upon placing a piece of cardboard to a steam main, and possessing an active imagination and certain predilections, one might easily visualize that tumbling white rift—ahead of the deep pool where the big ones lie—and where often fruitlessly yet ever hopefully, be it Cahill, Coachman, or Beaverkill, one is ever willing to try.

LAUNDRY EQUIPMENT *for* HOTELS

HOTELS cannot be successfully operated without properly laundered linen. It is one of the essentials. Hotel operators either do this work themselves in their own plant or have it done elsewhere. The desirability of doing it within the hotel depends on several things, but the controlling factor is the amount of work to be done. Enough work must be done to make the investment and operation profitable. In this proposition, profit is composed of several items that are not fully appreciated on first consideration.

Mr. Eugene G. Miller, Manager Hotel Walton, Philadelphia, in a recent article, stated, as follows: "One urgent reason why the hotel should conduct its own plant is that it will have complete control over the work and is able to keep up a standard of laundering which is almost impossible when it is done on the outside. The mere cost of having work done is not the only factor. It is absolutely necessary to have snow-white, clean-smelling linen for the guests and in addition to give the greatest of care to the washing and ironing in order to preserve the linen. Take the Walton alone, when it is considered that we launder in the neighborhood of five thousand pieces every day, except Sunday, one can easily see how vitally important it is that the best of care should be given to the work in order to prevent waste and destruction, particularly with linen at its present price."

The amount of laundry work required for different hotels varies greatly. First-class hotels completely change bed linen every day, while linen for permanent guests is changed sometimes two to three times per week. There is a great variation in the amount of table linen used. Some hotels have small dining room service, while others have extensive dining room facilities and daily serve thousands of meals to persons who are not guests of the hotel. Many of these large hotels specialize in banquets which require large supplies of linen.

Manufacturers of laundry machinery estimate the capacity of the machine by the number of pounds of goods it will handle in a given time. As a rule goods are not weighed in a hotel laundry. If any account is kept at all, it is the number of pieces handled. Therefore, with the machinery company figuring in pounds, and the hotel operator figuring in pieces, there are two different units of measurement to co-ordinate when an estimate is made on the machinery required for a hotel laundry. The manufacturers' unit of measurement, pounds of goods, is a definite one; the hotel measurement, pieces of goods, is not. A "piece" may be a napkin which weighs but a small fraction

of a pound, or it may be a large sheet which weighs a pound and a half. If the pieces are classified and counted it does not give an accurate basis on which to figure. For instance, some sheets weigh twice as much as others and it may be the same in the case of napkins, towels and other articles, either because of difference in size or on account of varying weight or thickness of the goods. The best that can be done under present conditions is to base estimates of required equipment for a hypothetical plant on average conditions and weights.

In planning laundry equipment ample provision should be made to take care of all the work that is to be done, and it may be well to have an excess capacity for emergency within reasonable bounds. Neither should the hotel operator, in a mistaken spirit of economy, go to the other



Battery of Extractors, Hotel Commodore, New York

extreme and underequip the plant, causing it to be always in an overloaded condition and therefore working under a handicap. The number of hours per week that the machinery is to be used should also be considered. Fifty hours per week is perhaps the longest that a plant can be operated but, on account of the scarcity of labor so prevalent throughout the country at this time, it is well to install machinery that will do all of the work in from forty to forty-five working hours per week. Equipment installed should be of ample capacity to handle all the table and bed linen of the hotel, together with the necessary attendants' uniforms, kitchen and dust rags and other miscellaneous articles.

In the lists for the equipment for hotels, 700 rooms or over, there is included a separate department termed "guest work." This is a branch of service which many large hotels have gone into,

and it has proven very profitable. It is not recommended, however, that hotels having fewer than 700 rooms give this service to their guests, unless they are so situated that satisfactory outside laundry service cannot be secured. When the personal laundry of the guests can be secured in volume, good prices can be charged and this service has proven so profitable that practically all the large hotels have installed a laundry department for this work. It also is a great convenience to the guests and an additional service that the hotel can advertise. It is frequently desirable that a separate laundry be provided for the help and this should be carefully considered in the preliminary planning. The equipment of such a laundry usually consists of ordinary



Flat Work Ironers, Hotel Commodore, New York

laundry tubs, drying racks and hand ironing boards—a small hand laundry.

The schedules of equipment which follow are, of course, approximate and based on average conditions and weights. These are conservative and can be used with safety in the preliminary planning and estimating of cost. The final planning, selection and location of machinery should be done with the assistance of manufacturers.

100 ROOM HOTEL LAUNDRY

1—30" x 36" Washer,
1—36" x 54" Washer,
1—28" Extractor,
1—30" x 42" Drying Tumbler,
1—100" Return Apron Flat Work Ironer,
1—38" Press
1—Ironing Board with Electric Iron.
Approximate space required—20' x 40'.
600 gallons hot water per hour.
200 gallons cold water per hour.

300 ROOM HOTEL LAUNDRY

1—36" x 36" Washer,

1—42" x 72" Washer,
2—28" Extractors,
1—40" x 64" Drying Tumbler,
1—100" Four Roll Flat Work Ironer,
1—Feeding Device for Flat Work Ironer,
1—38" Press,
2—Ironing Boards with Electric Irons,
1—Lace Curtain Finisher,
1—Panel Control Board.
Space required—30' x 50'.
1,500 gallons hot water per hour.
500 gallons cold water per hour.

500 ROOM HOTEL LAUNDRY

1—42" x 84" Washer,
1—35" x 48" Washer,
2—30" Extractors,
1—40" x 64" Drying Tumbler,
1—120" Six Roll Flat Work Ironer,
1—Feeding Device for Flat Work Ironer,
2—38" Presses,
4—Ironing Boards with Electric Irons,
1—Lace Curtain Finisher,
1—Panel Control Board.
Space required—45' x 60'.
1,800 gallons hot water per hour.
600 gallons cold water per hour.

700 ROOM HOTEL LAUNDRY

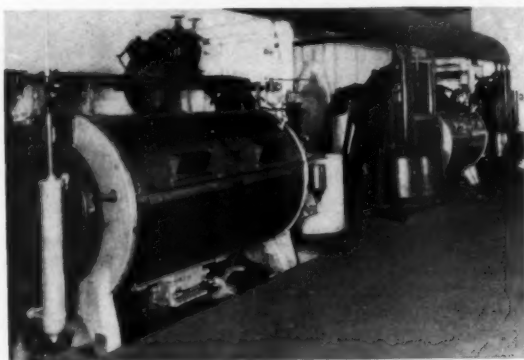
2—42" x 84" Washers,
1—36" x 48" Washer,
2—40" Extractors,
1—40" x 94" Drying Tumbler,
1—36" x 54" Shake Out Tumbler,
2—120" Six Roll Flat Work Ironers,
2—Feeding Devices for Flat Work Ironers,
2—38" Presses,
5—Ironing Boards with Electric Irons,
1—Lace Curtain Finisher,
1—Panel Control Board.

GUESTS' WORK DEPARTMENT

1—Marking Machine,
1—36" x 48" Washer,
1—28" x 33" Washer,
1—28" Extractor,
1—Starch Cooker,
1—Starcher,
1—Conveyor Dry Room,
1—Collar Dampener,
1—Collar Ironer,
1—Collar Finishing Table,
2—38" Presses,
2—Cuff Presses,
1—Neckband Press,
2—Ironing Boards with Electric Irons,
1—54" Handy Ironer.
Space required—60' x 75'.
3,700 gallons hot water per hour.
1,200 gallons cold water per hour.

1,000 ROOM HOTEL LAUNDRY

- 3—48" x 84" Washers,
- 1—36" x 36" Washer,
- 2—48" Extractors,
- 1—40" x 94" Tumbler,
- 1—120" Eight Roll Flat Work Ironer,
- 1—120" Six Roll Flat Work Ironer,
- 2—Feeding Devices for Flat Work Ironers,
- 1—48" x 54" Shake Out Tumbler,
- 2—38" Presses,
- 7—Ironing Boards with Electric Irons,
- 1—Lace Curtain Finisher,
- 1—Panel Control Board.



Installation of Direction Motor Driven Washers and Tripod Type of Extractors

GUESTS' WORK DEPARTMENT

- 1—Marking Machine,
 - 1—36" x 54" Washer,
 - 1—28" x 33" Washer,
 - 1—28" Extractor,
 - 1—Starch Cooker,
 - 1—Starcher,
 - 1—Conveyor Dry Room,
 - 1—Collar Dampener
 - 1—Collar Ironer,
 - 1—Collar Finishing Table,
 - 1—Shirt Unit Complete,
 - 2—38" Presses,
 - 2—Ironing Boards,
 - 1—54" Handy Ironer.
- Space required—60' x 100'.
 5,000 gallons hot water per hour.
 1,600 gallons cold water per hour.

The floor space given with the schedules is, of course, only approximate and will vary in each individual case, on account of location of windows, columns, doors and chutes. These areas allow ample space for sorting and the receiving of soiled linen, but do not include space for the storage of fresh linen. This is taken care of in a room or department separate from the laundry. The amounts given on hot and cold water consumption

are also approximated, as these vary somewhat according to the washing formula used.

Usually hotel laundries are located in the basement and as good ventilation as possible should be provided. A laundry at its best is a steamy, odorous, hot department and large exhaust vents should be so located that the air in the room can be changed every few moments and thus make it more comfortable for the employees. Wherever possible, metal hoods should be placed over washers, tumblers and flat work ironers, as these machines discharge a great deal of odor and steam which can be conducted away from the laundry room direct from the machines without going through the room. In many states, factory inspection laws require the installation of these hoods.

Getting the soiled linen into the laundry department is best accomplished by means of chutes having openings on each floor. Maids or others place the soiled linen directly into the chute and it is deposited as near the washers as possible. It is then assorted into what are termed "lots," that is, a separation made for each class of linen, such as, sheets, tablecloths and towels. If chutes cannot be installed, the goods can be conveyed to the laundry department by means of trucks and elevators. Hotels often employ systems to check the linen into and from the laundry.

In laying out a laundry plant the sequence of the work through the plant must be maintained. After the linen enters the laundry it is classified and assorted, and then placed in the washing machines. From the washers it is put into the extractors where the surplus water is removed, from the extractors all heavy bath towels go direct to the tumbler and thence out. All other articles of flat work go either to the shakeout tumbler and then to the flat work ironer or direct to the flat work ironer. After the goods are ironed they pass out of the laundry and into the linen storage room.

The laundry should be laid out so the linen will pass through without interference, preferably into the room at one end and out at the other. The laundry floor around the washers and extractors should be of concrete and pitched to the drains. The balance of the floor may be of wood or other satisfactory material. Waste water from the washers flows directly into a gutter or trough built in the concrete floor, draining directly to the sewer. If a guest work department is installed, it should be separated from the regular flat work equipment.

The washer thoroughly washes and rinses the linen. It consists of a stationary outer shell with a revolving inside cylinder, together with a driving mechanism. The supports and frame are made of metal. The outer shell and inside cylinder are made of wood; galvanized iron and wood; brass and wood; all brass or other non-corrosive metal shell and cylinder. The wooden shell and cylinder is the least costly machine but the better instal-

FERROCRAFT GRILLES



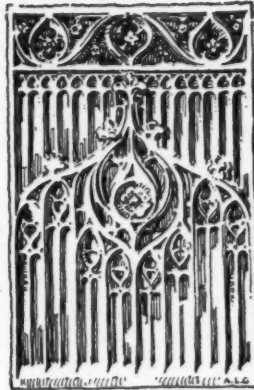
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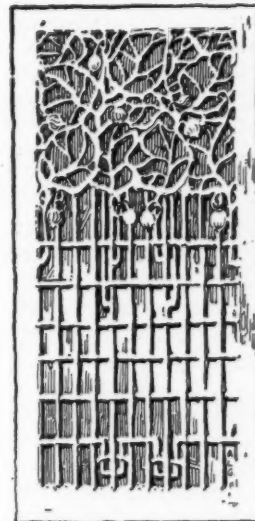
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lations are those made of the best of non-corrosive metals quite recently developed. The wooden machine is subject to decay and is extremely difficult to keep in a sanitary condition. The expansion, contraction and warping of wood makes it difficult to keep the bolts and screws tight. Good mechanical performance of a machine can only be obtained by the perfect alignment of driving gears and bearings. This alignment is not easily maintained in a wooden machine. Galvanized iron and brass are preferable to wood on account of their better sanitary washing qualities, but they are not altogether immune to the chemical action of the washing fluids.

The large washers mentioned in the schedules of equipment should be constructed with two pockets, so that goods can be washed in lots. That is, a "lot" of tablecloths can be handled in one pocket and a "lot" of towels in the other pocket and go through the laundry as a separate unit. This saves the labor of separating and classifying after the linen has been ironed.

Washers are driven by belt from a line shaft, individual belted motor mounted on the machine or by direct geared motor drive also mounted on the machine. In the last mentioned type, the reverse movement of the washer is effected by control equipment which can be mounted either directly on the machine or on a remote panel board. The reverse movement in the belt driven types is accomplished by the shifting of belts. The initial cost of direct geared motor driven washers is slightly more than the other types but is undoubtedly the best construction. It is a direct application of power and it eliminates power loss through the slippage of belts. Belt slippage causes uneven reversals of the washing cylinder and interferes with the work.

The extractor removes the water from the clothes by means of centrifugal force. It consists of a copper or steel basket enclosed in a heavy curb. The linen is placed in this basket, which revolves at high speed and extracts the water in from 10 to 15 minutes. When removed from the extractor the linen is still damp and the moisture is removed by heat. Extractors are made in two types—underdriven and overdriven. In the first mentioned type, power is applied by a belt connected to a motor. The latter type, in addition to belted motor drive, is also constructed with the motor mounted directly on the spindle of the machine. In this type belts are eliminated and the tripod or "bell" construction greatly reduces vibration. Special automatic and safety features are incorporated in this direct driven extractor.

The capacity of the extractors should balance up with the washers, but a little excess capacity is desirable as it undoubtedly is cheaper to remove the water in the extractor than in a tumbler or flat work ironer.

The tumbler is sometimes called a drier. It consists of a revolving wire cylinder enclosed in heavy housing. In the rear of the housing there are steam coils. Air drawn in from the bottom by large fans is heated by passing over the steam coils and is then blown into the cylinder. The hot air, forced into the linen which is tumbled around by the rotating cylinder, dries it rapidly. An outlet vent carries off the moisture-laden air. The entire machine is made of metal and the outer housing asbestos-lined to retain the heat. In the larger and improved types of tumblers an air cooling device has been incorporated. By means of this device, after the linen is dry, air is cut off from the steam coil section and from an outside connection a current of cool fresh air is admitted into the machine for a few moments before removing the linen. The objectionable hot laundry odor is eliminated and the linen is delivered cool and sweet-smelling. Bath and Turkish towels and bath mats are dried in tumblers, which gives them a fluffy, fresh appearance. These articles could be dried on a flat work ironer, but they would have a hard, packed-down appearance, and modern laundry practice requires a tumbler in a well equipped plant.

When not used for the above purpose, the tumbler is convenient as a shake-out tumbler for flat work. When the linen is removed from the extractor it is packed down and matted, and before it can be fed into the ironer it must be shaken out. This is done either by hand or by a shake-out tumbler. When a large volume of work is handled, a considerable labor saving is effected by the use of tumblers. These drying tumblers can be driven by belts from a single motor or furnished with a two motor drive. In this type the cylinder motor is of the reversing type and is directly geared to the cylinder. The fan motor is belted to fan driving mechanism.

The shake-out tumbler is practically the same as the drying tumbler except that it has no heavy outside casing, heating coils or fans. The packed down linen is thrown into this tumbler direct from the extractor and the revolving motion of the cylinder shakes the linen out ready for the ironer.

The washers and tumblers discussed above are reversing machines; they make a fixed number of revolutions in one direction, come to a stop and then reverse. On belt driven machines this movement is taken care of by shifting the belts. On direct geared apparatus, which is the best type of drive, this reverse movement can be obtained from a control box mounted on the machine or on a remote panel board. This control equipment consists of a small pilot motor which drives a revolving drum, controlling the electric current. A series of "fingers" come in contact with this drum and supply current to the motor. After a certain number of revolutions the fingers lose their con-

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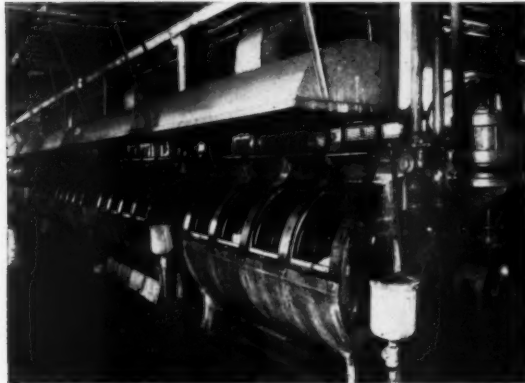
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tact on the drum, the current is cut off from the motor and the cylinder coasts. Current is then applied by another series of "fingers" and the motor drives the cylinder in the opposite direction.

Where this control is mounted on the washer or tumbler, it is a self-contained unit. When on one panel board the control is centralized. One pilot motor can control four washers or three tumblers.



Battery of Washers in a large Laundry

These panel boards are so constructed that no two machines can reverse at the same time, thus avoiding peak loads. When a washer or tumbler reverses the current consumption is practically equivalent to a starting load and if several of these machines were to reverse at one time the demand on the power system would be very great. In the case of large hotels generating their own power, unless the reserve capacity is sufficient to handle these peak loads, the unusual strain would be reflected by a dimming of the lights and slowing down of elevators. Resistances for extractor motors are also mounted on these panels.

After washing, extracting and shaking out by hand or tumbler the linen passes to the ironer which dries as well as irons all flat pieces. These ironers are made in two types—the cylinder type and the roll and chest type.

In the cylinder type, a steam heated revolving cylinder operates in connection with padded pressure rolls. The return apron ironer, included in the schedule of machines in a 100 room hotel, is of this type. The cylinder is 16" in diameter and 100" in length. The damp linen is fed into the machine by means of a ribbon feed, and passes between the heated cylinder and three padded rolls. An apron conveys the linen over the under portion of the cylinder and back to the feed side. Two girls can operate this machine and it can be backed up against a wall, thus saving space.

The other type of flat work ironers included in the foregoing schedules are of the chest type. Padded pressure rolls of large diameter operate

in concave, highly polished, steam heated chests. The linen passes under the rolls and in contact with the hot chests. From the last roll the linen is carried by heavy duck aprons over and in contact with the under surface of the chests. It is then conveyed back to the receiving side.

Cylinder type ironers are also made in the larger sizes having two revolving cylinders—30" or 36" in diameter with one 48" cylinder. These cylinders operate with padded pressure rolls and conveying aprons. In these large size ironers at least four operators are required, two to feed and two to receive.

Individual motor drive is preferable on the flat work ironer wherever possible, as a greater range of speed control is obtainable. When heavy or double thickness pieces are being handled the ironer can be slowed down and when light pieces, such as hand towels and sheets are worked it can be speeded up and maximum efficiency obtained. Better control and safety features are available in the motor driven type.

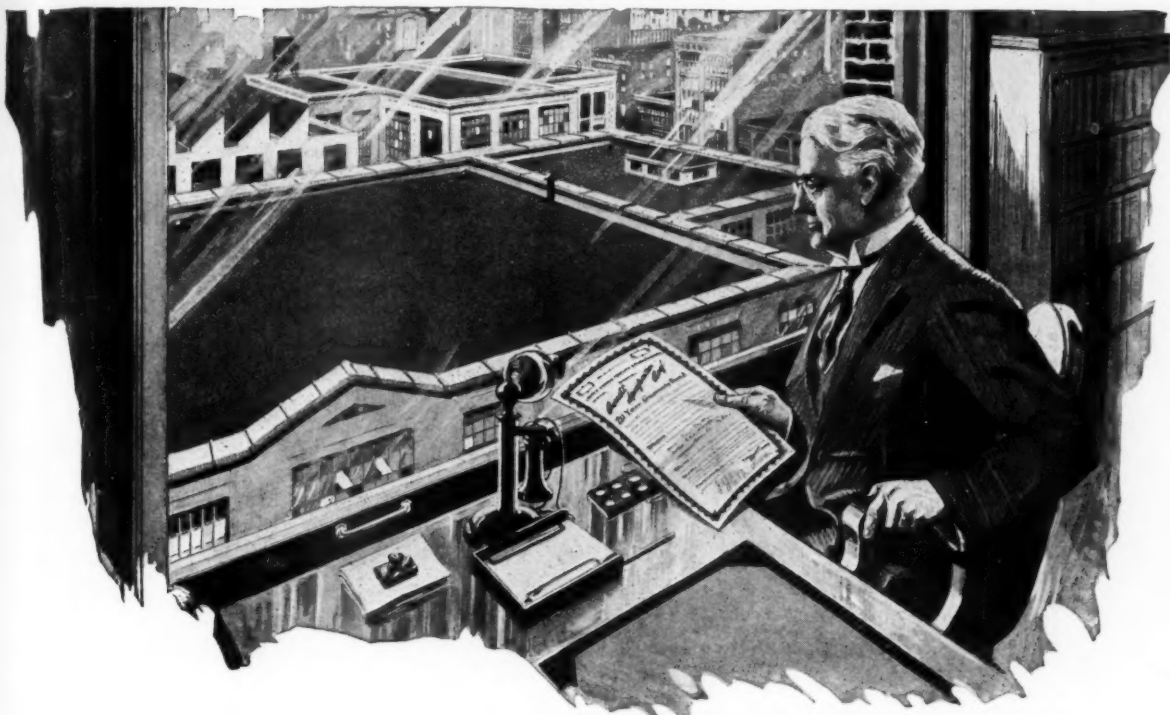
The pressing machine for the laundry is somewhat similar to that used by tailors for pressing clothes. In the hotel or club laundry this machine is used to handle cooks' and attendants' white uniforms—any wearing apparel that is handled such as maids' costumes. The 38" size is best adapted for hotel use.

Two types of these machines are on the market—one in which the pressure is applied by foot treadles; the other, motor driven, applying pressure by a motor driven shaft. The latter type is of course preferable, as it is much easier to operate and greater production is obtained. The pressure is applied by merely pulling a small lever, which starts the motor. A safety guard is also fitted on the machine to prevent accidents.

In order to comply with state laws and insurance rules, it is recommended that all laundry machinery be specified with solid guards covering all moving parts. All washer gears should be covered; extractors should be equipped with special safety covers; flat work ironers should have automatic safety finger guard and all belts should be screened over.

The guest work department of the laundry is operated separately from the regular flat work and in a department by itself. When the guest's bundle is received, each article is marked and listed. After washing, extracting and starching as required, the linen is ironed on presses and ironing boards. The finishing of starched collars is a rather complicated process and requires special drying and ironing machinery.

At least 100 pounds steam pressure at the boiler is required for the laundry. Flat work ironers, presses, tumblers and collar equipment of the guest work department show better results with 80 to 100 pounds steam pressure. The return steam



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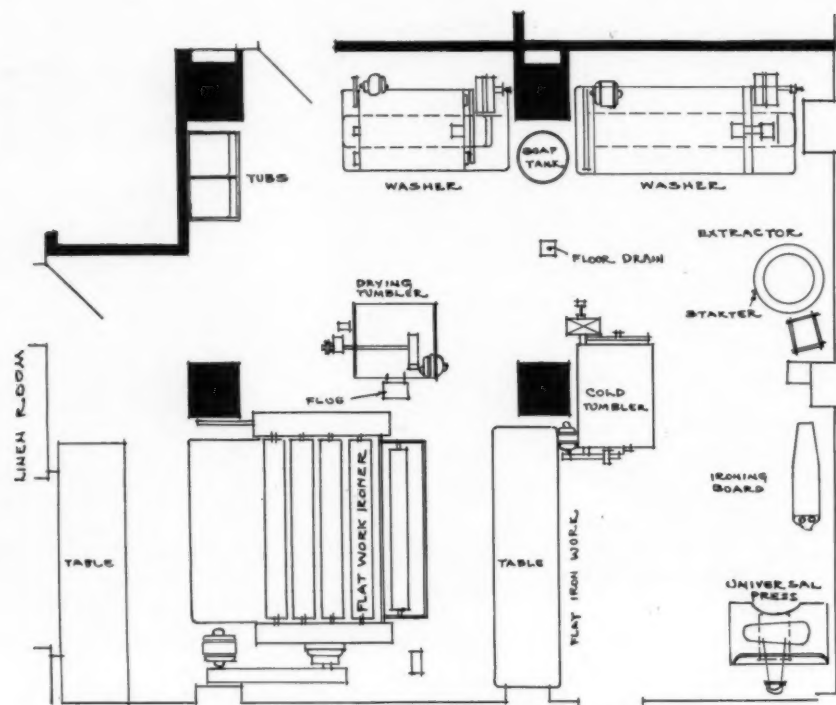
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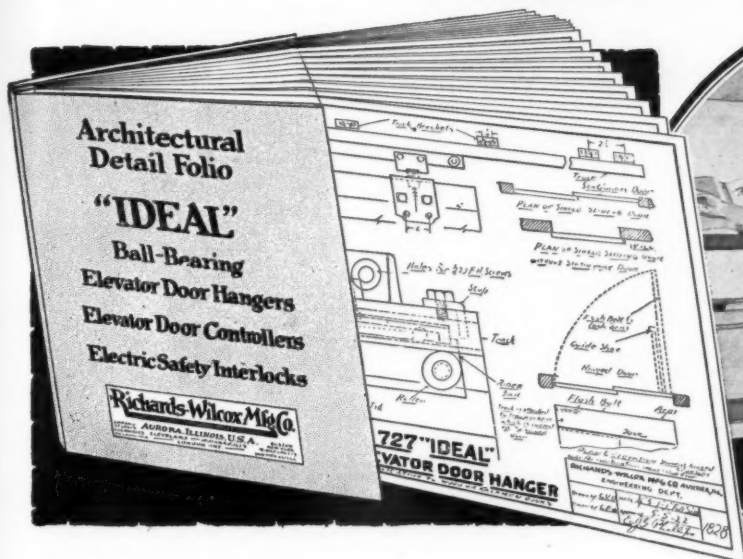
Laundry in Hotel Berkshire, Reading, Pennsylvania

from these machines can be utilized in the hot water heating system. Steam trap should be applied on all steam heated machines to insure proper circulation and remove condensation.

Manufacturers of laundry machinery have developed their products to a high state of efficiency. It is possible that the next step forward in the laundry field will be in the means of transporting the linen from one machine to another rather than in the machines themselves. The method now employed is called "trucking." For example, after washing the linen it is put in a

metal or wooden truck mounted on casters and pushed along to the extractors and so on through the plant. The use of conveyors for this work would undoubtedly increase efficiency in operation. To date we do not know of any hotel laundry using conveyors in the laundry, but several commercial laundries have installed them with great success.

Acknowledgment is made of the data and assistance furnished in the preparation of this article, to Mr. W. W. Baldwin and Mr. I. Kettle of the American Laundry Machinery Company and the Troy Laundry Machinery Company, respectively.



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DEPARTMENT of SPECIFICATIONS

BRICK MASONRY SPECIFICATIONS (Cont.)

QUITE often in brick masonry construction it is necessary to provide for some form of waterproofing in addition to that provided in the mortar for laying up the brick work. The usual requirement is in the waterproofing of parapet walls. The material for this waterproofing work should be an elastic cement capable of being troweled on to a thickness of about 1/16", which will retain its elasticity, which will provide adequate bond with the mortar in which the parapet wall coping is set, and which will not stain the facing materials. While an asphalt waterproofing compound that is swabbed on with a brush may be used with success, there can be no question that an elastic cement that must be troweled on may be better applied, and also of more value in accomplishing the desired end. Further discussion of this material will be given later.

In all buildings of importance that are to have face brick laid up in patterns, and in many cases where running bond only is to be used, the erection of a sample panel will be found to provide material for criticism that could not be obtained in any other way than by reference to such a sample or a similar sample in a building already constructed. The sample panel should be specified to be laid up very carefully in bond and jointing and pattern indicated, using the mortar specified. It is not expected that extraordinarily good workmanship will be put on such a panel, and the specifications should provide at least indirectly, that the workmanship is to be that which may be expected in the building itself. The specifications should state that the architect will inspect the panel, and if not approved, require the contractor to remodel the panel, rebuilding a complete new piece if necessary for comparison until the architect's approval is given. This panel then should be designated as the official sample by which the laying up of the face brick will be judged. Upon final approval of the panel the contractor should be required to have a photograph taken, one copy of which is to be delivered to the architect for his records.

For buildings in which machinery of fairly large size is to be placed it sometimes becomes necessary to provide temporary openings in a wall or several walls in the first story or basement or perhaps in the upper stories. The location of temporary openings should be determined on the drawings wherever possible, and if exact determination cannot be made, an approximate location should be fixed on, and the specifications should provide that its position will be located later. The edges of walls in temporary openings should be left with toothing to receive the fill that should be placed by the brick masonry contractor after

all devices requiring ingress through it have been passed. In some buildings it may be deemed necessary to provide temporary wood enclosures of these openings, in which case the specifications should provide for such work or should state that it will be provided by the carpentry contractor. In the latter case be sure that the tie-up in the carpentry contract is complete.

Arch centers must be provided for all arched openings. The brick mason contractor in some instances is expected to provide these centers but their fabrication and erection really belong in the carpenter's work. The brick mason specifications should provide that these centers will be furnished and erected by the carpentry contractor under the supervision of the masonry contractor. The arch centers should not be struck until a sufficient time has elapsed, which time should be specified clearly. One week may be established as a minimum, with longer periods determined according to the size and character of the work. In any event the arches should not be struck until the architect directs so, and then they should be removed with care so as not to damage surrounding work. The removal of these arches should be left to the brick mason contractor in order that he may be responsible for the safety and maintenance of the structure as required by his contract.

In many openings in brick masonry work it is necessary to provide wood nailing strips and wood brick to receive later finish or equipment. It is quite often impossible to determine the exact character of these items or their location, but the specification writer should give this matter consideration and should provide for the placing of a larger number of these items than he believes might actually be required. These strips and wood brick are of course furnished by the carpentry contractor except in unusual cases but the making of them in any case should not be left to the brick mason. All his specifications should require is that he build them in as directed by the architect, bedding each piece firmly and making sure that all anchorages are well secured.

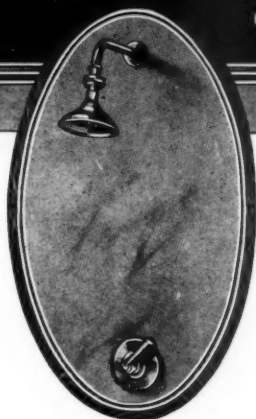
The laying up of common brick may be specified in a few words for the smaller operation but for the larger buildings it is better for the specification writer to be rather definite in every respect. The kinds of mortar that are to be used in the various parts of the work should be first specified. Walls having both sides exposed to the weather should have the brick laid up in cement mortar, gauge cement mortar, or waterproofed mortar. The waterproofed mortar is preferred with cement mortar given second preference. The gauged cement mortar should never be used unless the specification writer knows that the workmen will



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not use cement mortar even though it is specified. There is in this suggestion an idea that the architect should write his specifications to meet the whims of the workman, but on the other hand it is silly to specify something that one knows beforehand will not be used. Such a specification may cause trouble between the architect and a super-critical owner. It is impossible to be too emphatic in stressing the great regard that should be given the specifications for brick masonry where both sides are subject to the ravages of weather. Countless parapet walls may be seen in which the mortar is coming out of the joints, and in many cases the brick itself is deteriorating through frost action. Such destruction is not the fault of the brick and very rarely is the fault of the brick masonry contractor if the proper methods have been specified. Even though workmen do protest against the use of cement mortar, its use must be insisted upon unless the waterproofed mortar is to be used.

Cement mortar or gauged cement mortar should be used for all common brick walls supporting concentrated loads such as in piers or immediately under girder or truss bearings, for filling in old openings or temporary openings left in new work and for work underground, especially where the earth is in contact with one side. In the latter case waterproof mortar should be preferred. However, in all of these cases cited the purpose of cement mortar is to minimize cracks due to settlement which are especially severe when lime mortar is used in filling in new brick in old wall openings.

Brick backing for limestone should be laid up in lime mortar or gauged lime mortar for which the gauging is a white Portland cement containing not over five-tenths of one per cent of iron oxide. This non-staining mortar should be used for the 4" immediately back of the stone and will be discussed more fully later under the discussion of specifications for setting of stone. Many of the granites will not stain when backed up with common brick laid in gauged cement mortar, but as a precaution it is well to specify gauged lime mortar for this backing even though the back of the granite be dampproofed. Terra cotta should be backed up with gauged lime mortar or gauged cement mortar.

In general the remaining common brick masonry can be laid with gauged lime or gauged cement mortar according to the judgment of the specification writer as to their respective value. Walls exceeding the average story height and more especially the extremely high walls met with in theater and similar construction, should be laid up in mortar that is not weaker than the usual gauged cement mortar.

In most of this work the patented brick cements that are available may be used with the exception of brick backing for limestone and for parapet walls or other walls having both sides exposed to the weather. It is not believed that these mortars have been used long enough to insure their permanency under severe weather conditions, but in this case the judgment of the architect, especially if based on personal knowledge of such mortar, must be depended upon for guidance. Sometimes the masonry contractor may say that he would prefer to use one mortar for each story height or for all work above the roof level, in which case the specification writer should write his specifications up to the highest standard, rather than down to the ordinary standard that might be good enough for the usual enclosing wall work.

MISCELLANEOUS SPECIFICATION DATA

In Technical Note No. 200 recently issued by Forest Products Laboratory of the U. S. Forest Service, Madison, Wisconsin, there appears the following suggestions for basic grading rules for structural timber. The publications of the Forest Products Laboratory should be looked to with the same high degree of respect in reference to lumber as the American Society for Testing Materials is looked to for quality determinations made by them. This technical note is in part as follows:

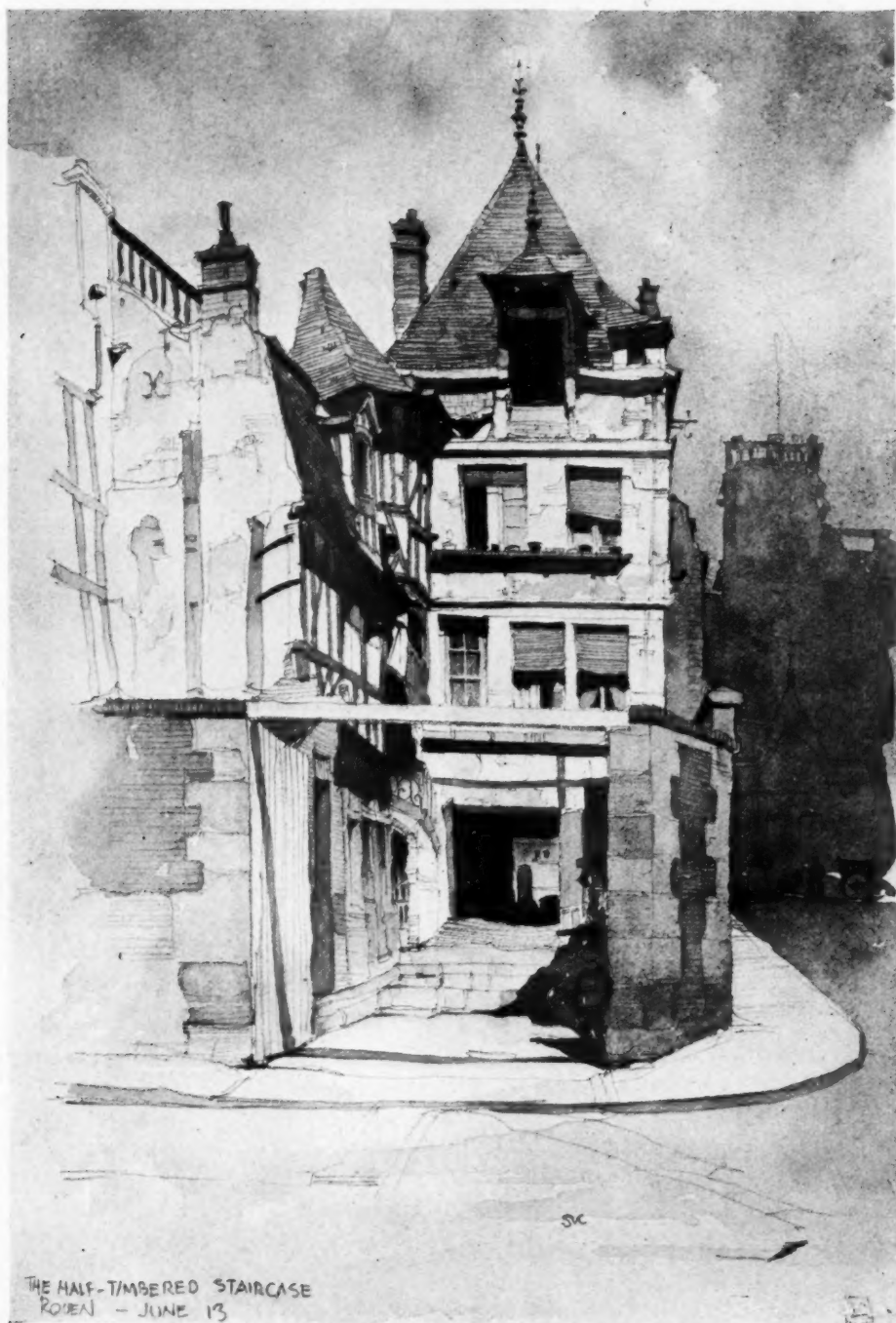
BASIC GRADING RULES FOR STRUCTURAL TIMBERS

As a step towards standardization and more efficient utilization of structural timbers, the Forest Products Laboratory of the U. S. Forest Service presents the following basic grading rules for softwood and hardwood timbers. These rules are based on the results of hundreds of thousands of tests on small clear specimens and numerous tests on timbers containing defects.

In substance, the new rules provide for a simple classification of any or all species into four basic grades from the standpoint of strength requirements for various structural purposes, excepting columns. The difference in inherent strength and character of various species is taken care of in the recommended working stresses. (See Forest Products Laboratory Technical Note 201).

The basic grades are formulated to take care of strength requirements only. It is expected that commercial grades will include provisions for any other properties that may be desirable in timber for particular uses.

(To be Continued)



THE HALF-TIMBERED STAIRCASE, ROUEN

(From the original sketch by Samuel Chamberlain)

THE AMERICAN ARCHITECT