THE ARCHITECTURAL FORUM

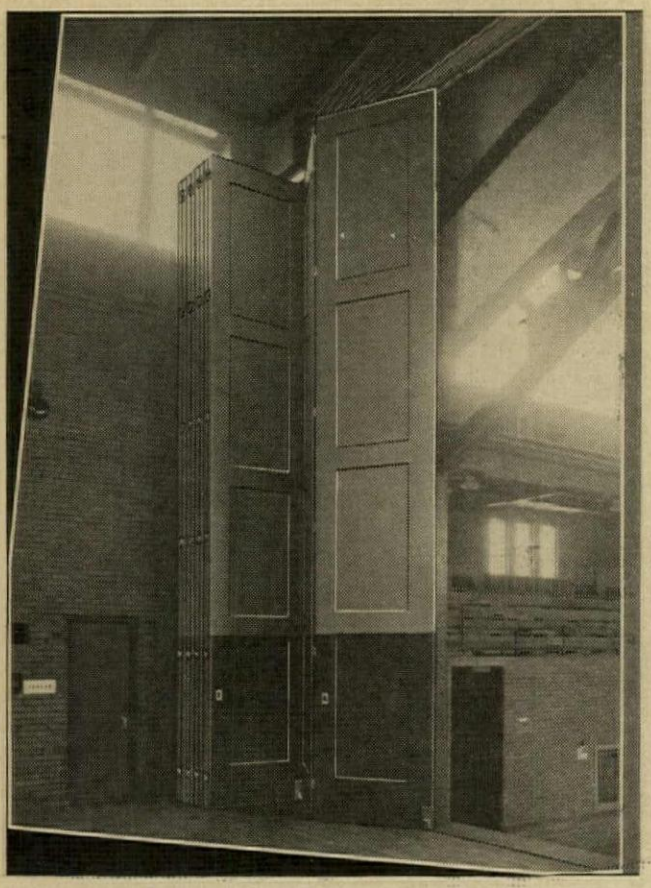
IN TWO PARTS

ARCHITECTURAL ENGINEERING & BUSINESS

PART TWO

NOVEMBER

1929



Twenty R-W FoldeR-Way doors, each 24 feet high, 4 feet 2 inches wide and 3 inches thick, form the sliding, folding, disappearing wall which closes the 83 foot wide opening between the boys' and girls' gymnasiums in the New Trier High School, Kenilworth, Ill.

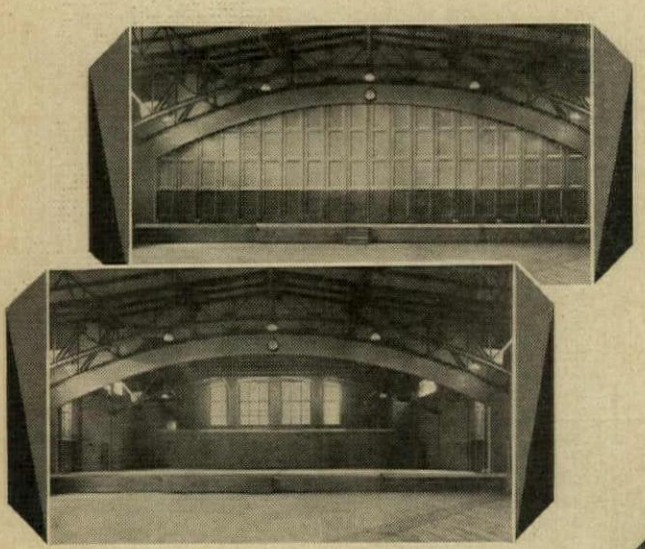
The whole wall disappears and reappears with FOLDER-WAY!

The high cost of floor space and the necessity for making one big room do the work of two or more smaller ones—this is the problem which finds its complete solution in FoldeR-Way equipment.

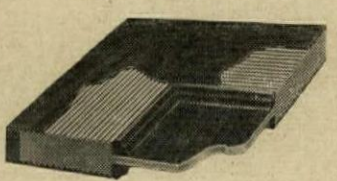
With FoldeR-Way, the wall is built to fold and slide away out of sight and to slip quietly and easily back into place at will.

The exclusive features of FoldeR-Way equipment assure certainty of operation that places R-W above and apart from all competition in the field of doorway engineering and equipment.

No opening is too large for FoldeR-Way. No problem is too intricate for R-W engineers. Write today for Catalog No. 43.



The beauty and smooth operation of R-W Compound Key Veneered doors are LASTING. *Sagging, warping, swelling, shrinking, are practically eliminated by tongue and groove method of applying extra heavy sawed veneer to rails and stiles of laminated core construction. Sold exclusively by Richards-Wilcox.*



FoldeR-Way flush bolt, two being required when doors divide at center, one when doors all fold one way. Brass or dull black finish.

"Quality leaves its imprint"

Richards-Wilcox Mfg. Co.

"A Hanger for any Door that Slides."

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NATCO VITRITILE *throughout*

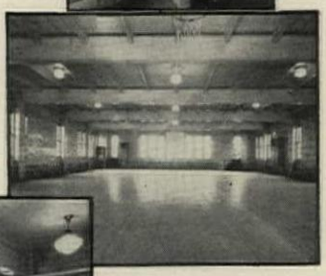
Lavatory

Stairway

THE BUILDING illustrated is significant, in that it indicates the growing tendency, on the part of many architects, to use Natco Vitritile throughout in buildings of an institutional or public character.

The structural excellence of Natco Vitritile has been repeatedly and convincingly demonstrated. The quiet beauty of the various shade ranges and the latitude of design that the colors and shapes confer, are immediately apparent to every observer. The qualities of economy, freedom from maintenance, low depreciation, ease of cleaning, sanitation, and serviceability manifest themselves unmistakably in use.

In lounges, halls, stairwells, corridors, gymnasiums, natatoriums, lavatories, and kitchens, Natco Vitritile has proved its worth beyond doubt or question. Write for catalog containing color plates, details and complete information.



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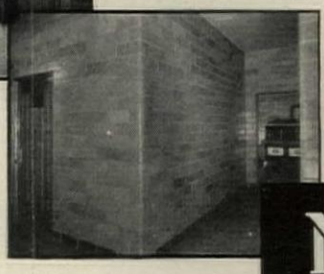
Corridor



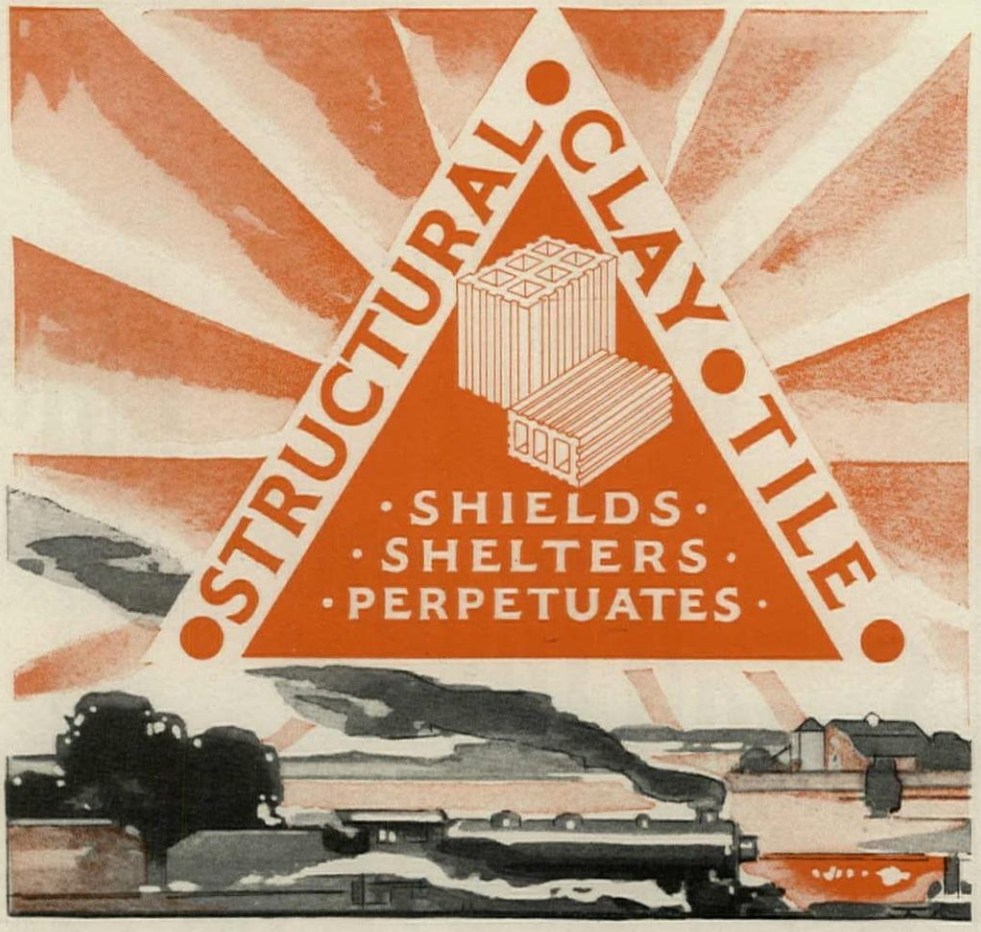
Drill Hall

Kitchen

Lounge

NATCO
THE COMPLETE LINE OF STRUCTURAL CLAY TILE

TURN TO "SWEET'S" Pages A-383 to A-416



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LOAD BEARING WALLS

Requisite strength with a minimum of weight results in economy in structural material. The large variety of sizes and shapes makes Structural Clay Tile adaptable to any type of construction.

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Tile floors can be erected in a minimum of time and at any time, regardless of weather and temperature. The light weight reduces dead load, permitting economies in steel and other materials.

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As back-up for brick, stone, terra cotta and other facing materials, Tile offers insulation, strength and permanence. Clay Tile furring, too, gives the best insulation for permanent buildings.

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Made in a variety of attractive finishes, face tile is appropriate for exteriors of homes, garages, rural buildings, etc., and for interiors of restaurants, lobbies, stations, subway viaducts, etc.

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The scored exterior surface and the uniformity of the units make Clay Tile partitions an excellent plaster base, while the cellular construction gives natural insulation against sound and moisture.

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This association maintains engineering and publicity staffs for the dissemination of information. Inquiries of a general or specific nature will be answered gladly.

EVERY NEED

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An Authoritative Institution for Research and Development, Representing 85 Per Cent of the Production of Structural Clay Tile in the U.S.A.

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Specify this Lighting Protection *for Public Buildings*

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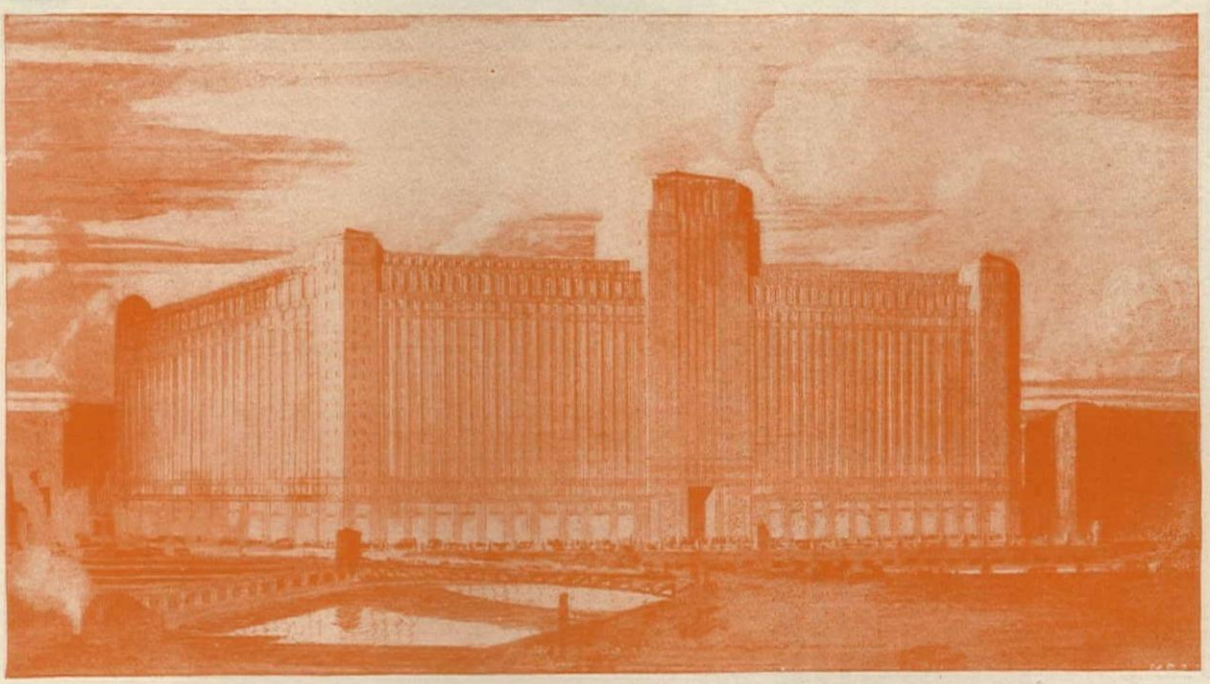

The Merchandise Mart, Chicago, Ill., piped throughout with Youngstown steel pipe.

Architect—GRAHAM, ANDERSON, PROBST & WHITE
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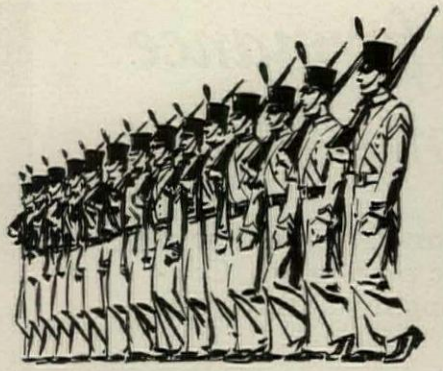
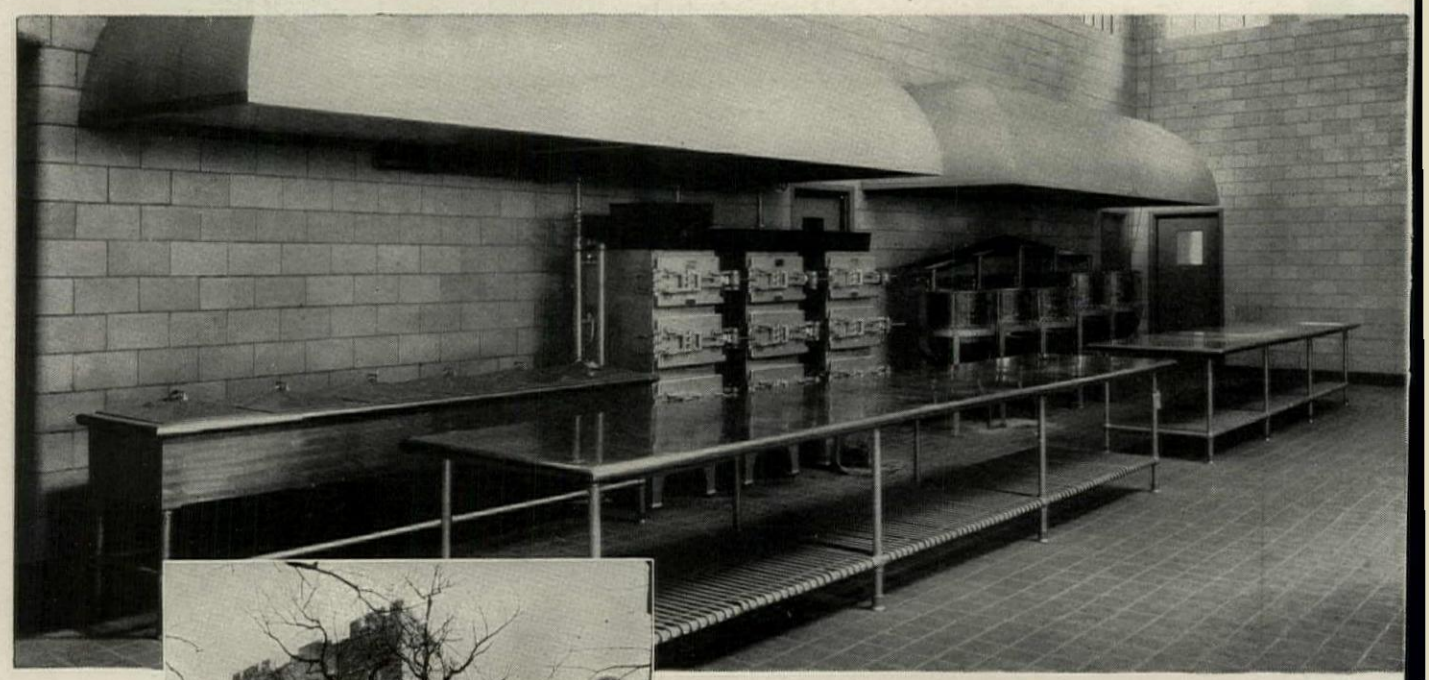
YOUNGSTOWN

GALVANIZED SHEETS PROTECT SAVE WITH STEEL



VAN EQUIP A WEST POINT

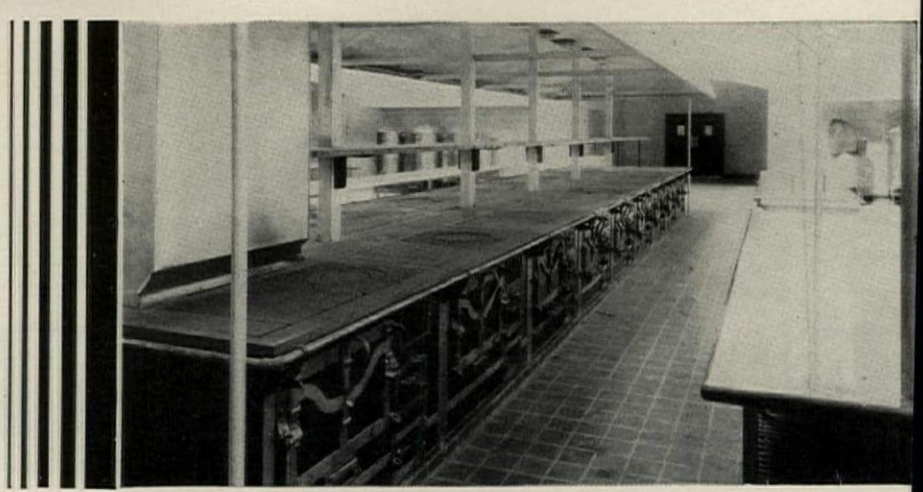


A battery of 3-compartment boiler plate Van steamers and five solid nickel, steam jacketed Van stock kettles, installed under specially designed canopies and serviced by 16-foot cooks tables with seamless Monel Metal tops.

IT is interesting to note that the West Point installation shown here was 100% VAN equipped. It includes ranges, broilers, steamers, stock kettles, cooks tables, cereal cookers, urns, automatic toasters, dishwashing equipment, a complete bakery and butcher shop, store rooms and cold storage—in fact every piece of equipment necessary for the storage, cooking and serving of food for the entire Academy.

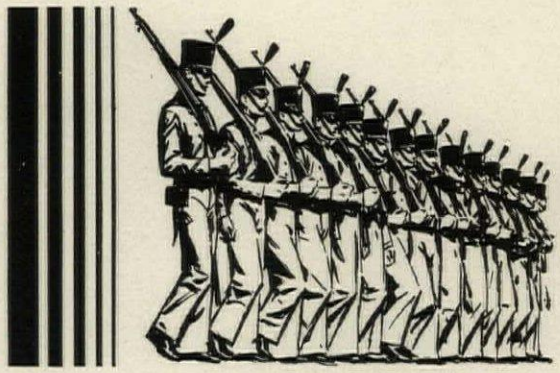
An interesting view of the main kitchen, showing part of the huge battery of 18 sections of Van heavy duty hotel ranges, with Monel metal cooks tables at the right.

The entrance to the "mess hall." The United States Military Academy on the Hudson River at West Point, New York.



GEHRON, ROSS & ALLEY
Architects

MENT PASSES INSPECTION



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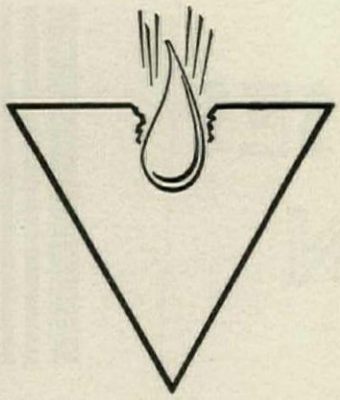
A small part of the 20,000 cubic feet of "Lorillard" refrigerators, installed by Van for use in connection with the West Point kitchens, bakery and mess halls.



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NO more elusive enemy of permanence in construction exists than the destructive force present in a drop of water. Leaks in foundations, mysterious seepages, efflorescence in brick work, stains appearing in stone facing, disintegration of concrete... these evidences of structural impermanence caused by dampness are only to be controlled by cornering the elusive drop of water.

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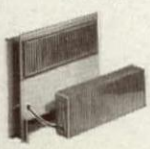

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RADIATORS—*yes, but out of sight—out of the way*

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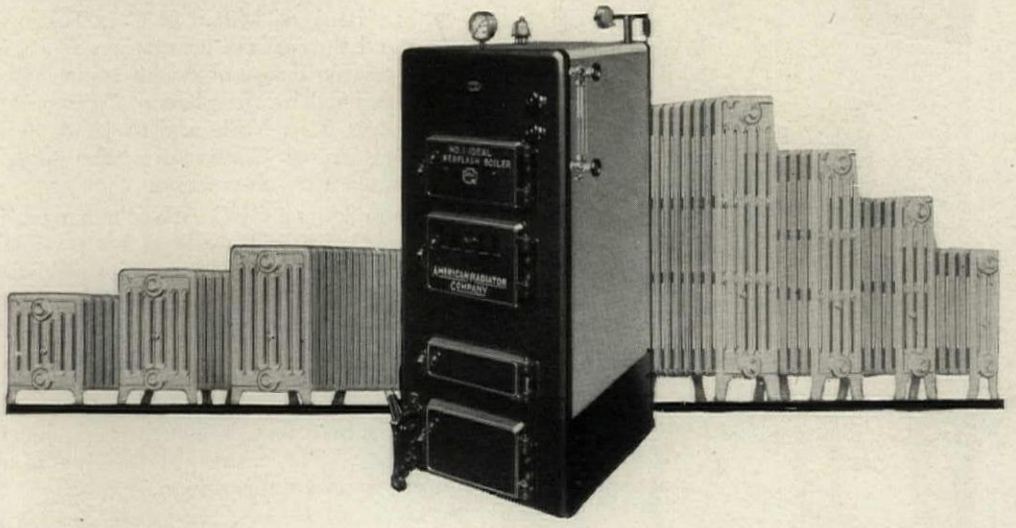

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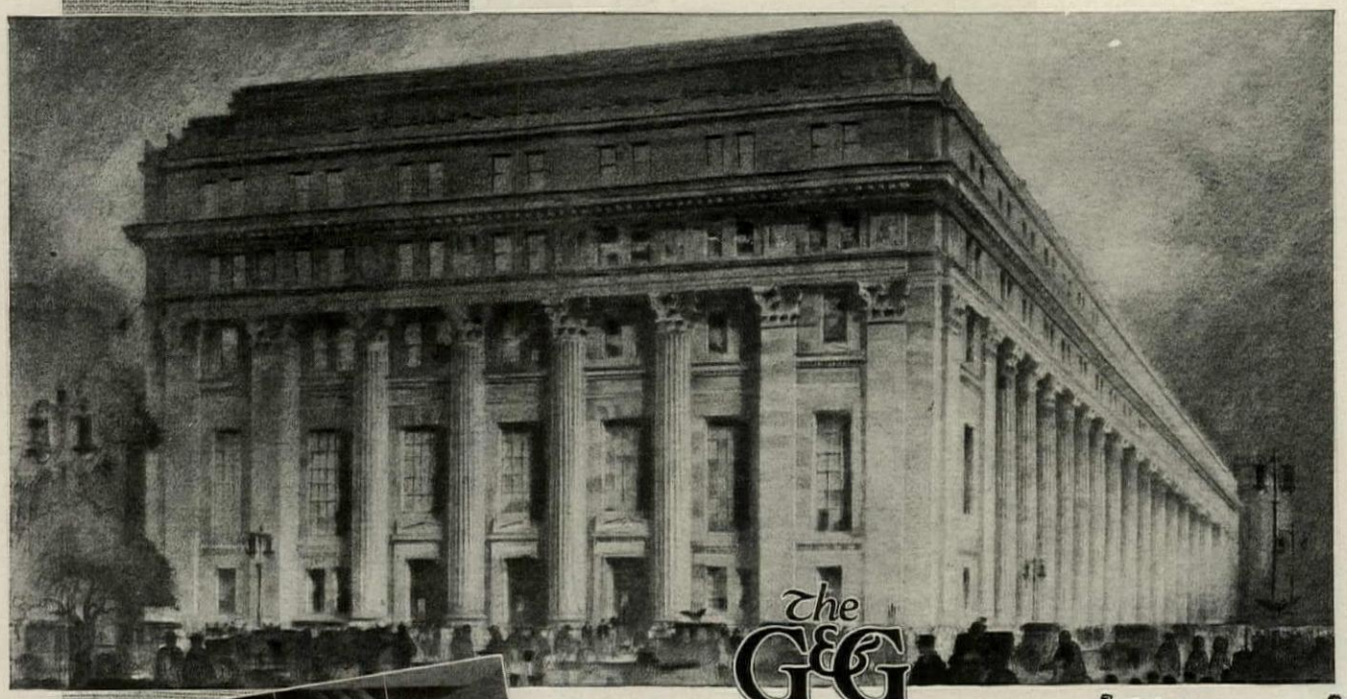

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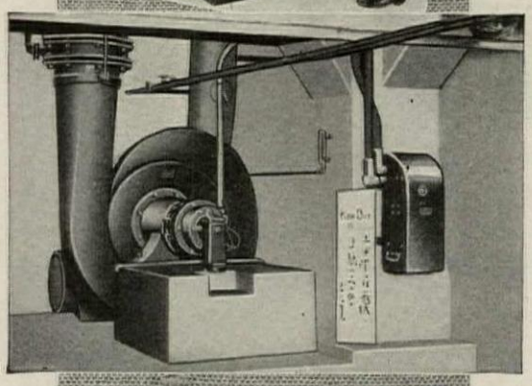

A Tribute to American Architecture

THE Bank of Mitsui & Co., Tokyo, will stand through the generations as a tribute to the creative design of Architects in America, as exemplified by the plans of Trowbridge & Livingston, New York, and to James Stewart & Co., General Contractors, who faithfully carried out the construction.

In this building a G&G Atlas Pneumatic Tube System (3 x 6 inch oval) makes possible the safe and rapid transmission of correspondence, documents, etc., between various departments. The upper left view illustrates the Central Station where carriers are received and dispatched. One of the stations on the main banking floor is shown in the center view. Motor and exhauster unit in basement is shown at lower left. The entire installation was made under our direct supervision.

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Catalog in Sweet's Archt. Cat., 23 Ed., pp. C3740-41
Catalog in Specification Data, 1929 Ed., pp.228-229

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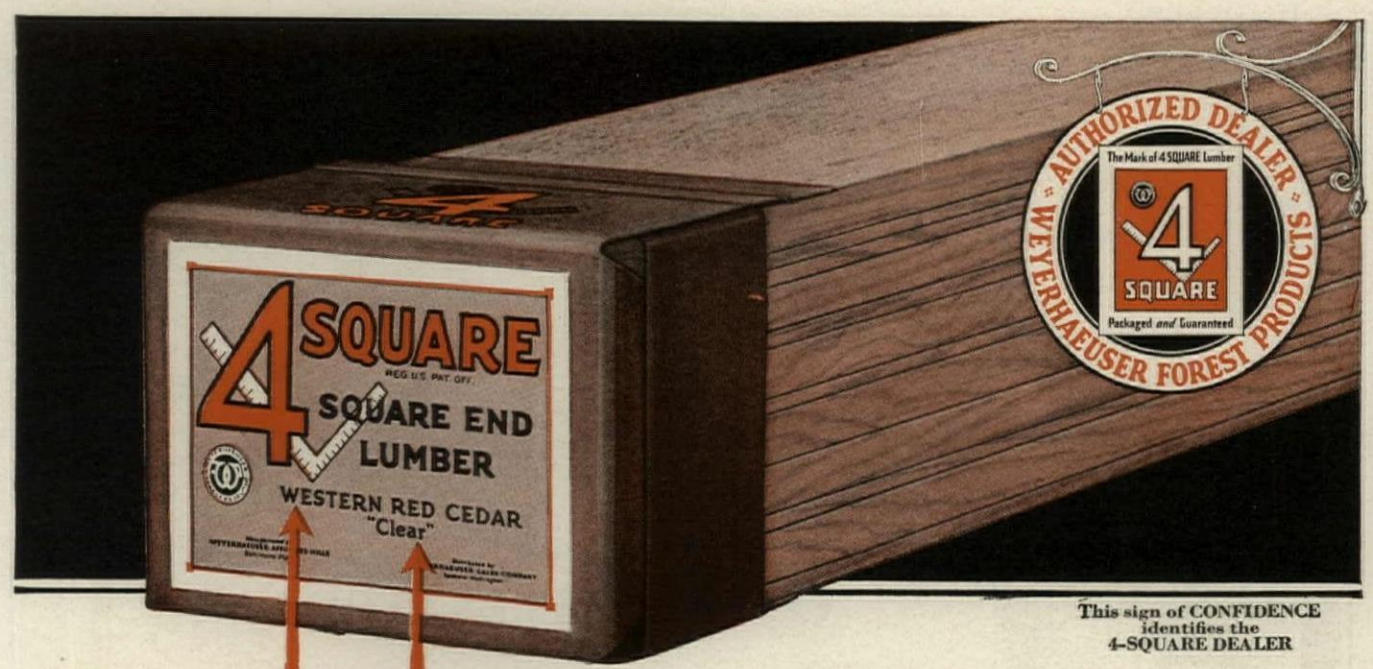
and many others.



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It is 4-Square Lumber—*packaged* lumber—*finest* quality lumber.

Every package is labeled and marked with the *species* and *grade* it contains. It is delivered from the mill—to the dealer—to the job in *original* packages for *identification* and *protection*.

It is *more* than packaged lumber. It is *guaranteed* lumber—the finest money can buy. Every operation from tree to job is controlled by precision standards. It assures finished results which measure up to your requirements.

Every piece of 4-Square Lumber is cut to *exact* length and *trimmed square at both ends*. Thus time is saved on the job—an added advantage.

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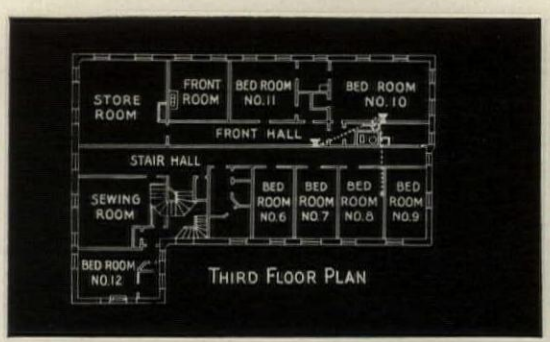
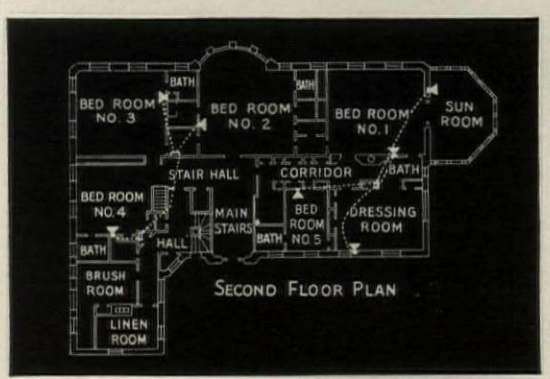
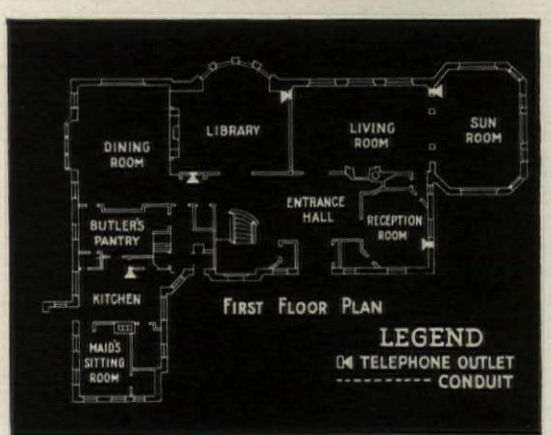
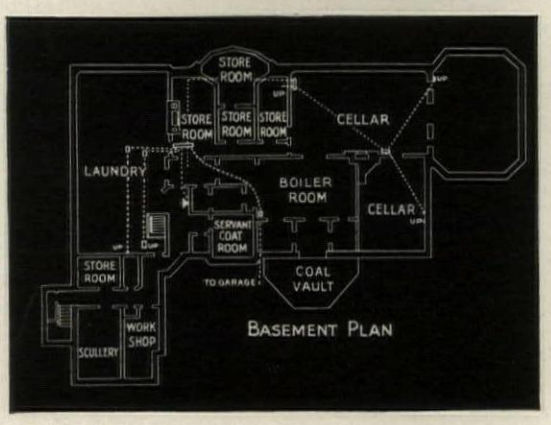








Seventeen telephone outlets provide for complete telephone convenience in the residence and garage of Mr. Edward Schmidt, 16960 East Jefferson Avenue, Detroit. The telephone wiring is carried in conduit built into the walls and floors. RAYMOND CAREY, Architect, *Detroit, Michigan.*

MANY ARCHITECTS find it desirable, in providing for telephone service in new and remodeled residences, to plan for possible expansion or rearrangement as well as for immediate needs.

Conduit for the telephone wiring is specified throughout the house. Outlets are thus made available in every place where a telephone may seem suitable. The owner can have telephones just where he wants them, utilizing as many of the provided outlets as may be necessary to furnish him the service arrangements desired. He can easily change or add to the telephone locations in the future, if occasion should arise. And he can enjoy the improved appearance and protection against service interruption that result from concealed wiring.

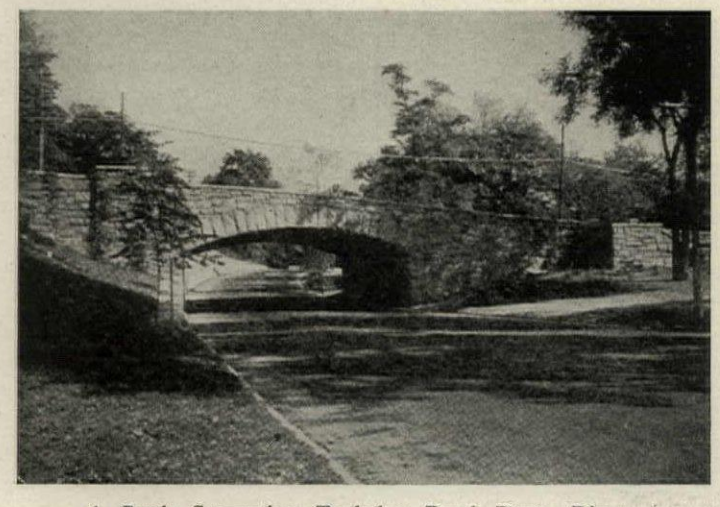
Telephone convenience has become so important a part of the modern home that architects are including provision for it in smaller residences as well as large. Most architects like to consult with representatives of the local Bell Company before planning the arrangements for specific houses. The telephone company is constantly studying ways to improve its service, and will gladly make helpful suggestions. There is no charge for this consulting service. Just call the Business Office.

BOOK DEPARTMENT

ROADSIDE DEVELOPMENT

A REVIEW BY
WALTER KNIGHT COLE

THE American people are spending an ever-increasing portion of their leisure time in the open, along the highways and byways which form a network over the entire expanse of the country. Automobiles are constantly carrying countless millions to and fro, and the natural and artificial features that form the surroundings of these roads are bound to have at least a subconscious effect on the spirits and minds of those who spend such a large portion of their time traveling the roads or resting along the roadsides. It might be said that the great system of roads in America forms an outdoor home for the people, and that as much attention should be given to beautifying and maintaining the surroundings of the outdoor part of the home as is given to the decorating of actual dwellings. It is quite certain that the automobile and good roads have had a very definite effect on domestic architecture. It is no longer so important to provide broad porches and other places where the householder may spend all his leisure time, since it is more than likely that he will have very little time to devote to staying at home, especially if he has available roads whose surroundings are not only pleasing to the eye but also furnish all sorts of utilities for his convenience and pleasure.



A Grade Separation, Tuckahoe Road, Bronx River Parkway, New York

Of course the part of the road that is of paramount importance to the traveler is the roadway itself. It is more important to have a broad, smooth driveway than it is to have elaborate landscaping surrounding a rough and inferior pavement. However, if it is possible to have both a fine roadway and pleasant, tasteful surroundings, the effect on the mind of the stranger is favorable, and he is filled with respect and liking for the inhabitants of the country through which he is passing. Often it is only necessary to take advantage of the natural beauty of the terrain along the right-of-way in which the new roadway has been built. By cutting the grass, cleaning up underbrush and grading off the shoulders of the road as well as of any cuts or fills made during its construction, the general effect of prosperity and good will may be increased to a surprising degree. Then, too, there are instances where the natural features need to be augmented by the planting of nursery trees or shrubbery. This may be done according to either a formal or an informal plan, depending upon the nature of the countryside or suburban district through which the road is passing. Public utility lines which run along roads are seldom assets to the beauty of the surroundings, but their objectionable features may be reduced to a minimum by careful planning and designing on the part of representatives of the companies and the men responsible for layout of roads, and this should be done.

Other features which have a lasting effect on the beauty of the surroundings include, of course, the design and construction of the engineering structures built in connection with road construction, such as bridges and culverts. It is in this department of road building that architects are most likely to be interested, since they are often called in to consult and collaborate with engineers in the designing of such structures. This type of design offers an opportunity for the beautifying of the road system. Beautiful bridges have always thrilled the human mind and will probably continue to do so as long as they continue to be beautiful. Even smaller culverts and their parapets should be carefully designed from an æsthetic point of view if the utmost in beauty of the roadside is to be attained.

Another type of roadside accessory in which architects have a professional interest is the convenience stations that are being placed along the highways at intervals to serve the traveling public. This type of building has been receiving considerable attention of late, and some very interesting and charming bits of architecture have been designed to serve these purposes. Service stations for the sale of supplies to automobilists of course are more often than not hideous blots on the landscape, being designed to attract attention to themselves rather than to beautify the scene. Some of the large gasolene dispensing companies have evidently made some efforts in the direction of building more pleasing stations, but the commercial urge has in most cases been too strong, and beauty has suffered accordingly. In some cases where comprehensively planned road developments, have

been laid out, the governing authorities or commissions have kept control of the construction of such gas stations, with the result that they are pleasing adjuncts to the landscape. A good example of this is the Hutchinson River Parkway of the Westchester County (N. Y.) Parkway system, where only one or two stations have been built in the entire length of the road. These stations have been carefully planned to fit in well with their surroundings, and in this their architect has been quite successful, but it is the exception proving the rule.

One of the leading road development systems in America,—if not the leading system,—is that Wayne County, Mich., which is famous the country over for its splendid roads running through right-of-way carefully kept and improved. One of the men who have helped to bring about this excellent system of roads has made a careful investigation of the subject of roadside development and has published the results in book form. This is J. M. Bennett, Superintendent of Parks and Forestry, Board of County Road Commissioners, Wayne County, Mich., and the work, entitled "Roadside Development," is issued as one of the "Land Economics Series." The author's long experience in the planning and developing of roadside development in one of the outstanding programs carried out in America fits him well to compile a manual governing this sort of work. The data given in connection with the various descriptions and discussions have been taken from the records in connection with the construction of these Michigan roads.

A great deal will be found in these pages to interest the architectural reader, especially if he or she be interested in solving landscaping problems. The architect doing general work is often called upon to solve problems having to do with drives and roadways approaching houses or public building he is designing, as well as the leading in of lines of wires and pipes supplying public utilities to buildings. While the chapter here devoted to the designing and construction of the roadway, both as to itself and in connection with trees and poles along its side, was written for use in connection with the construction of public roads, there are many facts and suggestions that should prove helpful to those planning private roadways. Planting is a subject which is of course of prime interest to the landscape architect, and the general discussion of the subject contained in this work will no doubt present to landscape architects many new ideas and theories, based as it is on an experience having to do with the planting of thousands of shrubs and trees in a climate which is typical of a large portion of the more thickly settled region of the United States.

Nor has the author confined himself to trees suitable to his native Michigan but has included in his investigations and descriptions trees suitable for roadside planting in all parts of the country. The actual planting methods employed by an organization having to do with planting on such a vast scale will be found of great practical interest to all interested in beautifying their natural surroundings. The chapters on planting materials, planting and seeding and sodding, will be of course interesting to architects only in a general way, as are also the chapters on the maintenance and preservation of trees. The chapter on comfort stations, however, treats a subject which may well become of interest to at least some members of the profession. In fact, the construction of public comfort stations along public highways has become

a necessity. They provide a necessary service to motorists and, if properly maintained, are a protection to the community. It is just as necessary to furnish pure drinking water and sanitary facilities for motorists on a heavily traveled highway as it is to furnish similar stations for pedestrians in cities. Some fairly important structures have been erected for this purpose already, and it is possible that with the ever-increasing motor traffic which we are experiencing, the number and importance of such buildings will increase rapidly.

For his chapter on Parkways, Mr. Bennett has come east and draws much of his reference matter from the reports of the chief engineer of the Westchester County Park Commission, whose system of parkways is world famous. Many photographs used for illustrating this chapter and others were taken along the Westchester County roads, and these together with a large number from Wayne County, Mich., and some from various other parts of the county lend greatly to the interest of the book; layouts of trees and roads and other technical matters are illustrated by maps and diagrams, adding to the lucidity of the explanations. The designing of lamp posts is another subject discussed and illustrated that will have more than usual interest for the architect, this compromise between utility and beauty being something that one may be called upon to design in connection with other work. They offer a fine opportunity for original treatment, and as a general thing there is an opportunity for improvement in the appearance of the light standards that line our streets and roads. There is a strong tendency toward extending systems of road lighting across country along all the more thickly traveled roads, and it is to be hoped that those in charge of the construction will employ designers competent to produce pleasing standards that will fit well into the surrounding scenes.

Although this work was obviously written to serve those who are concerned with public road construction and beautification, the architectural reader will be able to glean a great deal of interesting and practical information from its pages, to say nothing of the wealth of material as interesting to him as to a general reader. The description of the progress that has been made throughout the nation will give an idea to what an extent road building developments have been undertaken and carried on. In the appendices will be found reprints of the New York Parkway Law and the laws of New Jersey relating to roadside development and shade trees.

ROADSIDE DEVELOPMENT. By J. M. Bennett. 265 pp., 5½ x 7¾ ins. Price $5. The Macmillan Company, 60 Fifth Avenue, New York.

PERSPECTIVE DRAWING. By Joseph Brahdy. 104 pp. 6 x 9 inches. Price $2. D. Van Nostrand Company, Inc., 8 Warren Street, New York.

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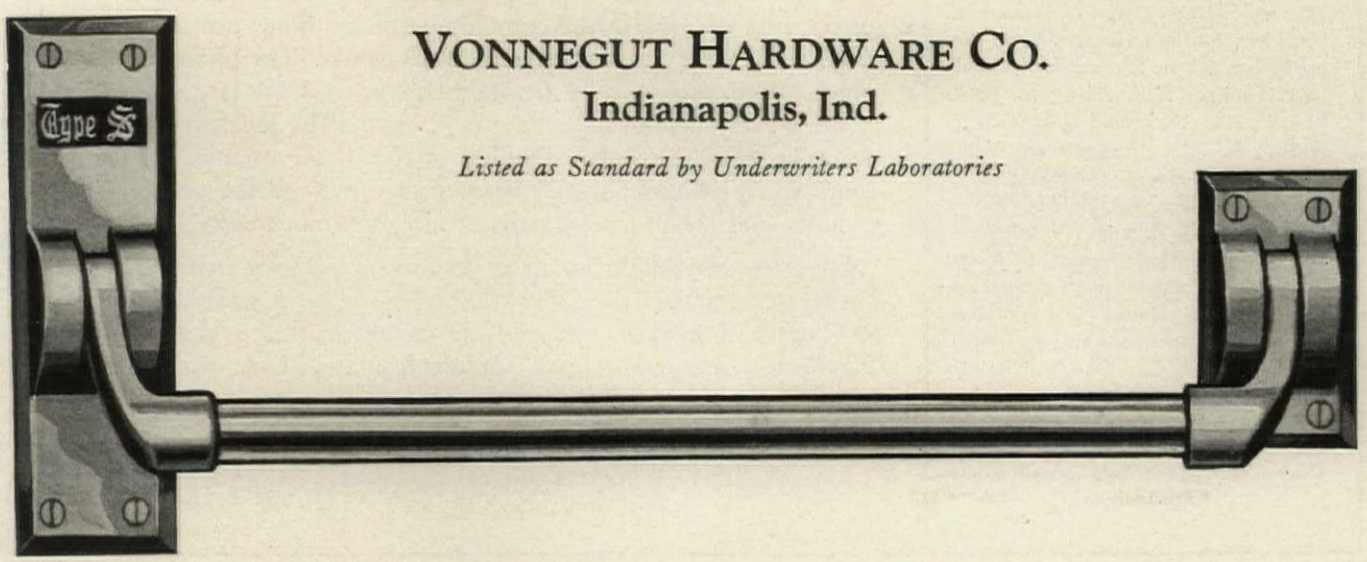

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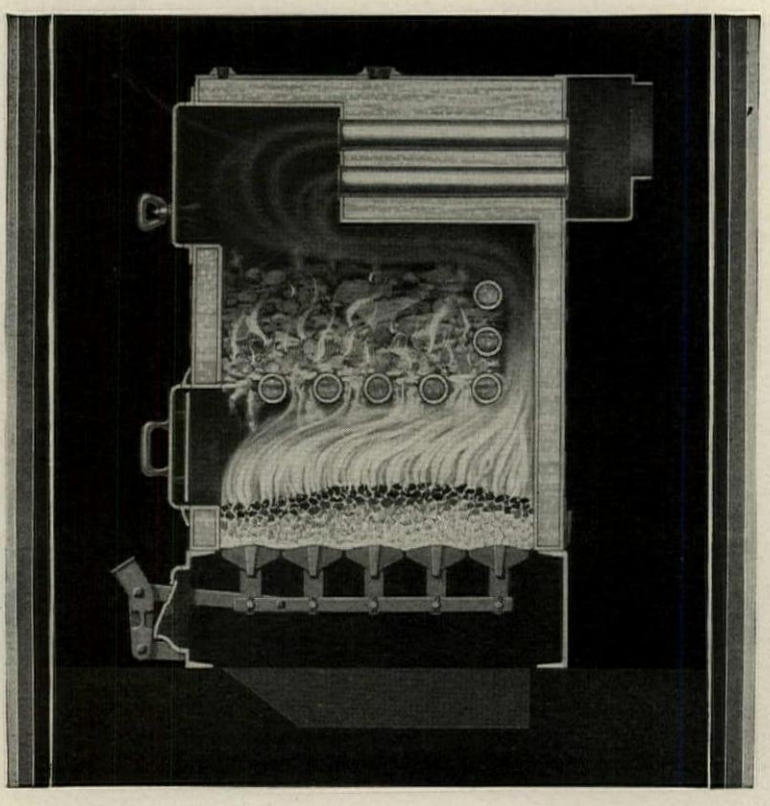

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VOLUME LI — NOVEMBER 1929

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H. J. Redfield, Chairman of the Board and Treasurer; Howard Myers, President and General Manager; John Thomas Wilson, Vice President; James A. Rice, Vice-President; C. Stanley Taylor, Vice President; Henry J. Brown, Jr., Secretary.

Yearly Subscription, Payable in Advance, U. S. A., Insular Possessions and Cuba, $7.00. Canada, $8.00. Foreign Countries in the Postal Union, $9.00. Single Copies: Quarterly Reference Numbers, $3.00; Regular Issues, $1.00. All Copies Mailed Flat. Trade Supplied byAmerican News Company and its Branches.

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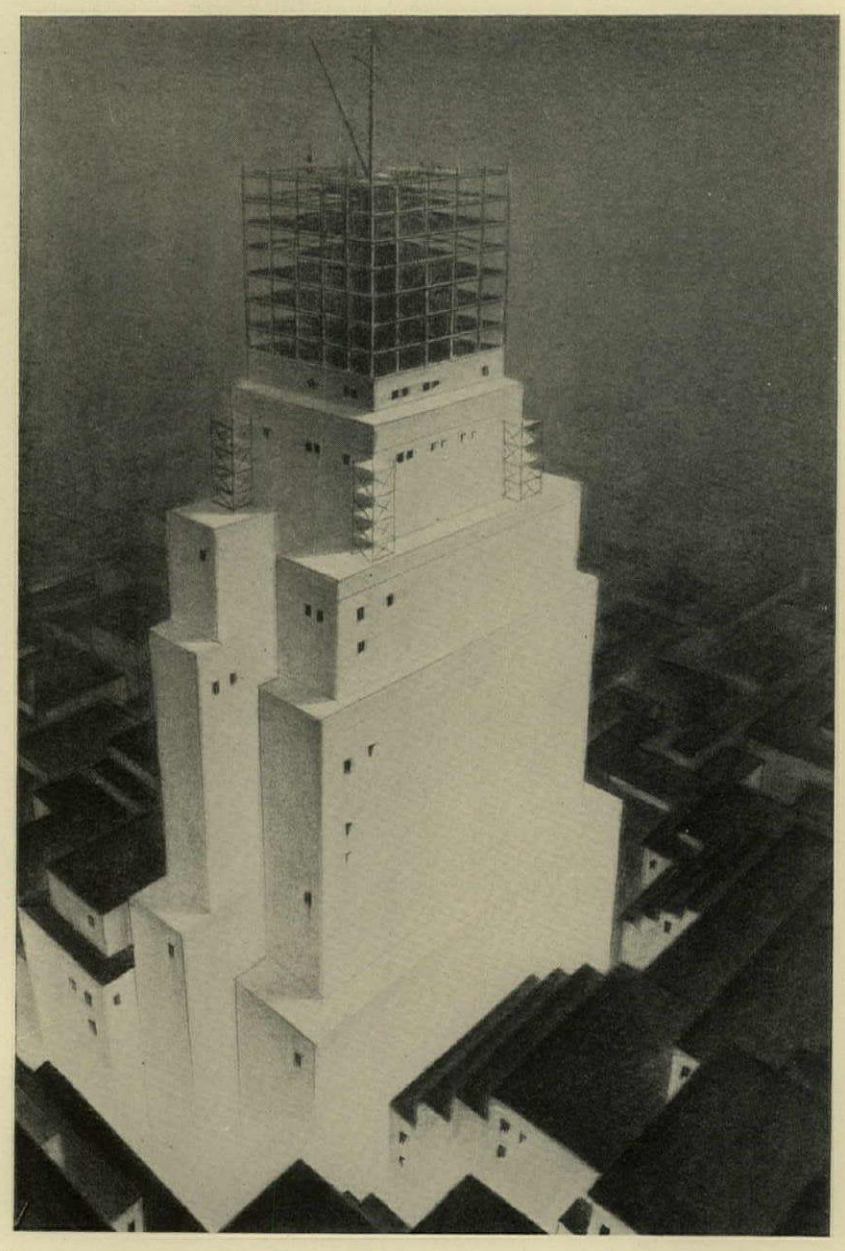


BUILDING THE TOWER

From a Drawing by Tabu

The Architectural Forum

THE
ARCHITECTURAL
FORUM

VOLUME LI NUMBER FIVE

NOVEMBER 1929

ACOUSTICS OF PICTURE THEATERS

BY

CLIFFORD M. SWAN

THE telephone rings. "Long distance calling. Smithtown, Palatial Theatre. New installation of talking picture a failure owing to bad acoustics. Advice necessary at once or house must close." Such is the typical S.O.S. call for help. It has been so frequent since the inception of the so-called "sound films" that it is of interest to analyze the causes and see how they can be corrected.

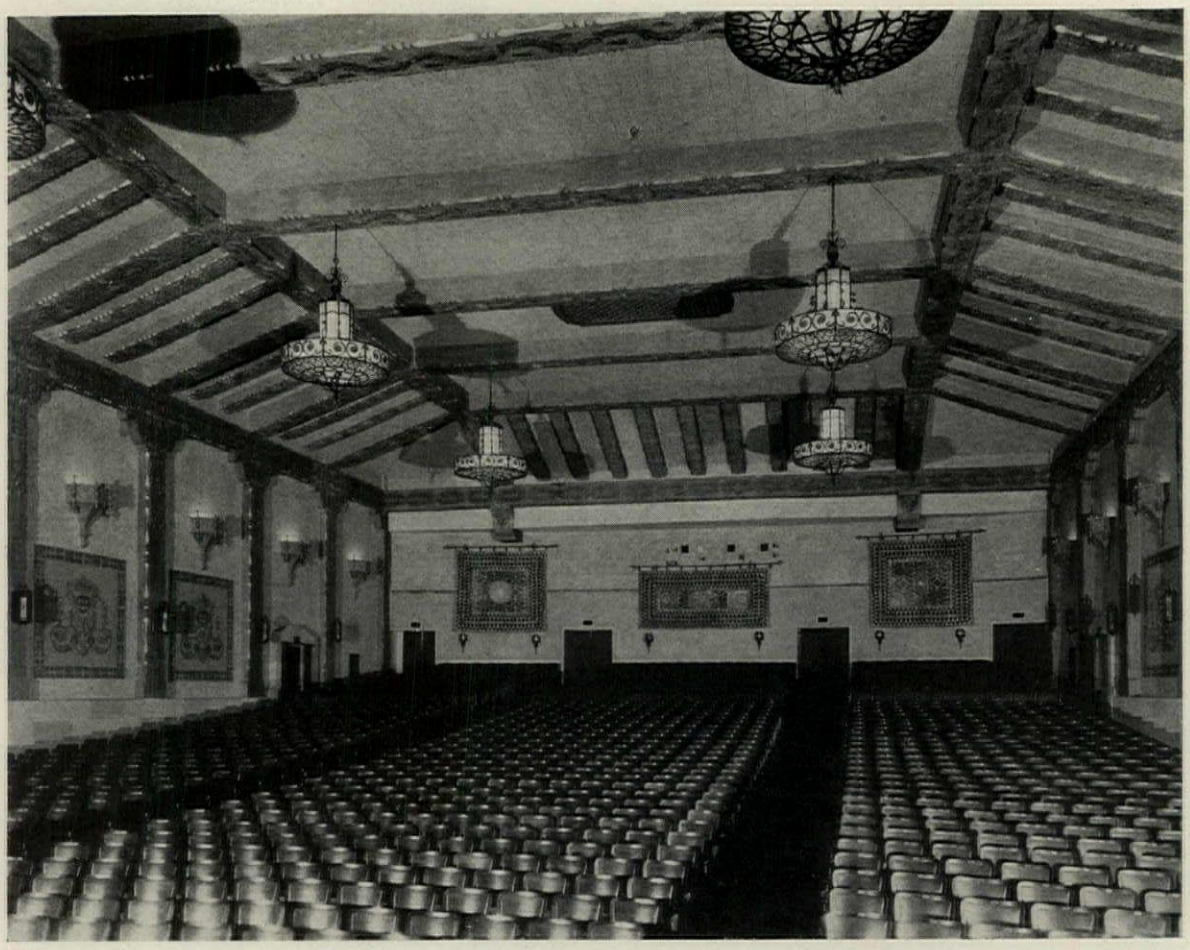
Of course, the general features of the case are not new, since acoustical qualities have long been studied not only in theaters but in all types of auditoriums. The problem becomes insistent under present conditions, however, for two major reasons. One is the fact that most of the theaters now used for talking pictures were originally designed only for the "silent drama," so that the question of hearing was not a matter to consider. The other reason is the great increase in the volume of sound developed as compared with the intensity normally given by the unaided voice or musical instruments, thus calling for a lower reverberation period than in the ordinary auditorium.

Another important consideration, added to the factors of design and reverberation, is the proper placing and operation of the sound-projectors, more often overlooked than one would think possible. Finally there is the disturbing effect of noise of ventilating fans, projection machines and other sources inside and outside of the theater.

Reverberation. First of all, let us consider reverberation, since this phenomenon has become fairly familiar in its general aspects in recent years through much discussion and advertising. Reverberation is the duration or persistence of sound in a room after the source has ceased to give out energy. It is caused by the multiple reflection of the sound waves from one surface to another before their energy is absorbed. Obviously, the more absorbent the surfaces the less time the sound will take to die away. On the other hand, if the surfaces are good sound reflectors, the period of duration may amount to a number of seconds. The effect of the latter condition is to cause a confused jumble of sound whenever words or musical tones are produced in rapid succession. This is increased with the size of the room and the loudness of the originating sounds and is much worse for speech than for music.

Omitting for the moment consideration of metropolitan picture houses which have a considerable amount of absorption due to carpets, hangings and upholstered seats, let us look at the condition of the large majority of motion picture theaters, especially in suburban or country districts. Many of them are mere barren halls with plaster walls and ceiling, wood or concrete floors, and bare wood seats. The only absorption is supplied by the clothing of the audience, and this is often confined to the floor, since there is frequently no gallery, or at best only a shallow balcony.

The absence of furnishings or other absorptive materials is not noticed as long as these houses are used only for silent pictures, but as soon as sound pictures are introduced, trouble immediately looms large. Reverberation, created not only by the very existence of sound but accentuated by the high level of intensity, makes conditions almost intolerable. Intelligibility becomes so imperfect as a result of the overlapping and blurring that the public refuses to be attracted, even by the novelty of the talking feature. Under such circumstances, obviously demanding prompt action, relief has naturally been sought in the placing of absorbent materials somewhere in the auditorium. This is often done in random fashion without due regard either to the amount of material necessary to produce the best degree of reverberation or to its location as influenced by the shape of the room. For these reasons, the results of such blind procedure are sometimes disappointing. Likewise, in the more richly furnished city theaters, where conditions are apparently satisfac-



Typical Theater Without Balcony, Showing Necessary Rear Wall Treatment to Prevent Echo, as Well as Ceiling Treatment to Reduce Reverberation

tory for ordinary speech or music, the amount and disposition of the absorption are not always the best for the new type of sound origin.

As the result of some 30 years of experience in the adjustment of auditorium acoustics, the optimum time of reverberation has been fairly definitely established for varying sizes of rooms as used for speaking or for instrumental or vocal music. In the normal auditorium there must always be some reverberation to preserve tone quality and sufficient loudness to hear comfortably. On the other hand, excessive blurring must be eliminated. The optimum period represents the compromise of the average ear between these requirements. If we take an auditorium which has thus been adjusted for normal source intensities and then substitute a source many times louder, as in the case of the amplified reproduction in talking pictures, the time of reverberation is materially increased. This means that additional absorption must be introduced to restore the reverberation period to the optimum value. Exact figures are difficult to give because the sound reproduction is not always presented at the same level of intensity. On the average, however, the talking picture house requires about from 20 to 25 per cent more absorption than if used for unamplified speech.

The actual area to be covered by any given absorptive material will be obtained from the number of absorption units as just outlined and the absorption coefficient of the material chosen. Sound-absorbing materials may vary widely in their efficiency over the range of audible pitch, and different materials have varying efficiencies. For the most perfect results, therefore, care should be exercised in the choice of material to be certain it will meet the requirements of the case, not only a single pitch, but over the entire range.

Location of Absorbing Materials. Of equal importance with the amount and kind of material chosen is its location. Indeed, its apparent absorption and its consequent effect upon the reverberation are dependent to some extent on its position. Furthermore, reflection from some surfaces is more harmful than from others, on account of the production of echoes and dead spots. Such surfaces should receive preferred attention in their treatment. Their location will be largely a question of the design of the individual theater. It may be laid down as a general principle in almost all

Theater with Ceiling Curvature which Would Produce Echoes, Corrected by Using Absorbent Tile Vaulting

cases, however, that the rear wall of the auditorium should be made as absorptive as possible, and particularly if this wall is devoid of balconies or is curved in shape. In fact, curved surfaces are dangerous wherever located, whether on walls or ceiling. Even plane walls if parallel often produce flutter echoes. The rear wall, however, is of especial importance, since it faces the origin of sound and produces a direct reflection, and the more so if horns are used, since these have a marked directional effect particularly for high pitches, and therefore submit the rear wall to an intensified bombardment of sound. Very deep and low balconies may protect this wall from much of the direct sound, but the average small picture house seldom has this protection. In a large number of theaters the rear wall is segmental, following the curved line of the seat rows and with its center of curvature located somewhere between the front of the orchestra stalls and the rear wall of the stage. This is about the worst possible curve, as it is sure to produce focusing effects. It should be avoided in the design of all new houses. In those already built it must be covered with the most absorbent material possible. Perhaps the best solution as regards appearance and efficiency is to hang heavy interlined curtains in full folds over the offending surface. Other points to remember in designing new theaters are that flat ceilings are preferable, as are plane side walls slightly flaring outward from the stage,—and that sharply curved surfaces of short radius, such as coves and corner curves, are permissible.

Sound Sources. Sound projectors are of two general types, — the disc and the horn. Disc speakers give a better diffusion of sound throughout the theater and consequently a better distribution of intensity. Horns are very commonly used, however, and on account of the directional effect already noted, make particularly imperative a careful study of the shape of the auditorium. Some such sources produce a beam of short waves analogous to a slightly divergent beam from a searchlight. The number and kinds of curious and unexpected echoes which can result from such a wave concentration when combined with a variety of curved walls and a vaulted or domed ceiling are truly remarkable. Since most of the sound from such projectors passes directly ahead, the auditorium should be limited in width—another

point to be borne in mind by the architect in new designs. If the theater is wide, sound will reach the front corners and extreme sides largely by reflection alone, and hearing will be difficult.

Another precaution which must be taken, especially with such directional sources, is the arrangement and relative positions of the several horns employed. Many cases arise where the acoustical condition of the auditorium is as nearly perfect as possible, and yet dissatisfaction is found in the hearing, simply because of improper placing of the loud speakers. Ideally, the sound should all proceed from as nearly one point as possible. Wide separation of the projectors,—the more so if they are strongly directional,—almost inevitably causes local regions of confusion in the auditorium due to imperfect registration of the various wave trains as a result of difference in length of path. A solution has been found in concentrating the loud speakers directly behind a picture screen, permitting the passage of sound. The only drawback to this is the partial selective absorption by the screen.

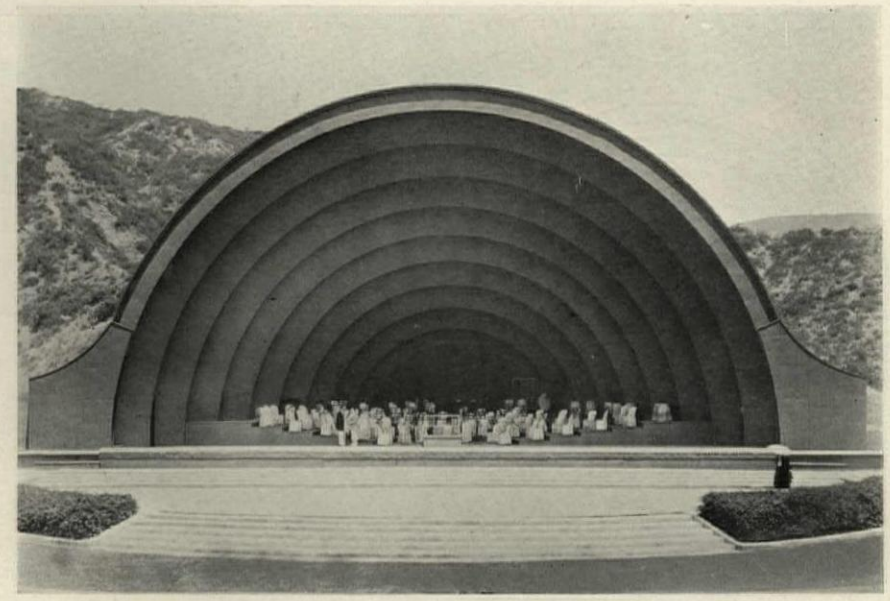
Extraneous Noises. There are still further points to be considered in the production of an auditorium thoroughly comfortable for hearing. These relate to the disturbing effect imposed on the ear by noise originating either inside or outside of the theater. Like dirt, which is said to be matter out of place, so noise is sound out of place. Conversation, which has its legitimate uses under suitable conditions, becomes noise when it interferes with a program of entertainment. The hum of a dynamo may be a musical tone, but it is noise when it intrudes upon desired quiet. The sound of a dance orchestra is often the worst possible noise to one trying to sleep in a nearby apartment. Any sound which interferes with the business at hand must be classed as noise.

In the case of the picture theater, noises may arise from a number of sources,—conversation or movements in lobbies and corridors, the sound of traffic on the street, the whir of ventilating fans, the hum of the motion picture machine, restlessness and coughing in the audience, and sometimes the reverberation of the stage chamber. Of course, the first precaution is to prevent as far as possible the production of such noises. Lobbies should be carpeted or have an absorptive material on the ceiling; aisles and spaces between the rows of seats should be covered with resilient deadening material; ventilating fans, motors and projection machines should be as silent as practicable.

Such noises as remain despite these efforts must be excluded from the auditorium. Doors leading into lobbies should be kept closed. The noise of persons walking and talking in such antechambers, together with the sound of street traffic, is a source of serious annoyance to those of the audience in the rear rows. Effective door barriers are an inestimable comfort. Fans and motors should be located as far as possible from the auditorium, preferably in a basement, but in any case on a rigid, heavy main foundation and mounted on cork. Ducts should be broken by a canvas sleeve near the fan. If noise passes through the air column of the duct, a felt lining should be installed within the duct extending from the canvas sleeve up to and around the first bend in the pipe.

Projection rooms suffer not only from the direct noise from the machines but also from the increasing of this noise by the reverberant interior of the space. Such rooms should always have a fireproof, sound-absorbent material applied to the inside surfaces of their walls and ceilings. In theaters where the stage is large and bare, there may be sufficient reverberation to magnify sound from the loud speakers or other sources. If this is great enough to be annoying, absorbent materials can be introduced to correct the difficulty. In many cases the sound projectors are housed in a horn tower or some similar structure. Of necessity, this must have a certain area of openings to permit of re-circulation. In order to prevent the escape of sound from these openings, the structure should be lined with absorptive material.

Of course, on account of the great loudness of the sound from the horns, the importance of many of the noises here enumerated may have been overemphasized and not appear to be as disturbing as in an ordinary auditorium. Still, they are excitants of the auditory nerves and shoud be eliminated.



THE ORCHESTRA SHELL OF THE HOLLYWOOD BOWL

BY
ARTHUR T. NORTH

AUDITION and vision must be correctly related to an audience to produce a complete presentation thereto. Both of these aims can be effected in enclosed spaces by well established methods, but securing good audition in open spaces has been a difficult problem to solve. The rapidly increasing number of outdoor auditoriums makes the securing of satisfactory audition a matter of prime importance. This problem has been solved successfully in the Hollywood Bowl by the use of an orchestra shell of unusual design.

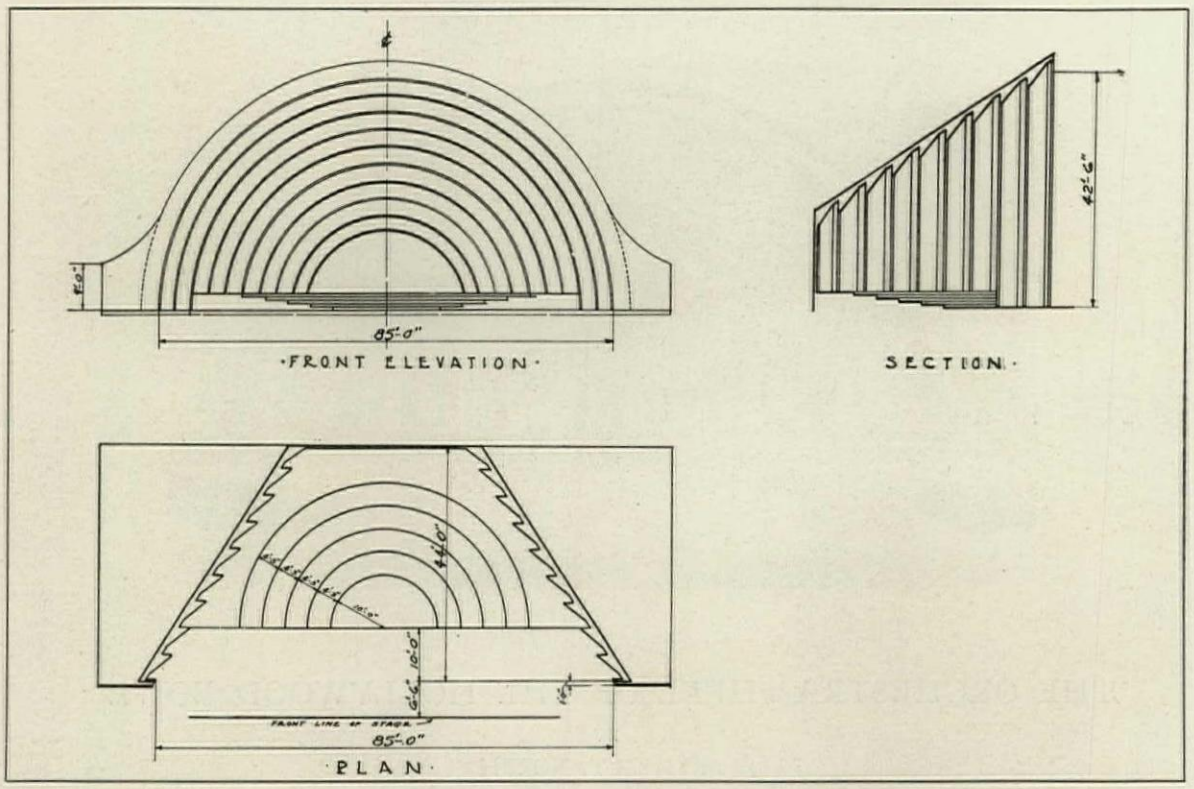
The Hollywood Bowl consists of a seated area built on a sloping hillside extending 550 feet from the stage which is placed at the lowest level. Opposite the seated area there is a corresponding hillside. The stage is 45 x 105 feet in size and is used several times a year for the presentation of elaborate pageants. At other times it is used for orchestral concerts, so the necessity for perfect audition is readily apparent.

The present orchestra acoustical shell is a steel frame structure erected on a movable steel frame floor system which is fitted with forty-seven 6-inch in diameter, double-flange, roller-bearing cast iron wheels which travel on five lines of 30-pound rails. With clips and cap screws the rails are attached to inserts built into the stage floor. When the orchestra shell is not in use, it is removed and the rails are taken up, leaving a flush stage floor. The framework of the shell is made of nine semicircular lattice steel trusses supported on the movable floor framework. The trusses are concentric, spaced about 4 feet apart and having decreasing spans. The weight of the shell and platform, without the walls and roof of the dressing and instrument rooms, is approximately 55 tons. The weight of the structural steel is 36 tons. The entire structural steel work was welded.

The flooring of the shell is made of wood, and the steel frame is covered inside and outside with flat, dense asbestos board sheets. A curtain is used to close the shell against the weather when not in use. It is made in two pieces, fastened along its lower edge, and it opens and closes like a folding fan. Wheels fastened to the curtain operate in a track attached to the outer perimeter of the front of the shell. It is operated by an endless cable and a hand winch located in the left wing. During performances the curtain is stored in a box, the cover of which forms the front portion of the stage.

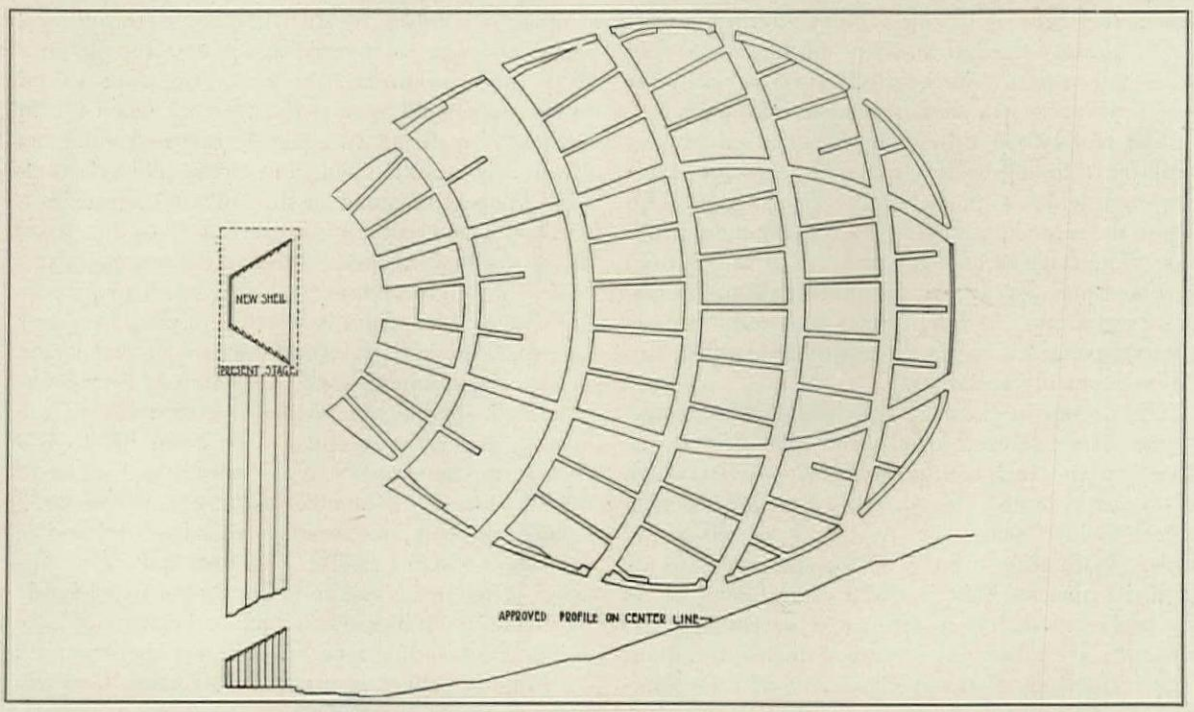
The maximum distance at which ordinary unamplified speech can be heard effectively in the open is generally accepted to be from 100 to 150 feet from the sound source. Sound will carry to much greater distances, however, when good sound-reflecting surfaces are placed behind and at the sides of the speaker. This principle of sound-reinforcing by reflection is applicable to all kinds of music, including that of an orchestra.

The most simple type of orchestra shell consists of a highly reflective vertical wall placed directly behind the orchestra. Such a wall or sounding-

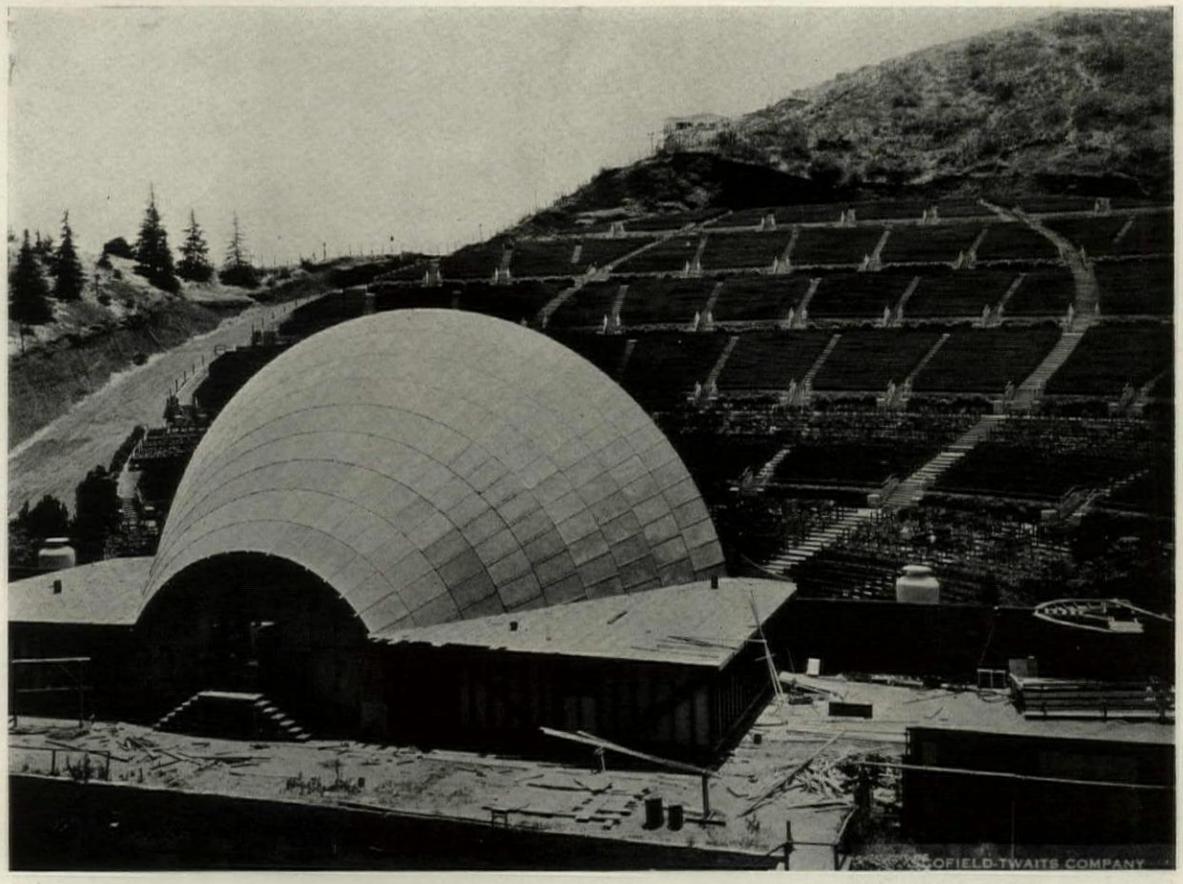


Plan and Sections of the Orchestra Shell

board would approximately double the intensity of the sound projected to the audience. The effectiveness of such a simple type of orchestra shell is greatly enhanced by an overhead reflecting surface. When this overhead sound-reflecting surface is placed at an angle of approximately 45 degrees above the horizontal, it would be suitable for projecting sound to an audience seated on a level area and at the same elevation as the orchestra. A seated area which is inclined and rises from the



Plan and Profile of the Hollywood Bowl, Showing the Orchestra Shell



View of the Orchestra Shell and the Bowl

orchestra level necessitates having an angle of the overhead reflecting surface greater than 45 degrees.

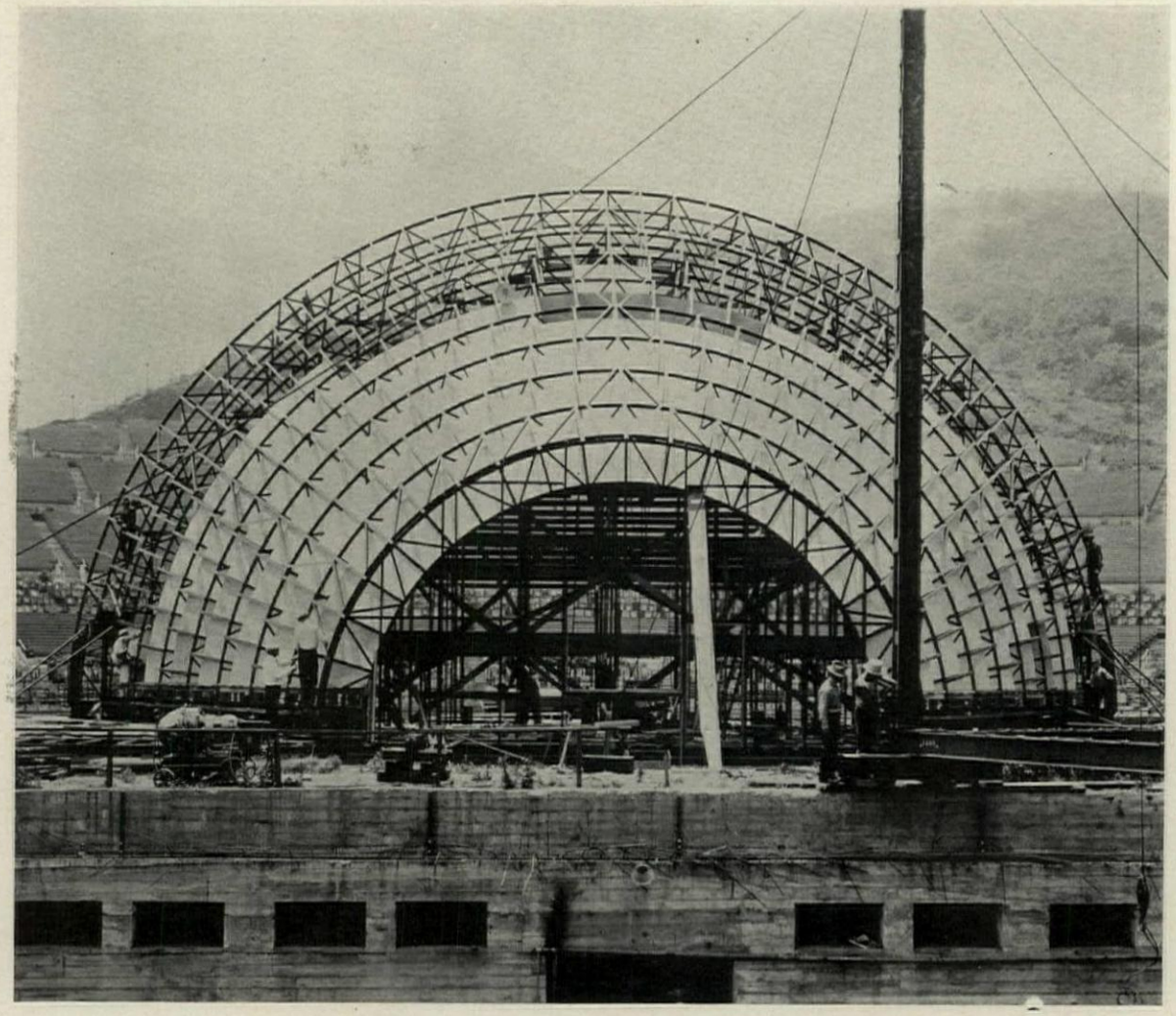
The seated area of the Hollywood Bowl is inclined at an angle of about 12 degrees above the horizontal. The last tier of seats, 550 feet from the stage, would be about 115 feet above its level. This condition requires the overhead reflecting surface to be pitched at an angle of about 51 degrees above the horizontal. With the overhead reflecting surface pitched at this angle the sound which rises vertically from the orchestra will be projected parallel to the slope of the seated area.

Vertical and inclined reflecting surfaces were placed behind and above the orchestra in one of the first shells constructed at the Hollywood Bowl. A shell constructed later was a combination of vertical walls behind and at the sides of the orchestra with plain parabolic surfaces above the orchestra. Although this shell gave a strong reinforcement to the sound, it was unsatisfactory because it produced an overemphasis of tones of those instruments located near the focal lines of the three overhead parabolic surfaces.

The form of the final design of the permanent orchestra shell is one-half of a truncated right circular cone having an outside radius at the front of 45 feet, 6 inches and of 18 feet at the back. The pitch or slope of the cone is 51 degrees. The structure is made up of a number of concentric reflecting surfaces. These concentric bands or surfaces prevent the focusing of the sounds of the various instruments. The sounds originating at any point on the orchestra platform in general are directed toward the audience seated in the Bowl with a slight advantage to those seated at great distances from the shell. That portion of the audience which is seated near the shell receives the direct sound waves from the instrument origins without reflection and of adequate intensity.

The primary function of the orchestra shell, which is to project the sound with adequate intensity over the vast seated area, is attained satisfactorily. The shell is free from such customary defects as echoes and sound *foci* and effects a diffused reflection of sound to all parts of the Bowl. The faintest tones of the violin are clearly audible in the most remote seats. The acoustics of the Bowl are enthusiastically praised by musical critics.

That portion of the movable platform outside of and at the rear of the shell is roofed over at the height of 8 feet and enclosed to provide rooms for the directors, soloists, musicians and for instruments. The permanent means for moving the platform and shell have not yet been provided. It



Welded Steel Frame of the Orchestra Shell, Partially Covered

will be moved probably by means of a small hoisting drum and motor located at the far end of the tracks and connected to the movable platform by an endless cable, or it will be moved by a direct attached motor truck or tractor. It is not probable that motive power will be installed on the platform itself.

The designing of the semi-circular steel trusses involved some very complicated calculations. The stress analysis of the arch ribs was made by applying the theory of the deflection of curved beams and the aëro-dynamical theory of wind pressure on a cylinder. Two analyses were made, one for wind and one for dead load stresses. Equations were written and solved for thrust, moment and radial shear and the corresponding curves drawn. It was thus possible to compute easily the maximum flange section required and the size of the web members at various points without the use of the customary stress diagrams.

A rough acoustical test was made when the shell was completed. Listeners were placed at 26 different locations in the Bowl, and one No. 10 bird shot was dropped varying distances onto a kettledrum located near the center of the shell. When dropped a measured distance of 8 inches, the sound was heard over the entire Bowl area. The drop was then decreased and the varying degrees of audibility in the different parts of the Bowl were plotted. It was found that the sound generated by dropping the shot ¼ inch onto the head of the kettledrum could be heard distinctly over three quarters of the Bowl area. Numbers were then whispered from the shell and called back by persons in all parts of the seated area.

In the designing and construction of the orchestra shell, the Hollywood Bowl Association was represented by Professor R. R. Martel, California Institute of Technology, as consulting engineer. The designing and supervising personnel included Messrs. Elliott, Bowen and Walz, consulting engineers; Frank Lloyd Wright, architect, and Dr. Vern O. Knudsen, physicist and consultant on acoustics.

CHILLED AIR DISTRIBUTION IN THEATERS

BY
WILLIAM GOODMAN
MECHANICAL ENGINEER

VENTILATING theaters today has become not only a problem in maintaining the proper temperature and humidity, but also a problem in the proper distribution of the air throughout the house. Warm air drafts on the feet and the back of the neck are unnoticed, but let the air become slightly chilled, and these same drafts become a serious annoyance.

Formerly air was almost universally supplied through "mushrooms" set in the floor. Few mushrooms were provided, and as a result, air passed through these mushrooms at a high velocity. This did not matter with warm air, but when the same system of air introduction was tried with refrigerating plants, another story was told. Most of us have vivid memories of having sat at one time or another over a small gale of vigorously blowing cold air. Today large numbers of mushrooms are used. It is usual to provide a mushroom for every 65 cubic feet of air supplied per minute to the auditorium. With this volume, the air leaving the usual type of mushroom has a velocity of roughly 100 feet per minute. This velocity will not cause serious drafts. However, an abundant supply of mushrooms will not insure a low air velocity unless the air velocity in the tunnels or plenum chamber below is very low. Air shooting down a tunnel at a high velocity means high air velocities through the mushrooms, inasmuch as velocity changes cannot be abruptly made,—a fact which many engineers seem to forget,—and as a result, even systems with sufficient numbers of mushrooms will produce feet drafts. When using a floor supply system, exhaust grilles are provided at various points in the ceiling and balcony soffits. All the exhaust should not be concentrated in one large grille in the center dome. The exhaust system is not only a means of removing air but also of securing a proper distribution of the fresh air by drawing it across portions of the house where it is needed.

As theaters are being designed today, the hottest, stuffiest portions of the auditorium will be found at the rear of the house, in three places: 1. Under the mezzanine boxes. 2. Under the balcony. 3. At the highest points of the balcony. The ceiling heights at these points seldom exceed 12 feet and are more often 10 feet. A vigorous exhaust should be provided at these points, and the exhaust grilles should be placed at intervals across the entire width of the house. Very often it is difficult to work grilles into the design of the balcony soffit or the main ceiling. In that case, it is possible to connect ducts to the hand holes provided for changing the bulbs in the ever-present coves. This is a very convenient expedient and is often resorted to. Where the design consists of large round or octagonal plaques, these can usually be dropped 3 or 4 inches without being visible to the audience, and air can be drawn through the spaces thus provided. The fact that the hottest, stuffiest portions of the usual theater are at the rear of the house under the low ceilings of the balcony soffit and at the high point of the balcony will bear repetition. A liberal amount of air should be exhausted from the balcony soffit and from the rear of the main auditorium ceiling. Hot air clings to the high points of the house, and provision should be made for its removal there.

More recently theaters have begun to use the downward system of air supply. Air is supplied from the main ceiling, from the side walls high above the heads of those in the audience, and from the balcony soffit. The air is exhausted by mushrooms at the floor. This prevents drafts on the feet of those in the audience, but it also has its drawbacks, although as the situation stands now, the downward supply system is superior in the matter of preventing annoying drafts. In introducing air through the main ceiling and through the side walls high above the heads of the audience, little trouble is experienced from drafts inasmuch as the entering air becomes greatly diffused, due to the large number of exhaust mushrooms spaced over the floor.

The greatest difficulty with the downward system is in supplying air at the low points of the auditorium at the rear of the house, under the balcony, and at the high point of the balcony. As has been said before, the ceilings are seldom more than 12 feet above the floor at these points and more often are only 10 feet. To blow air down at these points would be impossible because of the chilly drafts produced. To blow air in horizontally from the rear walls is even worse, for the simple reason that the back of the neck is particularly sensitive to even the gentlest of cool breezes. The same breeze coming from the front and blowing directly into the face would be welcomed. Introducing air from the side walls is good, but owing to the width of modern houses, it is impossible to get a satisfactory distribution of air with a uniform temperature. Probably the best way to introduce air at these points is to blow it in horizontally or at an upward angle at a very low velocity through the

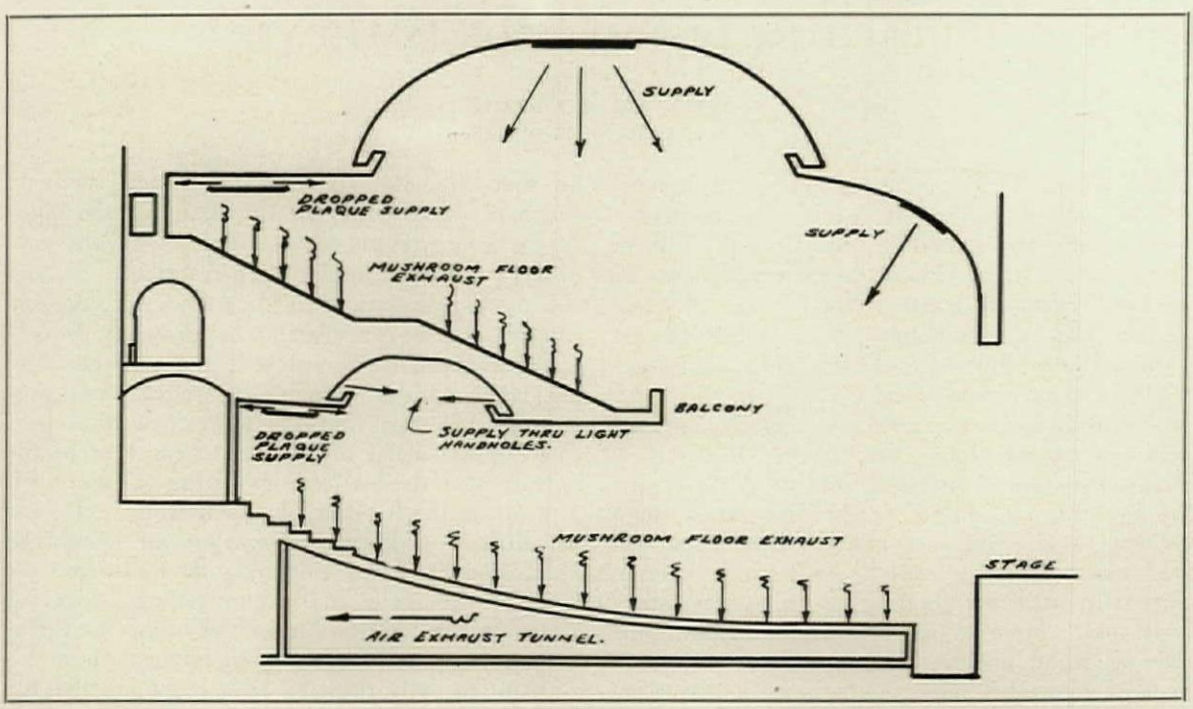
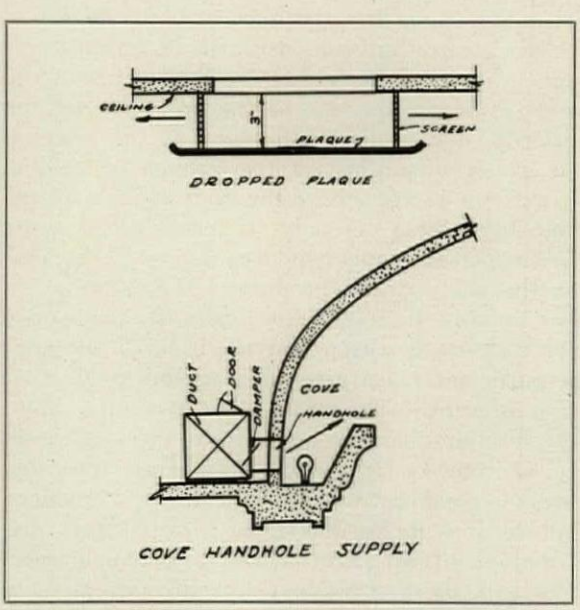


Diagram of the Downward Supply System

hand holes of the light coves. Another way of introducing air horizontally is to use the exhaust scheme previously mentioned,—that is, a ceiling design of ornamental plaques which can be dropped 3 or 4 inches below the remainder of the ceiling. In this way, the air is pretty well diffused before being sucked down by the floor mushrooms. In cases where this is impossible, the only thing to do is to use grilles or liberal areas in the ceiling or soffit and introduce the air at very low velocities. This method is always a gamble. It should be borne in mind that a grille of proper size connected to a duct carrying air at say 700 feet per minute, by means of a 12-inch long transition piece, will invariably deliver the air at the same velocity through a small portion of the grille, while the remaining portions are "dead." Transition or connecting pieces from duct to grille should be long in order to change the velocity gradually and, in addition, the transition piece should be divided into several sections by sheet metal partitions. These partitions should extend from the duct to the grille and will insure a proper distribution of air over the whole surface of the grille, instead of producing a high velocity spot and leaving the remainder of the grille dead. If proper connection is not made from duct to grille in order to reduce the velocity gradually from the duct velocity to the grille velocity, a small high velocity grille may as well be installed in the first place as far as results are concerned.



Two Methods of Providing Supply Outlets

When supplying air from the ceiling there are relatively few points of supply when compared to the number of supply points provided in a floor mushroom supply system. For this reason an exhaust is provided through a liberal number of mushrooms uniformly spaced over the entire main floor and balcony. The chief function of the exhaust system in a downward air supply system is to provide a proper distribution of the incoming air, by its sucking action.

The question of re-circulating the exhaust air is today highly controversial. There are consider-

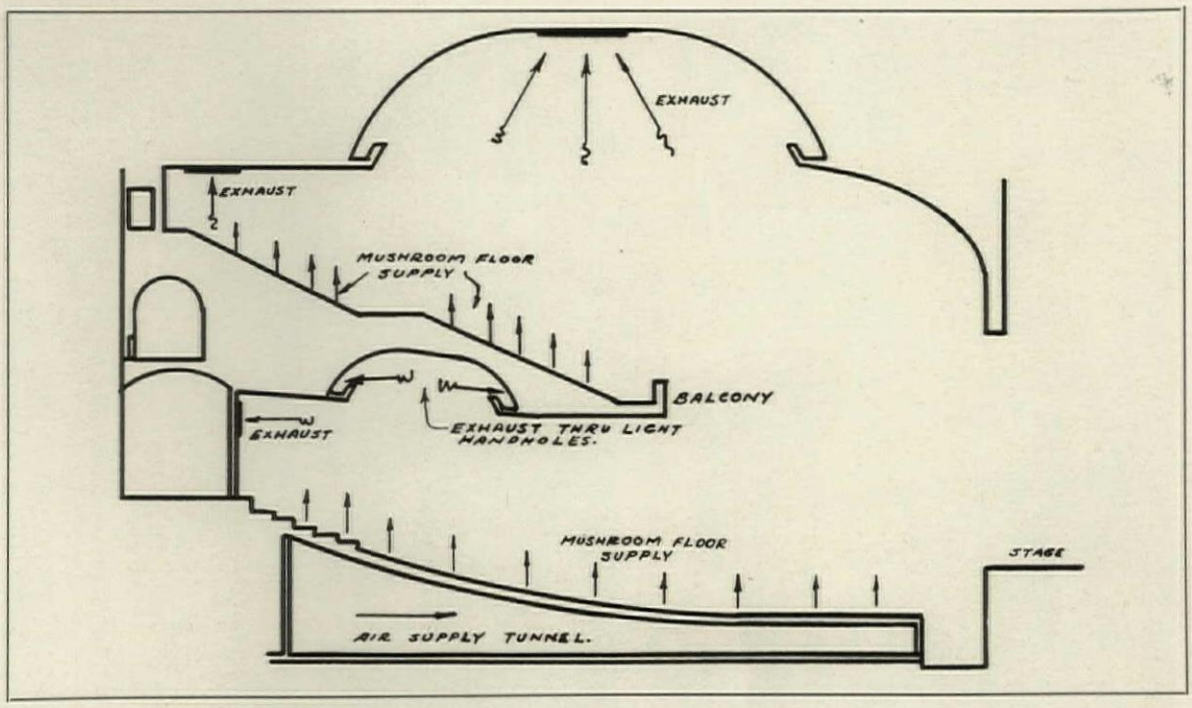
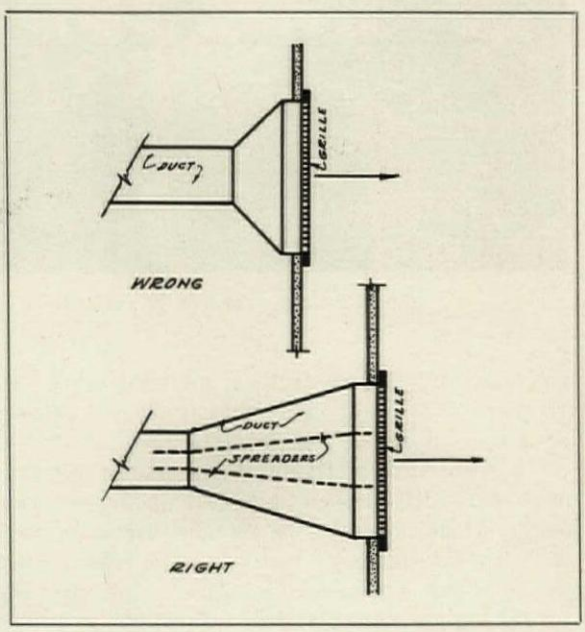


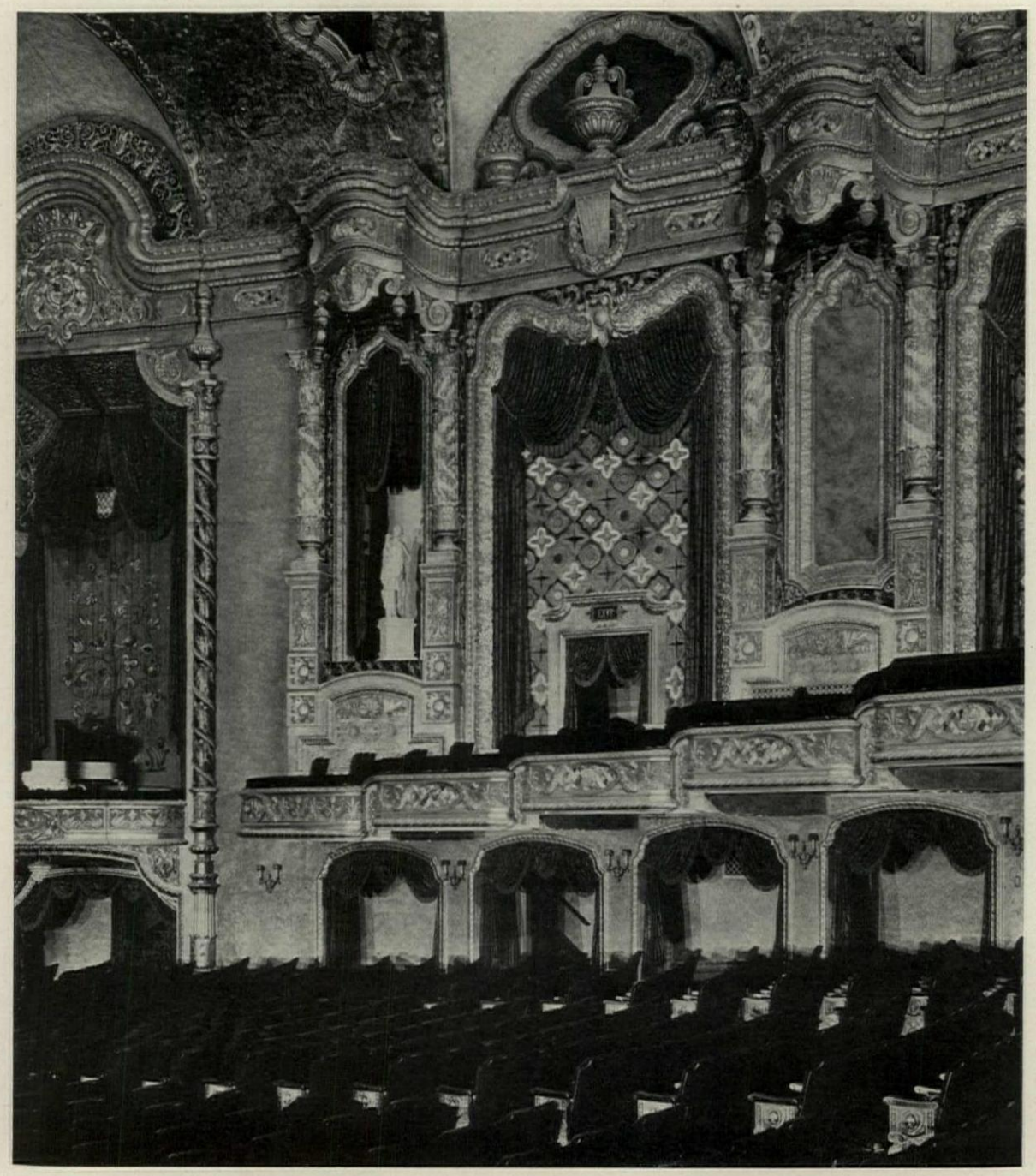
Diagram of the Upward Supply System

able operating savings to be made in both summer and winter by sending back into the auditorium all or part of the exhausted air, after passing it through the air washer. I have stood on the roof of a theater where the air which was being thrown out to the atmosphere was as cool, refreshing and sweet smelling as the fresh air which had just left the air washer, and it was certainly far superior in these qualities to the so-called fresh air which was being sucked into the air intake by the ventilating fan. This intake was located in an alley wall about 10 feet above the alley grade, and the air which was being drawn in was most emphatically lacking in the qualities just mentioned. The air washer and cooling coils perform seeming wonders and give this same air its refreshing qualities. The only doubtful point seems to be in connection with the bacterial content of the exhausted air, but it seems reasonable to suppose that the quantity of bacteria added to the alley air by a theater audience is negligible. The various city authorities as a rule forbid re-circulation, but a certain amount should be allowed. The ventilating system should be made flexible enough so that the exhaust air can be returned to the auditorium through the air washer or thrown to the outside and all fresh air taken in, or else so adjusted that any desired mixture of exhausted and fresh air can be sent into the air washer.

The question of the size of the refrigeration compressor to install is important because these machines are tremendously expensive, a 150-ton machine costing in the neighborhood of $25,000, installed and ready to operate. In Chicago, about ½ B.t.u. is roughly the amount of heat which should be removed from each cubic foot of fresh air, making one ton for every 400 cubic feet of air. No absolute figure can be given because so much depends on the theater itself, the heat gains, the amount of air re-circulated and many other items. For a Chicago theater of about 2,000 seats, a machine of about 150 tons ca-



Right and Wrong Duct Supply Equipment



The Piccadilly Theater, Chicago, has a Downward System of Chilled Air Distribution
C. W. & George L. Rapp, Architects

pacity would be satisfactory, allowing 25 c.f.m. fresh air per person. The extra tonnage would be used to cool lobby, lounge and foyer air.

All theoretical methods of calculating the tonnage which I have seen published so far give tonnages far in excess of the tonnages actually used to give satisfactory results. The calculation methods are theoretically correct, and the absurdly high results obtained are probably due to using heat gain coefficients and constants which are too high. It should also be borne in mind, that despite the "70 degree" advertisements so often seen outside of theaters and restaurants, no house is ever cooled down more than 10 degrees, or at the most 15 degrees below the outside temperature. If one were to step from a 92° outside temperature to a 70° inside temperature, the shock would be comparable to the feeling one experiences when a cold shower is suddenly turned on. Stepping from a 92° atmosphere into an 80° properly de-humidified atmosphere is surprisingly refreshing and stimulating, however.

ARTIFICIAL MARBLE AND SCAGLIOLA

BY

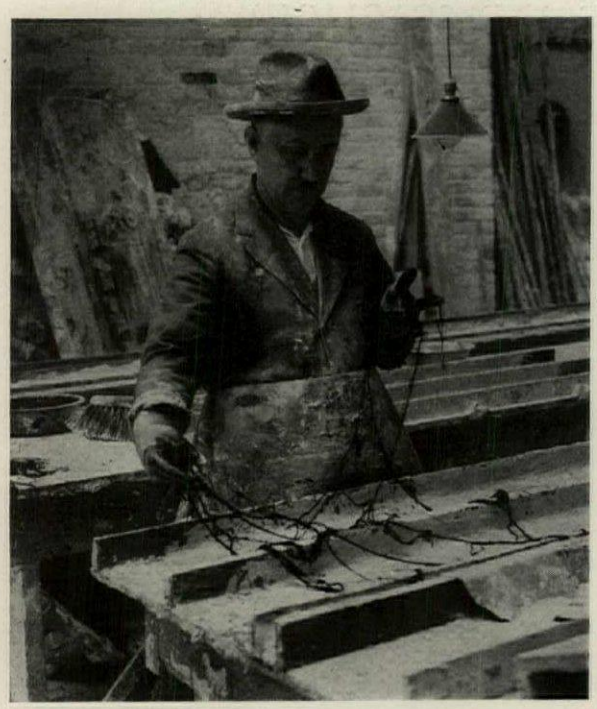
CLIFFORD WAYNE SPENCER

NO art has been subjected to greater abuse at the hands of the modern commercial competitive system than has the making of artificial marble, the result being that many have come to regard it as an altogether unsatisfactory material for building decoration. As a matter of fact, it is difficult to name any form of art work that has been carried to a point more nearly approaching perfection. When the process is carefully performed by a really skilled artist, as it must be to be at all satisfactory, the finished product reproduces the veining, coloring, texture and hardness of natural marble so exactly that the layman is completely deceived, and it is with some difficulty that even the experienced marble expert can detect the difference between real and imitation.

Advantages of its Use. It is not claimed that the imitation is ever superior, or even equal to the genuine product, but there are certain conditions under which the use of artificial marble is of distinct economic advantage and does not impair the appearance or durability of the work. In many instances its use enables the architect to attain the rich effect produced by marble interiors where the cost of genuine marble would have absolutely prohibited its use. Then, too, the use of artificial marble often affords the architect a greater freedom in the designing of interiors. He may desire to attain a definite effect by the use of a certain variety of marble only to find that that particular variety is not available, or that it can be had only after a considerable length of time. He is then faced with the necessity of changing his design to fit the marble supply, or he may have a marble made that will satisfy his desire exactly. This can and has been done, even to the point of "reproducing" a marble that has never existed.

The making and use of artificial marble seem to be subjects on which very little printed information is available. Most people, including some architects, go about surrounded on all sides by artificial marble without ever knowing that such a thing exists. When we enter a great theater or banking room, we may marvel at the size of the vast towering column shafts and perhaps even

A Small Black and Gold Column of Artificial Marble Being Polished in the Shop

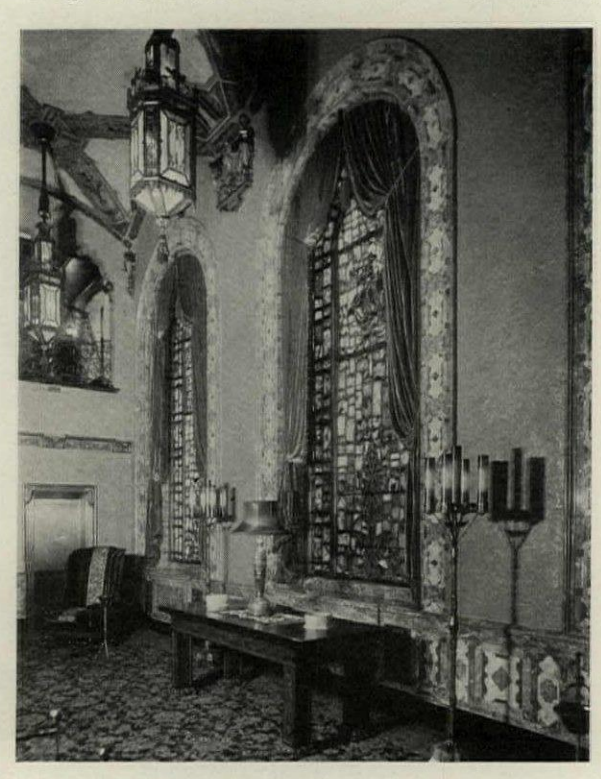


Silk Fiber Being Spread to Give the Veining of Siena Marble

wonder how such great blocks of that particular marble could be found. As a matter of fact, in many instances it is quite probable that such blocks could not be found, since it is a recognized fact that in general, marbles of the more highly colored and elaborately veined types are seldom found in large blocks. Herein, then, lies another of the reasons for the use of artificial marble in preference to that of natural stone,—that is, it is possible to produce monolithic pieces in certain richly colored marbles that would not otherwise be possible even if price were not a factor. Another such reason is that in some cases certain particularly desirable marbles are no longer obtainable and that their reproduction in artificial marble is the only way in which they may be obtained; or it may be that marble work in such unobtainable varieties is to be added to or repaired. In such cases the skilled artificial marble maker can provide a much closer match than can be obtained in any other way. There are many instances of this sort of duplication in daily use where it is almost impossible to detect the point at which the natural marble leaves off and the artificial begins.

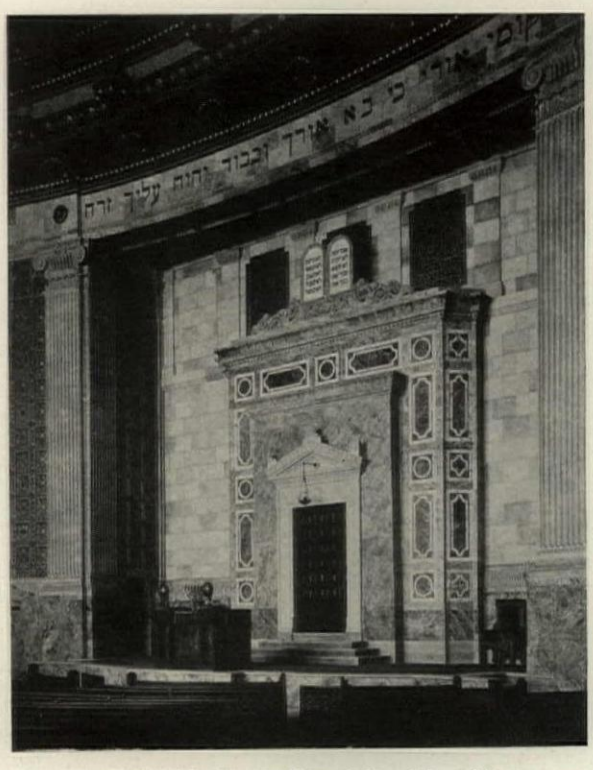
High Standards Necessary. Artificial marble work is such that it permits of no compromise between the good and the bad. Either it is an exact reproduction of natural marble or it falls immediately into the class of a cheap imitation of a good building material,—a thing which is such a curse to modern architecture. Therefore, it is necessary that the utmost care be exercised in the choice of the workman who is to do the work, that every feature be carefully specified, and that the specifications be carefully enforced. Intense competition among contractors has led to the introduction of so many bad practices in the process of manufacture that it is quite essential that the architect using this material be familiar with its uses and abuses to a rather unusual degree, if he wishes to assure his client absolute satisfaction.

History. The making of artificial marble was probably first practiced by the Florentine monks in decorating the interiors of churches in about the fifteenth century, and the results of their work may still be found in many beautiful old churches throughout Italy and over all Europe. When we consider that the plaster with which they worked was much inferior to that now available, we realize that they reached a remarkable degree of perfection, due largely to the great amount of time and painstaking care they were able to devote to their work. The exact process they followed is not known today except that it was very similar to the process used in this country up to a few years ago. The plaster was "retarded" or made slow-setting by the addition of a retarding material, usually some sort of glue. The coloring matter was then added, and the whole mixed and kneaded, as bread is kneaded, until the color was spread through the plaster in irregular streaks and veins. After the block thus



Insert and Mosaic Work is Cast in Large Sections

formed had been allowed to set partially, thin slices were cut off and applied to the surface to be marbleized. Being still plastic, it was possible to fit and mould the colored plaster to the surface desired. This, however, required a great deal of hand work in order to exactly fit the material together, to make the veining match and the surface even. In drying, these pieces often pulled apart from each other slightly, so that the early examples as they now exist show faint hair cracks between slices of plaster as originally applied. As labor costs rose, the process became less and less profitable, so that now very little, if any, of this kind of artificial marble, which is the true scagliola, is made. Another reason for its disuse is that the plaster does not form as hard a surface as the Keene's cement process does, although there are certain varieties of marble, such as Black and Gold, Verde Antique, and other marbles with dark grounds, whose color and veining can be more nearly reproduced by this process. However, as was said before, the cost in skilled labor is such as to exclude the possibility of its manufacture for commercial purposes. The most approved type of artificial marble as used today is made of Keene's cement. Although this is not properly scagliola, it is often spoken of as such. The manufacture was made possible largely through the introduction and development in England of a special Keene's cement which has never been equaled for the purpose of making artificial marble. The manufacture of this type of marble substitute is still practiced almost exclusively by Italian artisans, there being only about a dozen firms in this country employing a few score of these workmen in the making of the better class of artificial marble.



Artificial Marble is Especially Adaptable to Insert Work

Various Colored Cements are Distributed to Give the Effect of Mottled Backgrounds

Contracting for Artificial Marble. It seems that the decline of artificial marble making in this country as an art began when the building trades became unionized. The artificial marble workers were taken under the wing of the plasterers' union, and while this in many cases was beneficial to the workers, it also meant that artificial marble contracts were included with plastering contracts and sublet by plaster contractors. This tended to commercialize the business in many instances, whereas the importance of artistry should have kept this part of the work directly under the control of the architect.

Work done under sub-contracts which are peddled to the lowest bidder is usually unsatisfactory, since only labor and material of the highest quality should go into the making of artificial marble, and if the price is forced down by competitive bidding, such labor and material cannot be expected. The present high scale of wages in the building trades increases the temptation for less responsible contractors to skimp on workmanship and material. The more responsible firms have endeavored to maintain the high standards previously established, but unless the architect specifies in detail and insists on his specifications being followed implicitly, he opens the way

Column Shafts of Artificial Marble are Much Used for Bank Interiors

for firms without established reputation to compete, with their bids based on inferior materials and labor, and the reputable firms, in self-preservation, are forced to do likewise. This forced attempt to save invariably results in a loss to the appearance and finish of the work proportionately far greater than the saving effected. It would be as logical for the painting of the pictures which are to hang on the walls to be included in the general paint contract as it is for the artificial marble to come under the plastering contract. It is strongly recommended that the artificial marble be made on a cash allowance basis or under some arrangement which will give the architect absolute and direct control over the choice of the artisans and the supervision of the work.

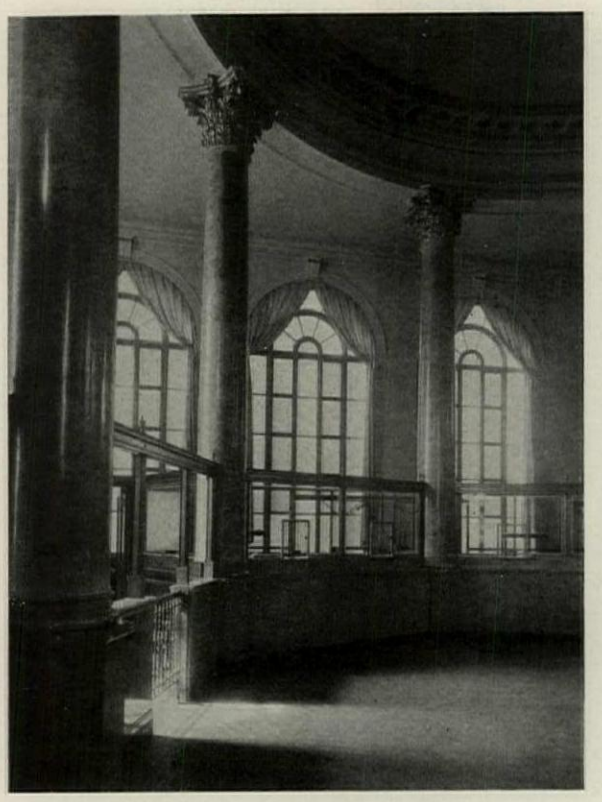
The Modern Process. As to the best up-to-date materials and methods for the manufacture of artificial marble, it is perhaps universally admitted that for satisfactory results only the best English Keene's cement should be used for both facing and backing. The English Keene's cement is the only absolutely neutral cement available, and it has other properties which make it more nearly like marble when it has been colored and hardened. Artificial marble is produced by mixing superfine Keene's cement with the proper amount of mineral coloring matter, of proved permanence, to give a ground color to match that of the sample of natural marble which is to be duplicated. Skeins of silk fiber are then soaked in water in which has been ground mineral color to match the desired veining. This color-soaked silk is spread out on a smooth counter (for slab work) in such a way that some strands remain bunched together while others spread out thinly over what is to be the surface of the marble, the effect being remarkably similar to natural marble veining. It is at this point that a great amount of skill and care must be exercised by the workman. The surface coating of superfine Keene's cement is then poured over the threads to a thickness of from 3/16 inch to 1/4 inch. The silk threads which hang together are then carefully drawn out, leaving behind the coloring matter to form the markings of the finished marble. The silk is washed and saved to be used again. Cheesecloth is now spread over the soft cement and dry coarse cement sprinkled upon it. This tends to draw excess moisture from the mixture and gives it a slight initial set. The cheesecloth and dry cement are then removed, and coarse Keene's cement, which is usually pink in color, is mixed with water and poured on the facing cement which is still soft and with which it forms a perfect bond. Burlap reinforcing is usually included in this backing to give it added strength. The backing is poured to the required thickness (usually ¾ or ⅞-inch) and the whole allowed to dry for a few days. It is then rubbed, honed and polished much as is natural marble, except that all work must be done by hand, as the surface is

These Richly Polished Column Shafts are Over 25 Feet High

still somewhat soft and no machine has been found gentle enough to give the proper polish without scoring the surface.

Polishing. Care should always be taken to specify that natural polish be used, as cheap work is sometimes done with a shellac Process known as French polish. This is easy to apply and gives a high luster for a time, but is not at all permanent, and its use should not be permitted in connection with good work. It might seem that if good quality cement is used for the surface layer, the quality of the backing would not be of such great importance. This, however, is not true, since most cements are either highly acid or alkaline in their reaction. When such cement is used, even though it be as backing for neutral cement, the active agents in the cement will come to the surface, destroying the smoothness and partially obliterating the color. The use of cements of different degrees of strength is also likely to result in warping, since the shrinkage of the two will not be the same.

Moulded and Carved Work. Where moulded or carved work is to be executed, the process is similar to that described here except that a clay model is first made and a plaster or glue mould taken from it. The color threads are then spread about in the moulds and the fine and coarse cement poured as for the making of slabs. After the mould has been removed, the surface must be carefully pointed up and made smooth by hand, after which it is allowed to dry several days before being honed and polished. The advantage, from both an economic and a time-saving point of view, of casting a number of pieces in the same mould rather than carving each by hand from the natural stone, will be quite evident. One of the most important uses of artificial marble is as shafts for great monolithic columns, especially in theaters and banks. Obviously, these may not be made in the shop and then set up at the site, as are the smaller pieces, so they are made in place, the process being as for making slabs, except that the color threads are laid and the cement is poured on pieces of oilcloth instead of on the smooth counter. After the cheesecloth and dry cement have been applied, and the surface layer set to the right consistency, the workmen carry the oilcloth with its thin slab of plastic material to the member on which it is to be applied. This has been built up and brought to a surface approximating the finished form with rough Keene's cement, which may in such cases be mixed with 50 per cent of marble dust or fine sand. The slab, oilcloth and all are wrapped about the column or other moulded member and smoothed in place, the overlap being cut away or the gap filled, as the case may be. Great care must be taken that a perfectly smooth joint be made, and that the lines of the veining continue around the whole piece, as in a natural monolithic stone. As soon as possible, the oilcloth is removed and the



The Bank Screen is Real Marble, and the Columns are Artificial

surface made smooth and even. After this, a workman with a graving tool goes over it and "cleans up" the color veins, eliminating ragged edges and smoothing the surface. Great skill is required in this work, since the column must be brought to a true and even surface by hand alone. The entasis of the column must be carefully worked up and the whole thing brought as nearly as possible to a state of perfection. It is true that this perfection is not attained to such a degree as is the case with monolithic columns in natural stone, which can be turned on lathes and honed and polished in the same manner, everything being done with mechanical precision, but the slight irregularities and imperfections resulting from being finished by hand are not necessarily a disadvantage from an artistic point of view.

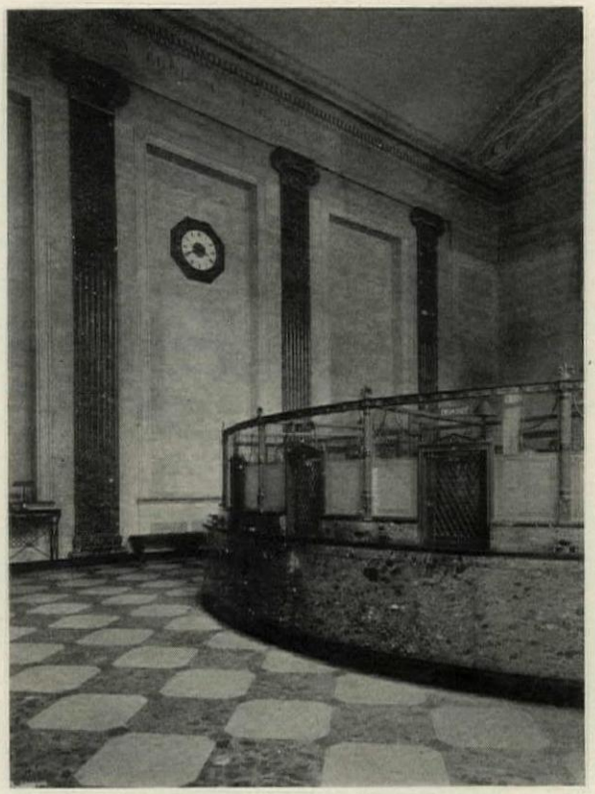
Lasting Qualities. As to the permanence of artificial marble, much can be said. The monasteries and churches of Italy, of course, were decorated with a different class or variety of artificial marble, the plaster process being much inferior to that in use today. Notwithstanding this fact, much of the work done then is still in a good state of preservation after over 500 years of service. In St. Peter's there are scagliola columns which are still in perfect condition and whose composition is never suspected by the thousands who visit the structure annually. The present Keene's cement process has been in use for only some 50 years, there being examples of work of about that age still in existence. Much of the older work in this material has been destroyed when buildings, of which they were a part, were demolished. Such buildings as the Waldorf-Astoria and the Bellevue-Stratford hotels contain much artificial marble, and the Brooklyn Trust Company's building contains some very fine artificial marble still in good condition after a period of about 18 or 20 years. It is said that artificial marble continues to grow harder with age, attaining a flint-like hardness after the passage of several years. In the shop of H. A. Cousins (now retired), who is considered the dean of the artificial marble industry and to whom is due much of the credit for its development in this country, a slab of artificial marble about 6 feet by 9 feet, said to be one of the largest slabs ever made in this material, was left standing for several decades. It was finally decided to divide it into smaller pieces for use, but it was found that it had attained such hardness as to make cutting impracticable.

Limitations. It should be clearly understood that artificial marble should never be used for exterior work, and that even in interiors it should not be brought too near the floor where it will be subject to moisture from mopping or other sources. It is quite common practice to have a base of natural stone surrounded by wainscot and trim of artificial marble, the marble thus being protected from injurious direct contact with water.

Cost. Although, as has been explained, there are some cases in which artificial marble fills a

Artificial Marble is Combined with Genuine in Many Elaborate Theater Interiors

need that cannot be supplied by natural stone, its chief *raison d'etre* lies in the economic advantages that may result from its use. These are probably becoming less and less as the highly skilled labor necessary for every step of its manufacture becomes scarcer and more costly. Natural marble can be worked largely by machinery, so that the proportion of its cost chargeable to labor is much less than is the case with artificial marble, when no machine work at all is possible. This high cost of labor has led in many cases to the cheapening of artificial marble by its manufacturers to meet the competition not only of one another but of the marble industry as well. For the purposes of this discussion, however, only such material as conforms to the highest standards, and which will compare favorably with the marble it reproduces, will be considered. It is not true that artificial marble is cheaper in all cases than its corresponding variety of genuine marble. Several factors govern the scale of comparisons between the two materials, one of which is the fact that all marbles can be reproduced in artificial marble at practically the same cost. The ordinary low-priced domestic marbles and some cheaper Italian varieties may be quarried and finished at a cost well below that of the same variety in artificial marble. As the value of the genuine marble increases, according to its coloring and beauty, while that of the corresponding reproductions remains about constant, a point is reached where the cost of natural marble becomes greater than that of artificial marble, making the substitution of the latter more and more desirable. Another factor affecting comparative costs is the degree to which the piece is to be moulded or carved. It is obvious that to produce a moulded object in clay and make a casting of it is vastly easier than carving the same object from a block of stone. Then, too, if the same mould can be used to cast several or a large number of pieces, the economic advantage of using artificial marble is increased almost in proportion to the number of the pieces. The type of work which affords the greatest saving and which is most often done in artificial marble is, of course, the making of large monolithic columns. Even if natural blocks of sufficient size could be obtained, the great difficulty in quarrying, manufacturing and transporting them would make their cost so great as in some instances to exclude the use of marble altogether. In such cases, if the column shafts can be made in artificial marble in connection with other parts of natural marble, a great saving may be effected without detracting from the beauty or stability of the work. Artificial marble is particularly adapted to use for insert work where a design is made up of a large number of pieces of contrasting marble. In such work, the various parts may be cast in a single block and thus bring about a worth-while saving in the cost of setting, at the same time insuring better joining of the pieces and a more lasting bond between them. In general, then, it may be



Ashlar and Artificial Marble Panels as a Background for Real Marble Pilasters

Artificial Marble Columns in the State Capitol of Idaho

said that it is advisable to use artificial marble only to duplicate: (1) very expensive marbles, or those difficult to obtain; and (2) for marble work that contains carved or moulded detail, especially if there be a large number of repeats.

The Architect's Responsibility. It seems that a great deal of the responsibility for the maintenance of the high standards in the artificial marble industry rests squarely on the broad shoulders of the architect. By specifying clearly and explicitly and supervising carefully artificial marble work under his control, he may force the artificial marble industry to do work such as will command the respect and admiration of all, or he may allow it to fall into such disrepute as to finally disappear altogether. Certain it is that for his own protection he should not allow work, which can produce such a terrible effect when poorly done, to be performed without taking precautions to insure the high quality of the result.

Details and Specifications. In general, work to be executed in artificial marble may be detailed exactly as for other stone or marble work. However, a draftsman who is equipped with a thorough understanding of how artificial marble is made, as well as of its limitations and advantages, is often able to detail the work in such a way as to take full advantage of the plastic qualities of the material and thus save considerably on the cost. A summary of some of the more important points and axioms governing the making of artificial marble may be found in a standard specification adopted by the National Building Congress, to be used by architects in the specifying of high class work. Among other things, these practices should always be insisted upon by the architect: (1) Use only the highest grade of English Keene's cement for both facing and backing, together with mineral colors of proved permanence. (2) Contracts should be entrusted only to workmen or firms of established artistic ability and prestige, and who can give satisfactory references as to work successfully completed. (3) After casting, the face should be dried up twice to insure hardness. (4) All work should be stoned twice and afterwards finished with a natural polish without the use of shellac or other surface applications. (5) The superfine surface coat should be not less than 3/16 inch thick, and should be applied to grounds or backing prepared the same day, to insure perfect cohesion. (6) There should be no visible joints where sections are joined, and veinings should continue around columns as on a monolith. (7) The surface should be brought to a perfectly even and fine line before honing and polishing. (8) The architect should reserve the right of rejecting all work not satisfactory up to one month from the date of completion, and it is not asking too much to demand that the contractor guarantee the work against defects of workmanship and finish for a period of at least two years.

In Installations Such as This the Presence of Artificial Marble is Never Suspected

It is Almost Impossible to Detect the Division Line Between Real and Artificial Marble

ELECTRICAL WIRING LAYOUTS FOR OFFICE BUILDINGS

PART II

BY

NELSON C. ROSS

ELECTRICAL ENGINEER, RICHARD D. KIMBALL CO.

MOTORS operating toilet vent fans, hood vents, and other motors at the roof may be under remote control with controlling push-button stations and pilot lamps in the superintendent's office, the boiler room, or elsewhere as desired. Separate circuits may be run from the distributing switchboard for the operation of each of the elevator machines, or two feeder circuits may be used, each of the required capacity for the combined load, these cables terminating in a transfer panel made up with double-throw switches and located at a central point in the elevator machine room. Tap circuits are taken from the panel to each of the elevator controllers, thus permitting the full operation of the elevators from one circuit in the event of breakdown of the other.

Motor service may be required for any or all of these services:

Ventilation
Fresh Air Fans.
Main Vent Fans.
Air Washer Pumps.
Ventilating Units.
Kitchen Hood Vents.
Cafeteria Vent Fans.
Vent Fans for Assembly Hall.
Toilet Vent Fans.
Vent Fans in Booths.

Boiler Room Section
Vacuum Pump Equipment.
Boiler Feed Pumps.
Motor and Ash Hoists.
Water Circulating Pumps.
Coal Handling Equipment.
Draft Fans.
Stoker Motors.
Fire and Tank Pumps.
Boiler-room Sump Pumps.
Monorail Hoist.
Oil Burners.
Oil Pumping Equipment.

General Power
Passenger Elevators.
Freight Elevators.
Refrigeration of Air.
Kitchen Refrigeration.
Brine Circulation Pumps.
Vacuum Cleaner Plant.
Air Compressors.
Repair Shop Motors.
Circulating Pumps for Drinking Water.

Kitchen Section
Dish Washer.
Vegetable Peeler.
Food Chopper.
Buffers and Polishers.
Knife Grinders.
Ice Cream Machines.
Ice Crushers and Cubers.
Individual Refrigerators.
Cake Mixers.
Cake Beaters.
Electric Ovens, Ranges and Warming Closets, etc.

Available Service. In general, the lighting service will be delivered to the building over direct current or single-phase alternating current lines and at the standard lamp voltage of 110-115 volts. Lamp bulbs, small heating, and office equipment, if of the proper voltage, will operate equally well on either direct or alternating current. Depending on the location of the building and the development of the public service company's lines, motor service may be delivered over:

(1) Direct current, three-wire system at 115-230 volts, power being taken from the outside wires at 230 volts.

(2) Single-phase alternating current, three-wire system at 115-230 volts, power taken at 230 volts.

(3) Three-phase alternating current at 220-440 or 550 volts.

(4) Two-phase alternating current at 220-440 or 550 volts, four-wire service.

(5) Two-phase alternating current at 220-440 or 550 volts, three-wire service.

The standard frequency is 60 cycles. In certain locations, however, the service may be delivered at 25 or 40 cycles. Lamps, heating and office equipment, etc., will operate satisfactorily on these frequencies. Motors and motor circuits, however, must be designed to operate on the available motor service, and if alternating current, the motors must be wound for operation on the phase, voltage, and frequency of the service lines. If the service is to be supplied from a private generating plant on the premises, the character of the motor service may be selected. Even with the use of a private plant, it is good practice to select generating equipment corresponding to the phase, voltage, and frequency, as that used by the public service company, thus permitting of an auxiliary throw-over service with the company's lines, or the future purchase of the service.

Service Connections. It is advisable to provide an electrical switchboard room (even in smaller buildings) in which the service switchboard and master metering equipment may be installed, the riser and feeder cables passing from the service switchboard to, and connecting with the distributing switchboards, panels, wire closets, and other equipment. The switchboard room should be accessible from a public room or corridor, or from the outside of the building.

In certain cities local ordinances require an outside entrance to the switchboard room, giving the fire department access to the service switches. If this is impracticable, the control of the service switches must be within reach of a window, or it may be located under glass in the main vestibule or corridor, the service cables passing through the switches and terminating in the buss connections of the switchboard.

For smaller buildings the service switchboard room may approximate 8 by 10 feet in floor dimensions, with full head room. For larger buildings, a service switchboard room is necessary, and if the service switchboard is to be combined with the main distributing switchboard, a floor area of 25 by 40 feet or more may be required. The

Typical Service Switchboard for Large Building Showing Power and Lighting Sections

room height should be ample to permit the installation of large horizontal feeder conduits from the distributing switchboard to the wire shafts and equipment.

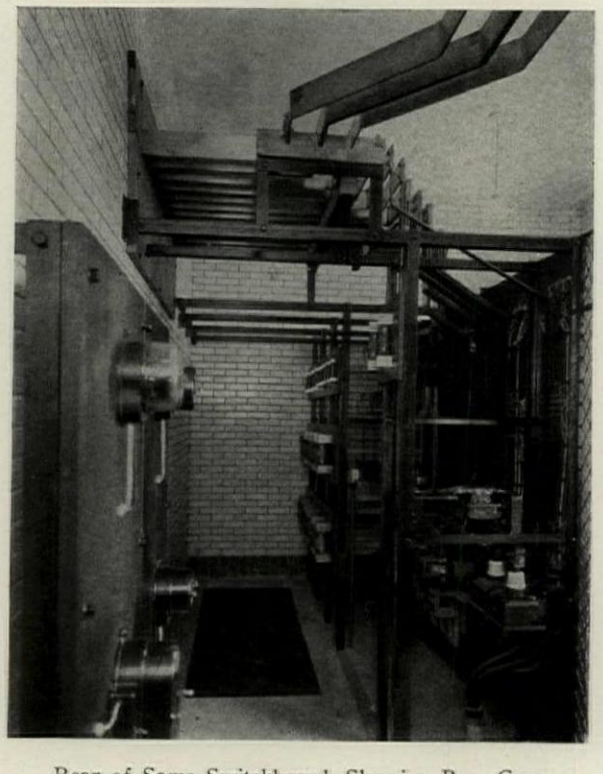
Service and Distributing Switchboards. For smaller buildings, the service switchboard may be developed with the use of fused safety switches mounted on a wood backing and interconnected with conduit and wires, or may be made up with fused switches in a steel cabinet, or it may be of the floor-standing type as desired. For larger buildings, the floor-standing type will be a necessity, made up with slate panels and the required number of fused knife switches, and circuit breakers, instruments, etc., for the control of the feeder circuits and mains. The board, as a rule, stands approximately 6 feet from the wall with buss connections and fuses mounted at the rear of the panels, and with separate panels for control of the power and lighting feeders.

The "service metering equipment" may be mounted on separate panels as a part of the switchboard, or it may be on a separate switchboard in the service room. The switchboard room should be located at the point of service permitting the service cables to enter the room directly from the street, or from the transformer vault. If a vault is to be used, the switchboard room should be a part of the vault, and it should be separated from it by a fireproof partition.

For larger buildings a distributing switchboard must be considered, this located in a separate room on the basement or sub-basement floor, and at a point central for the load, the switchboard being made up in two sections mastering the power and lighting services respectively, and equipped with fused switches or circuit breakers connected to control each of the sub-feeder circuits or risers leading from this switchboard to the meter closets, panel boards, and motor-driven equipment. Where the voltage of the motor circuits exceeds 230 volts, sub-feeders should be mastered from oil circuit breakers on the power section of the switchboard. Sub-feeder conduits leading to the distributing switchboard may terminate in a steel junction or pull box over the switchboard, the wires of the sub-feeders passing through bushed holes in the bottom of the box and connecting with the circuit breakers and switches.

Transformer Vaults. If the available electric service is to be "direct current," the cables will enter the service room directly from the street, and terminate in the master service switches, one or more cables being installed as may be required for capacity, or to provide for emergency service. With the use of alternating current, the company may provide transformers in pits on the street, or on poles (if the service is "overhead"), or the company may require a private vault on the premises, or incorporated in the building. For other than small buildings a private vault is preferred.

The vault must be of fireproof construction,



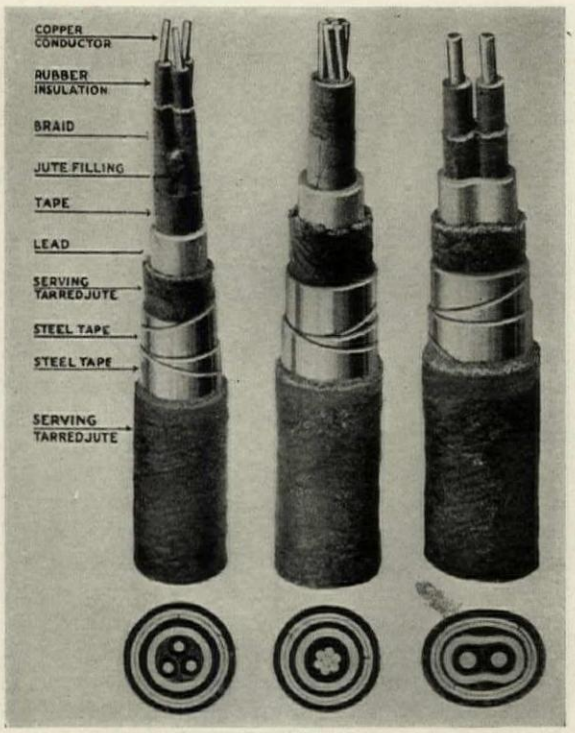
Rear of Same Switchboard, Showing Buss Connections to Transformer Vault

with cement floor and ceiling and with walls of cement or of brick; it must be vented to the outside of the building, equipped with a floor drain, underwriter's door with lock, and with a 6-inch cement curb at the door to prevent the escape of oil in the event of there being defective transformers. Where possible, the entering door should be from the outside of the building. If this is impracticable, then from a public service corridor or from the boiler room, as approved. Where possible, with the use of an inside vault, the outer wall of the building should form one wall of the vault and be so arranged that the primary cables may enter the vault directly from the street. Where it becomes impracticable to locate the vault at the outside wall, the conduits and primary cables must be carried from a point outside the building under the floor to the vault, or the primary conduits must be surrounded with 12 inches of masonry to the approval of the company.

The required floor area will depend upon the number and capacity of the transformers required, approximating 8 x 10 feet with 7-foot head room for installations, not exceeding 100 K.V.A. with proportionately greater floor area as the capacity of the transformers is increased. The size and arrangement of the vault must have the approval of the company for each installation. Regardless of the location of the vault, provision must be made so that the transformers may be readily removed and replaced.

Service Cables. The type and construction of the service cables, as well as the method of bringing these cables into the building must, in each instance, be to the approval of the service company. The service cables must extend from the company's lines on the street or public right of way to the transformer vault, or to the master service switches. In the event of the service being "overhead," the company will extend the lines to some determined point near the building, and from the service pole the cables may enter under ground to the vault or the service switches.

With underground service the company will bring the lines to a service pit on the street, from which point the service cables will enter the building as just explained. As a rule, the company will bring the service to the property line at its own expense. All service cables on the property will be at the expense of the building's owner. A splicing pit will be required at the curb, with either overhead or underground service. Where underground service cables pass under cement walks or roads (between the service pit and the building), underground conduits must be used, made either of tile, galvanized iron or of wood fiber. these being laid in trenches, in straight lines and to grade. Splicing pits will be required in the lines at intervals of not exceeding 200 feet and



Cross Sections and Partially Stripped Sections Showing Construction of Parkway Cable

at offsets or where the line changes its direction.

Where, as in outlying districts, the service cables may be under lawns and shrubbery, and at right angles under walks or roads, Parkway cables may be used, these laid in single lengths without pits, between the building and the service pit at the curb. The Parkway cables are sheathed with lead over the insulation, are protected with steel tapes, and saturated jute servings, and are laid in trenches without further protection. Where Parkway cables pass under roads or walks, pipe sleeves may be used, and the cable passed through them, permitting the removal of the cable in the event of breakdown without disturbing the road. This also applies to Parkway service cables where they pass under the floor of a building to an interior service room, as pipe sleeves must be provided to permit the cable to be removed in the event of accident without the necessity of opening the floor.

Provision for Low Tension Equipment. Complete low-tension equipment may include public and private telephones, electric clocks, bells, paging equipment, office signal and annunciator systems including time clocks and time stamps, etc., as well as fire alarm and watchmen's clocks, and provision for A.D.T. and Western Union service wiring. With smaller office buildings, low-tension wiring may include only provision for public telephones, watchmen's clocks and possibly provision for A.D.T. or Western Union service. With larger buildings, particularly when occupied largely by one tenant, all of these may be called

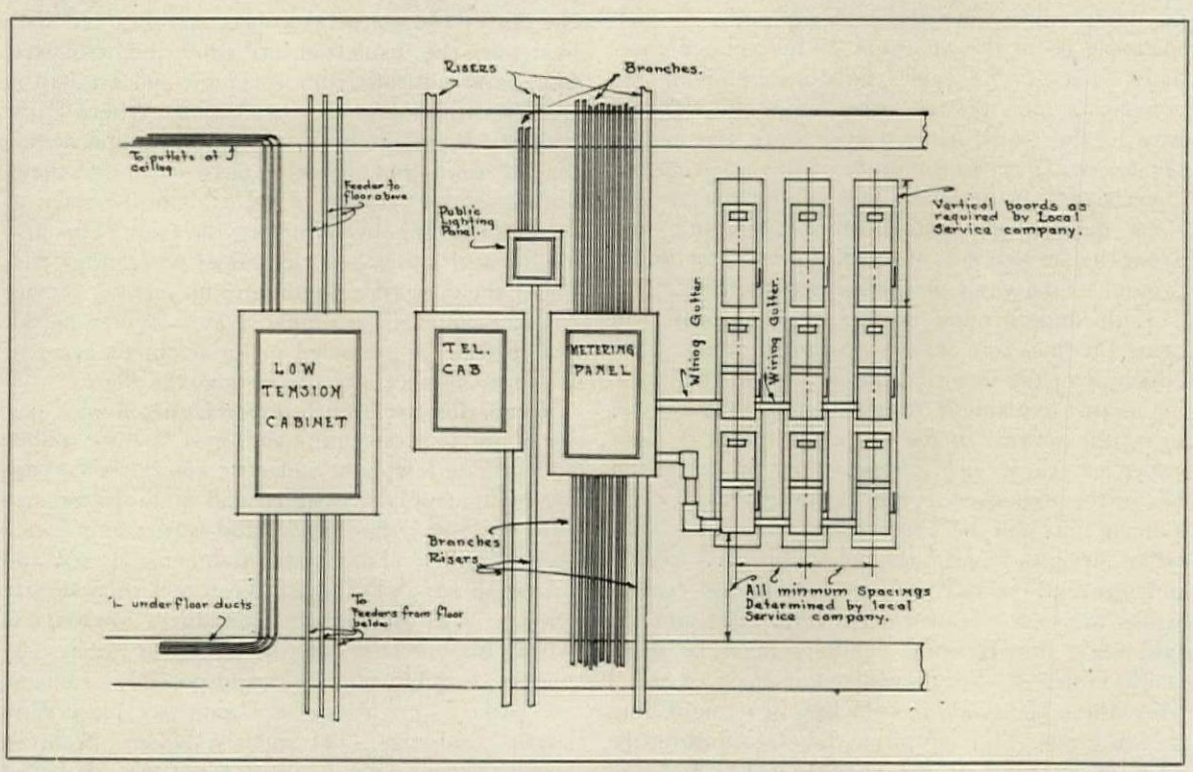
for. In general, the outlets for fire alarm and watchmen's clock stations, bells and electric clocks, etc., may be permanently located, as these outlets may occur in public corridors, on columns, or on permanent walls. Outlets for office equipment, however, may not be permanently located, as there are no fixed locations for desks, and the furniture layout will be changed by tenants.

Public Telephones. In general, provision for public telephones must include a raceway of empty conduits, terminal cabinets, and junction boxes, in readiness for the installation of terminal strips and telephone wires. The conduit raceway must be installed to the approval of the telephone company by the building owner, all required telephone wires, terminal strips, and instruments, etc. furnished and installed by the telephone company.

Where meter closets are to be used, terminal strips and cabinets will be located in the meter closets, on the respective floors. Where, in smaller buildings, meter closets may be omitted, the terminal cabinets and terminal strips may be mounted on the wall of some public corridor, on one or more floors. The size and wire capacity of the terminal cabinets will depend upon the maximum number of instruments to be served. Sizes may be obtained from the company upon request. The telephone service conduit will enter the building at the point determined by the company, usually terminating in a steel service cabinet in some service corridor or in a room accessible from a public corridor, and near the point of entrance.

The dimensions of the service cabinet may approximate 6 x 10 feet by 12 to 18 inches in depth, depending upon the service. The cabinet must be equipped with wood back and fitted with steel doors under lock. A separate compartment may be provided in the service cabinet for the wires of the A.D.T. and Western Union services. In very large systems a service room is to be preferred. From the service cabinet, riser conduits must be carried to the terminal cabinets in the meter closets or in the corridors, and the cabinets looped vertically on the conduits. Riser conduits must be proportioned for the sizes of cables. These conduits are seldom smaller than 2-inch, are run without bends, and connect to alternate sides to provide spare riser conduits, permitting the installation of cables without sharp bends. Where bends or offsets occur in the risers, junction or pull boxes should be used to the approval of the company. Expense permitting, it is good practice to provide spare riser conduits, permitting the later extension of the system.

All this construction will, in general, apply to all types of office buildings with a few exceptions. With larger buildings, meter closets of ample sizes should always be considered, as large terminal cabinets on the corridor walls will prove unsatisfactory. Where, due to the floor area, two or more meter closets may be used on a floor, separate conduit risers should be run from the services to each of the meter closets on the lower floors and loop vertically through the terminal cabinets in the



Typical Arrangements of Meter Closets

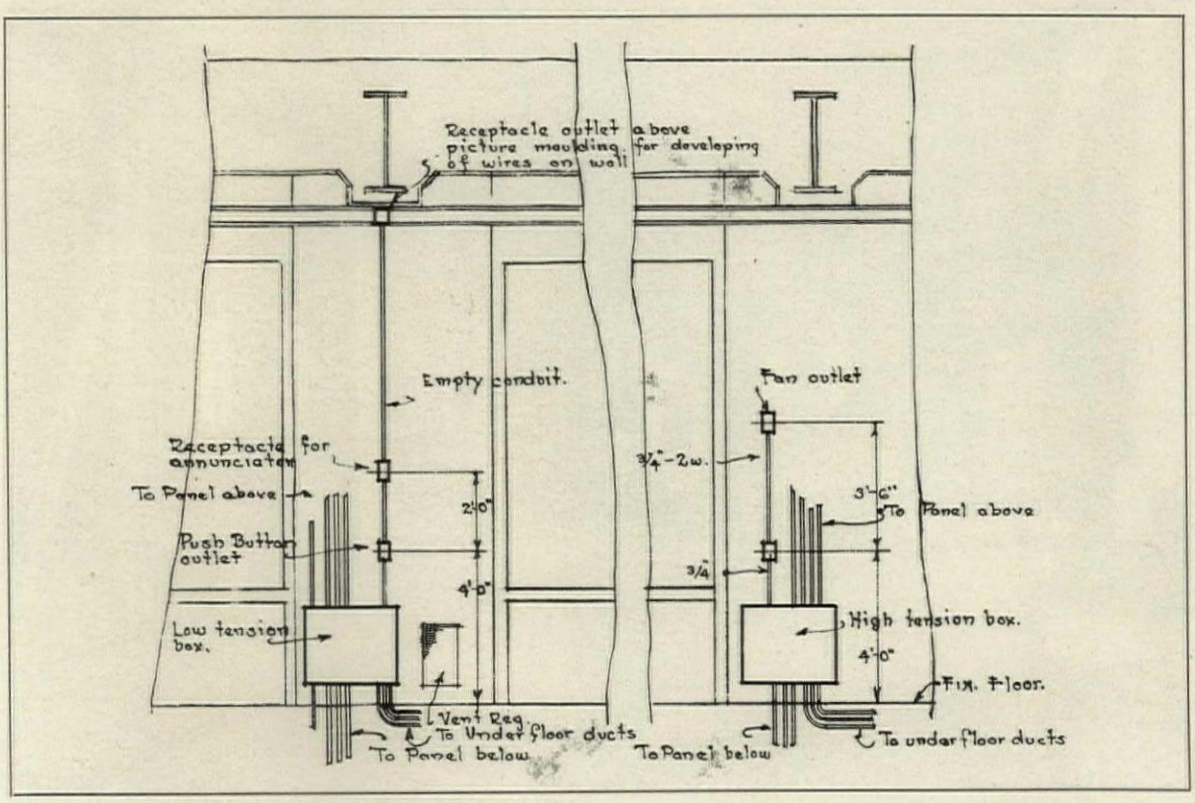
meter closets on the upper floors of the buildings.

Where, as with a large office building, occupied largely by one tenant, a private branch telephone exchange may be required, the exchange and wire service room should be as near the center of the building as is possible. With this construction, the service cables are carried into the building through a service junction at the point of entrance, passing from the junction direct to the service room at the exchange, and developing in conduits from the exchange to the distributing terminal cabinets in the meter closets. With this construction, the wires of the A.D.T. and Western Union services are taken from the telephone service cable at the time-service junction, and pass through a separate conduit raceway to the low-tension cabinets in the meter closets. Adequate junction or pull boxes must be used in all service telephone conduits, at all bends, and in all lines exceeding 150 feet between cabinets or terminals.

Branch Telephone Circuits. One method of outlet wiring for office telephones provides fixed conduit outlets in the permanent walls and on columns, setting the boxes at points above picture mouldings, and also at the baseboard, connecting these outlets with conduits and running conduit from the feeding outlet to the terminal cabinets in the meter closets or in the corridors. In making connections to the office instruments, the wires pass through a bushed hole in the cover of the outlet box and are run exposed on the baseboard or behind picture mouldings to the instruments. While flexible, this method is more or less bulky, and it requires a large number of outlet boxes, as well as large conduits for development of circuits.

A more simple arrangement employs the use of a deep picture moulding set at approximately 4 inches below the ceiling on all walls throughout the corridors and offices, public space, etc., and the further use of 2-inch fiber tubes through all walls and partitions, these tubes set flush with the face of the walls, and aligning with the wire space of the moulding. From the terminal cabinets 1½-inch conduits pass in the construction to junction boxes set flush with the walls and at the rear of the wire mouldings, separate conduits being used from the terminal cabinets to the mouldings on each side of the corridor. The telephone wires pass from the terminals, through the conduits to the mouldings, and are concealed in the wire spaces in the mouldings, passing from room to room through the bushings or tubes. The mouldings are drilled where required, and the wires are run exposed to the instruments.

Further flexibility is secured by the use of vertical 1½-inch conduits at intervals of 50 feet in the corridors, these looping through junction boxes at the rear of the mouldings, permitting the ready installation of low-tension wires between the offices on the different floors. This equipment



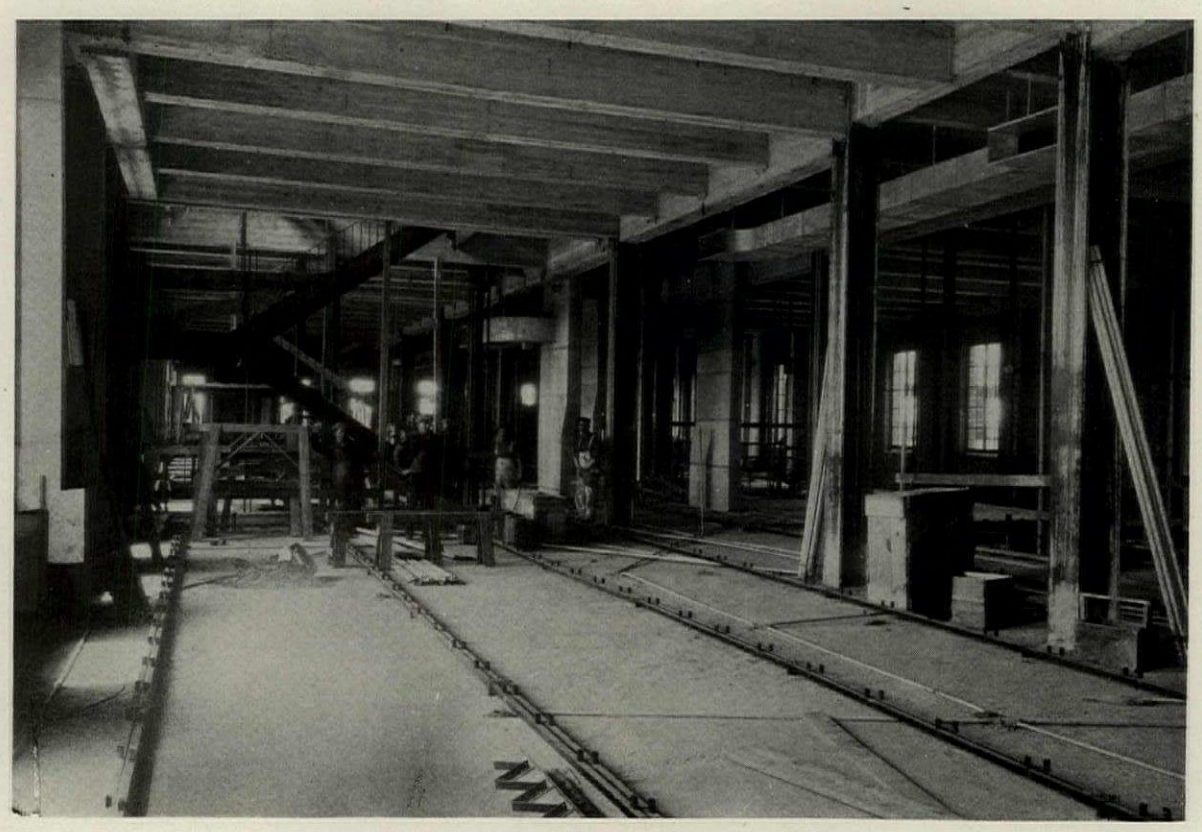
Arrangement of Outlets at Each High and Low Tension Cabinet of Underfloor Duct System

is inexpensive to install; the wire capacity is limited only by the sizes of the conduits and the wire space provided in the mouldings.

Underfloor Raceways. These methods of telephone and low-tension wiring work out well in limited areas, as desks may be set reasonably near the windows and columns. Instruments may be used on the desks, with ringers and like equipment mounted on the walls. Wires, however, where run exposed may be objectionable, even though installed in metal mouldings. Larger office areas with desks and other furniture not in proximity to the walls and columns, will require service from the floor. The use of standard floor boxes and conduit wiring does not always prove satisfactory for this service, due to the sizes of conduits required for the development of the underfloor wiring, and the necessity for three separate conduit services for all floor outlets.

In general, the most flexible underfloor wiring may be had with the use of underfloor steel raceways consisting of a network of rectangular steel ducts, junction and crossover boxes and steel tube inserts, etc., the whole being embedded in the floor slab so that the tube inserts and covers of the junction boxes are flush with the finished floor. The system may be designed to cover the whole floor area, or such portions of the floor as may be required for special work, and ducts may be laid parallel with the walls and for full coverage may be spaced from 4 feet, 6 inches to 6 feet apart, depending upon the locations of the columns and the space available for desks, etc. Junctions or crossovers should be spaced not more than from 25 feet to 40 feet in the duct lines and home run ducts of feeder conduits taken from the nearest junctions to the meter closets, and connecting with the cabinets and panelboards. The system may be designed with the use of one, two, or three ducts, depending on the coverage and flexibility desired. Separate ducts, however, will be required for the wires of the lighting, telephone, and details of miscellaneous low-tension office equipment.

For maximum flexibility and full coverage, the "three-duct system" should be considered, consisting of two 3⅛x1¼-inch ducts and one 1¼x1⅞-inch rectangular steel duct, providing three separate steel underfloor raceways for the wires of the lighting, telephone, and miscellaneous low-tension systems. The junction boxes may also be so arranged that pipe conduit runouts may be taken from the junction boxes to feed special outlets on the walls and columns (where a single service may be required) or to cross connect the duct system with subordinate panel cabinets or connecting boxes. The three-duct systems are fed and extended through single three-duct junctions and crossovers, partitioned so that there is no in-



Two-Duct Metal Raceway Being Installed

tercommunication between the three systems, the crossovers and junctions, ducts, etc., requiring not more than a 4-inch slab for installation.

By the use of auxiliary panel cabinets at intervals in the walls of the different floors, connected with vertical conduits, and the connection of the cabinets with conduits to the duct system on each of the floors, the system, combined with the meter closets, becomes an underfloor conduit raceway throughout the entire building, permitting any reasonable combinations of wiring between desks on one or more floors without the necessity of cutting floors for the installation of conduits.

Tube inserts are built into the ducts in the process of manufacture, and no drilling is required for the installation of equipment. Special receptacle heads are provided (these fitting with expanding couplings in the tube insert) for desk lights, telephones, and low-tension office equipment. With the installation of wires, it is but necessary to remove the covers of the required crossover boxes, as well as the caps of the insert tubes at the desks, the wires being readily fished and final connections made at the respective cabinets in the meter closets.

Where partial coverage only is required, and it is not desired to develop the three-duct system of underflooring wiring, a two-duct or single-duct system may be used with the usual junctions and crossovers, and may be connected with meter closets or with standard panel boards of the lighting service.

Electric Time Systems. The development of an electric clock or time system synchronized from some central point of control is almost a necessity in modern office buildings, since it provides for accurate and uniform time at all outlets of the systems and permits of the development of office clocks, time stamps, employes' time clocks and like time equipment. With outlets for synchronized time available in all offices, and throughout undeveloped office space, clocks and like equipment may be connected to the system or removed at will, and the time system readily developed to meet all requirements of tenants. The time service may be included in the office rental, or clocks may be installed at the request of the tenant at a fixed annual charge. The time system may be designed to operate on alternating current circuit from the lighting service, or for direct current and operated from a central storage battery. The wiring with either system will be substantially the same.

While round metal case secondary clocks with either 8-, 10- or 12-inch dials are in general use for office work, secondary clocks of any design and finish are available, and also in either the floor, desk, or semi-flush wall type. Secondary clocks in general should be considered for offices, corridors, elevator lobbies, special offices and rooms, and in assembly halls, gymnasiums and cafeterias. If large outside bracket clocks, pedestal, or tower clocks are to be considered, these may also be readily operated from the time system and under synchronized control from the master clock. Where tower clocks are to be illuminated, the illumination may be under automatic control of the time system. The master clock and program movement may be in some public office, usually that of the building superintendent; the storage battery for the operation of the time system may be in a room convenient to the clock or in the switchboard room of the lighting service.

Master Clock. The master clock controlling a large installation will, in general, be of the floor type, with three compartments containing the clock, the program movement, and the transfer board equipment respectively, the whole designed to conform to the surrounding finish. For large installations, the clock may be equipped with ten or more circuits with the corresponding number of circuits for the program movement, and the plugging or transfer board will require floor space of approximately 2 x 10 feet.

Wiring. All circuits of the time system should be run with rubber-covered wires in conduits, branch circuits being of No. 14 gauge, branch circuits on each of the respective floors running back to and connecting with the terminal strips of the low-tension cabinets in the meter closets. Branch circuits should loop through the clock outlets with not more than ten outlets connecting to the circuit. Circuits to desk outlets will develop from the low-tension cabinets through the duct system to the desks. Riser circuits from the master clocks pass to the meter closets on the lower floor, looping vertically through the meter closets on the upper floors, connecting through the low-tension cabinets to all circuits of the time system.

Separate circuits are, as a rule, carried from the master clock for the control of outside bracket or pedestal clocks and also for tower movements. Six No. 10 or even larger wires may be required for the control of the tower movement and illumination. Service wires from the battery to the master clock will depend upon the load and the distance from the battery to the clock. In general (for large installations) these wires are not smaller than No. 4 gauge. A separate circuit of two No. 12 wires must run from the master clock to the battery for the automatic operation of the battery charger. General battery current may be provided at each of the low-tension cabinets in the meter closets by means of riser circuits from the battery (not less than two No. 4 wires), the battery circuits looping through each of the low-tension cabinets, and providing battery current for miscellaneous low-tension office equipment.

Where, due to the type of the building, and the

location of the master clock, the clock and bell circuits exceed some 300 feet in length, the relays may be located in the meter closets at some central point rather than in the master clock, the primary circuits from the master clock operating the relays which take current from the battery wires for control clocks and low-tension equipment.

Corridor Gongs. With the use of a building largely occupied by one tenant, corridor gongs may become a necessity, as these gongs, operating on a schedule from the master clock, direct the employes where group control is desired. The gongs should be located at central points, wired in multiple, using No. 14 wire in conduits feeding back to the low-tension cabinets in the meter closets and from the program clock. Where a common schedule is used, with all bells ringing upon the operation of the relays, the gongs may be connected in multiple on a two-wire circuit. When, however, it is desired to change the schedule of any individual bell or group of bells at will, a plugging or transfer board must be used at the clock, and the gongs are connected to a common wire with a separate wire from the plugging board to each and every gong.

Storage Batteries. The capacity of the required storage batteries will necessarily be determined by the size of the time system and the equipment to be operated therefrom. As a rule, the battery required for a large installation will be of not less than 300-ampere hour capacity, at 24 volts. A duplicate battery should be considered, as well as duplicate charging equipment from the master clock. The battery should be furnished with controlling switchboard fitted with the usual equipment, including instruments, circuit breakers, and fused switches for control of time and low-tension systems.

Interior Telephones. The wiring for interior telephones and office signaling equipment, etc., cannot well be included in the wiring layout of the building, without exact information as to the location of desks and the scope of the equipment desired. With the use of under-floor raceways and telephone corridor and office mouldings, these in turn connected with the low-tension cabinets in the meter closets and on the walls, the wires of the local systems may be readily installed and connected as desired.

Watchman's Clocks and Fire Alarm. The combined watchman's clock and fire alarm system (A.D.T. or like service) will include an empty conduit raceway, (usually ¾-inch conduit) with connection to the gongs, station boxes, the control station and the point of service. The gongs and station boxes will be set in the stair halls, corridors, boiler rooms, large storage areas, basements and elsewhere as may be required to insure the complete coverage of the building by the watchman in his rounds. The exact location of the boxes will be at the approval of the company. The company will furnish the box grounds or casings and deliver them to the building ready for installation in the rough by the electrical contractor. The boxes are set one over the other on the different floors and are connected in series on the conduit risers, with cross connections run in the sub-basement space.

The gongs and stations as well as all cable and equipment will be installed by the company at the completion of the work. It is good practice to provide a lamp receptacle on the wall and at a point over each fire alarm station. These receptacles are fitted with red lights of small wattage, the lamp being kept burning to indicate the character and location of the station. With the use of a private watchman's clock system the locations will be the same, with the clock in the office of the building superintendent. Stations may be of the magneto type and set flush with the walls, connecting with the common wire and an individual wire from each of the stations to the clock. Wires should not be of less than No. 16 gauge rubber-covered wire. The use of the private fire alarm system will necessitate the same conduit raceway as noted here for the combined system, with the master station located in the superintendent's office, the boiler room or some convenient point, and with battery service furnished from the storage batteries of the clock system.

Paging System. These systems in general may consist of a series of single-stroke gongs or sounders located throughout the corridors and elsewhere as required, these sounders being connected on multiple circuits (with No. 14 rubber-covered wire in conduits) the circuits carried back to the meter closets on each floor. From the nearest meter closet the master circuit is carried to the exchange telephone switchboard and connected to the control from a master call station which sounds the required call signal on all of the sounders until the individual called communicates with the exchange switchboard. The system may cover the whole or any part of a building as desired, and may be operated from the exchange switchboard or from push-buttons in the superintendent's office or from some central point as desired. The system may operate from the lighting current at 110 volts or from the low-tension system at 24 volts. With the use of push-buttons at the entering doors, the button circuit may be extended to the master call station at the exchange switchboard, thus sounding the paging gongs or sounders from the door when the building is locked, and notifying the watchman that he is wanted at the door.

THE ARRANGEMENT OF SPECIFICATIONS

BY

ERNEST O. BROSTROM

FIRST, there came the standardization of general document sizes. 'Twas a boon to get away from the mixed papers, letters of any old dimensions, contracts of legal cap size, and end-rolling specifications that reminded one of ancient papyrus scrolls. And catalogs! Scramble every letter and punctuation mark, and they could not adequately represent the confusion of the architect's file of—say—a decade ago. Then came the American Institute of Architects with the "standard filing system for information on building materials and appliances." It has been tried and—lives. The creators of sales publications have not found it excessively difficult to produce folders and catalogs of uniform dimensions, nor to arrange them so that they can be easily placed in the proper divisions of the file, and, in turn, be readily resurrected when wanted.

Thus there has been a steady advance toward order in this part of the architect's business. For himself he demands that others shall present their information in a thoroughly ordered manner. Fine, but is he giving out as he is receiving? Assuredly some offices are producing work thorough and complete in every detail. This is almost universally true of the drawings. The specifications, too, are subdivided in close approximation to building progress. But the arrangement of the divisions themselves within the specifications? Can you go to your brother architect and turn to a particular item of the work and find it in the subdivision of his specification in which you carry this item in your own? No. Neither can the contractor!

It is a very simple matter to re-arrange a specification sequence so that the various sections tally perfectly with the numerical numbering of the A. I. A. standard catalog classification. The page numbering of the sections and many of the paragraphs may quite readily bear the file number corresponding to that of the A. I. A. classification. Then a salesman will know exactly where to find the specification bearing upon his interests. His sales book and your file and the specification carry the item or items in the same order. The contractor will know just where to turn in a specification for any particular portion. Jones & Jones' specifications and yours, and Debilicale's, all following the same general arrangement, will facilitate estimating. The general order of the estimator's take off will become the same as the specification order,—not only for one office, but for all offices, and that as widely as this orderly practice may extend itself. The standard classification sequence will become an index that is already very natural and will easily be remembered.

To illustrate. The general conditions may be ordered much like the A. I. A. standard documents and bear a prefix letter or letters.

Section 1.—Preparation of Site. There are always items that come under this heading.

Section 2.—Excavation. Occasionally there comes a job when there is no earth work; then this section naturally does not enter into the specification and is omitted.

Section 3.—Masonry Materials. In the usual specifications the materials for the various masonry contracts are carried under each respective head, but there seems no adequate reason why this classification should not stand.

Section 4.—Concrete. And so it goes on down the entire numerical order.

Paragraphs, too, may bear an exact identifying number, for instance:

Forms, Wood—4 d 2.

Reinforcing Steel—4 e 22. Identified at a glance, to the initiated, as referring to high carbon steel. Introduce your own numbers as needed, reserving the main classification as a guide.

A plumber desires to figure his work. He turns to the 29th Section. He soon learns that that is where his work is to be found. The metal door man will know he is to look in Section 16, for so his catalog is numbered.

A glance at your own copy of the A. I. A. Document No. 172 and a review of your most convenient specification will indicate the ease of adopting this classification order for your own. The wisdom of the result will prove itself in a short time, especially if this order of specification sequence is extensively adopted. In order are found facility, comfort, strength, precision, assurance and economy.

EDITOR'S NOTE. In order to illustrate one way in which the suggestion may be carried out, we have reproduced in facsimile, at nearly full size, a page from one of Mr. Brostrom's specifications. On the original copy the A.I.A. classification was indicated in pen and ink on the margin. Copies were made by blueprinting. The main classifications are indicated in the upper right corner of each page, in this case A.I.A. 19. The figure (2) indicates the second page of the specification covering Major Division 19. Carpentry.

AIA 19-(2)

MILL WORK

DOORS: 19e12

The fire escape doors to be heavy construction of white pine.

The doors where glazed to have 1/2" dividing muntins.

The interior doors, except those already specified as of metal, to be of plain 2-panel B & C.fir style birch panel veneered door of standard manufacture, except that the main doors in all rooms from corridor are to be equipped with a standard American sash or equipped ventilower of approved type. Doors marked Gl. are to be glazed.

FRAMES: 19e13

The exterior frames to be built of W. P. per drawings, all well put together with rabbeted 1-3/4" solid jambs.

Interior wood jambs, cased openings and frames to be worked to the details. Plain 7/8" jamb Y.P. with square edged stops nailed in place.

WINDOW FRAMES: 19e13

Box frames to be standard brick frames and may be built of Y. P. except brick mold and sills which are to be of cypress. Equip with weights and sash cord and anti-friction pulleys. Frames resting on masonry are to be bedded in mortar.

All frames are to be prepared for interior trim of same finish as room in which they are located.

SASH: 19e11

Check rail sash shall be 1-3/4" as marked, with 1-1/4" between glass in the check rail, all of white pine. Muntins, where shown, to be 1/2".

All sash shall be rabbeted on outside for glass; all sash shall be mortised and tennoned together and pinned, all to be well glued. Any interior sash shall be of same finish as that of the room in which they occur.

INTERIOR FINISH: 19e3

All interior trim for doors, windows, etc. shall be Y. P. strictly clear finish materials free from all defects, all machine sanded mouldings, hand sanded.

SPECIFICATION PAGE, SHOWING A.I.A. CLASSIFICATIONS

THE SUPERVISION OF CONSTRUCTION OPERATIONS

BY

WILFRED W. BEACH

CHAPTER 10. CONCRETE REINFORCEMENTS AND OTHER BUILT-IN MEMBERS, CONTINUED

EDITOR'S NOTE. *The considerations of the placing of reinforcement were taken up in the previous article (October, 1929) and are here continued, the discussion centering on the various provisions made by specification writers regarding the placing of sleeves and boxes.*

A SPECIFICATION writer who is lax in properly correlating these functions should be cautioned and made to correct his practice. The chief reason for having the contractor for each trade provide his own sleeves and boxes is that he is best able to forecast his requirements at the time of compiling his bid and make proper allowances, while a general or concrete contractor must simply guess high enough to be safe. This does not apply to estimating for duct work, the necessary openings for which are generally shown on drawings as of definite sizes and at definite locations. For these and other larger members, wood boxes are ordinarily built into forms so as to be easily removable.

It is not unusual for a superintendent to discover that no adequate provision has been made, however, for treating the interruption of reinforcement due to locating holes larger than the distance between reinforcing members. He must look ahead to this and, if necessary, get special instructions from his home office and see that they are carried out. Hit or miss location of large holes in slabs at the behest of any and every trade is careless practice and not to be tolerated. An experienced superintendent knows that the value of any tension or shear member in concrete lies in its continuity, and that they are not to be cut or deflected without specific instructions. Minor members may be slightly deflected around small holes, but larger holes (depending upon the computed live load and the relation of the hole to the location of the reinforcement) may need special treatment of reinforcement and should be investigated in ample time.

Among the items that must be thus located and maintained in the forms with extreme accuracy are sleeves for all manner of piping, conduit, shafting, ducts, chases, etc.; anchors for veneering; furring, stripping, machine foundations and equipment of every description, boxes for floor-inserts, cabinets of all sorts, etc., etc., *ad infinitum*. The superintendent must familiarize himself with the work to such an extent that he may be sure that nothing has been neglected. The omission, improper installation or accidental displacement of any one of such members spells subsequent grief and probability of undue cutting and patching.

For example, a contract for the installation of an automatic sprinkler system in a reinforced concrete factory building was let as an afterthought by the owner. The pipe anchor inserts were sent to the site by this contractor to be placed by others. The owner, to avoid an extra on the general contract, employed his own house carpenter to set these inserts in the forms, depending upon the architect's inspector to watch him. The inspector checked some, but not all of them. Later, when the pipe setters attempted to make use of the inserts, they found several series to be so out of alignment as to be useless, and, hence much cutting for new anchorage was necessitated, all at the expense of the owner. He was inclined to place all blame on the inspector (where some of it belonged), but was made to see that, in having had work done direct, instead of by the contractor, he was taking to himself the responsibilities that would otherwise have plainly rested upon the latter individual. The architect was fortunate in having a client more than usually amenable to reason.

In accordance with the terms of the specification paragraph which demanded that "a competent mechanic (more, if necessary) shall be exclusively and continuously employed, before and during pouring, in the correcting and replacing of reinforcement and other members to be embedded, which may have been displaced, and shall keep just ahead of the pouring," our superintendent took the earliest opportunity to have the general foreman assign a man of sufficient intelligence, experience and interest in his work to be dependable in the matter of properly adjusting chairs and reinforcing, cleaning and strengthening forms and rectifying everything else that needed attention just prior to pouring. Unfortunately, there was (as ever) a continual temptation on the part of the foreman to consider this man insufficiently employed, but the superintendent used a firm hand and kept control of him. He was especially particular to see that all intersections of members were wired together to the extent specified; that all splices were of requisite length and not in forbidden locations; that all bulkheading was properly done and all concrete and other surfaces in proper condition to receive the new flux; that all open ends of pipe, conduit and wall slots were well plugged, and that all sleeves were similarly stopped, or filled with sand or paper to keep out the concrete. As a result, they had but one case of serious form

leakage and but slight trouble elsewhere. There was no effort to "cheat the mix" and, by using this assigned man to make all slump tests, they were able to keep things moving at a good rate.

Some difficulty was experienced later on in the placing of wire fabric in the various slabs where this light weight reinforcement was called for. The men tried to unroll the material in place, but could not eliminate the bends and kinks to the satisfaction of the superintendent who insisted upon their taking it out to the street paving, unrolling and turning it over, then smoothing the curved wires by hand to the degree necessary to permit the mesh to lie flat. By so doing, they found that it would "stay put," and that time was saved with this troublesome material. Many contractors prefer to buy wire mesh in flat bundles, perhaps not so easily handled, but certainly more easily deposited and maintained until covered.

Where anchors are to be set by templates, as for machine foundations, hardware and the like, the superintendent should ascertain well in advance that the templates as well as the members to be embedded are on hand and that the foreman understands just how they are to be placed. Frequently, even a small mistake is disastrous.

CHAPTER 11
WATERPROOFING AND DAMPPROOFING

EARLY in the process of preparing drawings and specifications for a given work, it is essential to determine whether provision should be made for permanently waterproofing or dampproofing any part of the structure. If either is indicated, the designer must decide to what extent such protection is advisable and determine the means to be adopted for the purpose; or he may make certain provisions indeterminate, to be decided after the excavating has permitted a better examination of local conditions.

In the case under discussion here, of a school building in a semi-isolated location on a hillside in a small city, we find these specification clauses pertinent to the subject:

1. Integral waterproofing.
2. Damp courses.
3. Coating of outside basement walls.
4. Drain tile along footings.
5. Membrane waterproofing.

Regarding the first of these methods, it is interesting to note the diversity of opinion as to which of these integrants can be counted upon to function most efficiently:

(a) A diatomaceous or other magnesite or calcite earth or similar ingredient in powder form intended to be dumped into the mixer at same time as the cement.

(b) Slaked or hydrated lime.

(c) A waterproof admixture ground into the cement at the factory.

(d) A liquid waterproofing intended to be mixed with the gauging water.

On the general subject of such types of admixture, it is well to consider certain conclusions reached by the representatives of the Portland Cement Association as published in their "Concrete Data for Engineers and Architects": "Concrete made from properly selected aggregates, combined with Portland cement in suitable proportions, when thoroughly mixed to the right consistency, carefully placed and adequately protected during early hardening, will be watertight under all ordinary conditions."

As essential to the production of good concrete, the Association recommends clean, well graded aggregates, well mixed in proportion of 1:1½:3, with not more than six gallons of water per sack of cement, laid monolithically (or equivalent thereto), well spaded and kept warm and damp for ten days. Architects and engineers, however, continue to specify 1½ to 12 per cent (1½ to 12 pounds to each sack of cement) of admixtures, dependent upon their kind and the richness of the mix. This is done as much, perhaps, to improve the workability and flowability of the fluid mass as to guarantee its later water-repellant capacity.

The contention of the Association that well made concrete is practically waterproof is borne out in many instances. Experienced workers in this material, in localities such as the Missouri River valley, where the subsoil is yellow clay easily eroded, yet firm where undisturbed, do not hesitate to guarantee the watertightness of cisterns, the walls of which consist merely of from ¾ to 1 inch of cement mortar applied in successive coats, the first troweled directly on the clay and each applied with a strong arm.

The specifications for the work we are considering called for a certain integrant "or equal," somewhat to the embarrassment of the superintendent who was approached by several salesmen, each more or less insistent that his type of integrant was equal or superior to all others. Not being pressed for time, he refused to pass upon any of them but referred the subject to the architect who, in turn, declined to express a preference until the contractor himself decided what he wanted to use, which happened to be satisfactory and was duly approved. It was thereafter necessary for the superintendent to see that the concrete poured in outside basement walls contained the requisite admixture.

This was simplified by the fact that the contractor found that the integrant improved workability to a degree that made it economical to use the same mix for all basement pourings.

The specification for a damp course was sufficiently explicit to have prevented any excuse for one's going wrong with it; nevertheless the superintendent found the foreman instructing a laborer to cut the widths of heavy felt in two lengthwise to save material, thus making its width the same as the thickness of the wall. This was corrected, and the material laid its full width of 30 inches, so that the felt would project beyond the face of the wall, inside and out, to member with other waterproofing to be laid later, thus preventing exterior moisture making contact with the wall just above the footings. (See Fig. 10 in THE FORUM for July, 1929.)

Inasmuch as the soil carried a considerable moisture content, the coating of the outside surfaces of the exterior basement walls was specified as a precaution additional to the use of integrant in the concrete. In order to make such coating effective, it is essential that (1) a substance appropriate to the purpose be used; (2) that it be applied only to clean, dry surfaces; (3) that it effectually covers *all* areas with which earth is to come in contact; and (4) that it extends above grade at top, and down to and is well connected with the damp course lying on the footing shelf. In order to effect these conditions, it was necessary to do much cleaning of the outside of walls and uncovering of the felt, nearly all of which latter had been buried by falling earth. But thorough cleaning was insisted upon by the superintendent, who also made the workmen go over several places where the coating was defectively applied and put on a second coat. It is especially true of waterproofing and dampproofing that no work is better than its weakest part. If either is to be done at all, it must be well done or the whole cost is practically wasted.

The three methods described are inexpensive and effective under ordinary conditions, but each of the two latter can be improved upon, if thought advisable, by increasing the ply of the materials. Instead of a single thickness of heavy felt for the damp course, three or more plies of impregnated felt can be laid (tarred or asphalted), with thorough moppings between. This treatment can then be continued, as membrane waterproofing, over the outside wall areas below grade in place of the liquid application. This is much more expensive, because it is common practice to protect such membrane by from 2 to 4 inches of concrete or other masonry. Plastering it with cement mortar is not good procedure, because the weight of the mortar must be supported by the adhesion of the felt to the wall, and this may easily fail. "Parging" or plastering the wall with a mixture of cement and tar pitch, asphalt or other water repellant (without the membrane) is often resorted to and is probably more efficacious than the fluid application,—at somewhat increased cost. The chief essential, that there shall be no break in the coating, is, of course, best guaranteed by the membrane which should have greater elasticity than other solids, though pitch and asphalt, if of proper quality and consistency, will remain "alive" almost indefinitely when buried, and may re-seal minute fractures.

After examining the subsoil in the excavation, the architect decided that it was advisable to add assurance by installing a line of drain tile all around the outside wall footings. This had been forecasted by an alternative in the specifications, for which the contractor had, in his bid, named an extra of $380. This small cost affords an assurance of temporary protection against pressure of surface water on the walls when seeking an outlet. Owing to the eventual filling of the drains with silt and earth, the safeguard cannot be considered permanent, though the water may continue to run toward the sump in small channels, either inside or outside of the drains. So long as this lasts, there will also be a slight reduction in the upper pressure of moisture under the basement floor. The choking of the drains is partially guarded against by covering the upper half of the open joints (if farm drain tile is used) with pieces of tile, sheet metal or felt; or by the use of hub-joined tile. However, as these joints must be sufficiently open to permit ready seepage into the drain, it is obvious that sediment and roots cannot be entirely excluded. Knowing this, the superintendent saw that the tile were in good condition, properly placed on a natural earth bed, with proper fall, fairly close joints, well covered on top, and the trenches filled with broken stone or coarse gravel to the required height (See Fig. 10 already referred to); also that the sump was constructed as detailed, with proper connections in and out.

Thus was water or moisture that might percolate through the outer walls fairly well guarded against. There remained the possibility of infiltration through the basement floor. It was assumed that the footing drainage would serve to prevent this, except, perhaps, in the deeper section housing the boiler room. All basement floor slabs were, nevertheless, waterproofed integrally in the same manner as outside walls, and were laid on sand cushions which would absorb a moderate amount of moisture and slightly check its pressure. If the anticipated "head"

of water had been somewhat greater, or if in the basement there had been wood floors, which are particularly susceptible to the influence of dampness, something more positive would have had to be done. In such event (as where gymnasium floors are laid on the ground), it is often advisable to use membrane waterproofing or to lay hollow tile, with dry joints, under the concrete slab, which latter can then be reduced in thickness enough to compensate for part of the cost of the tile, as it need only be thick enough to afford secure anchorage for the floor sleepers or bedding for the wood blocks, as the case may be. Whatever is done in this particular, it is important that the protection shall be extended under the interior basement walls and partitions, if these are of concrete, brick or tile, to prevent capillarity. The protracted drying out of such masonry has been known to produce a vertical suction lasting through many months or even years, making it impossible to stop the staining by painting or by other usual methods.

The fifth method of waterproofing called for was for the membrane to be built into the floors and walls of the swimming pool. This served the dual purpose of keeping the ground water out and the tank water in, and was specified to consist of consecutive layers of impregnated felt containing a fabric, mopped under, over and between all layers, and with an added ply at all corners. This was covered with a flat layer of brick on the floor and 4-inch brick walls on the sides, on which the tile bed was laid in each case. This work was carefully done and supervised.

Waterproofing and dampproofing are more or less interchangeable terms and practices, though some authorities differentiate them by insisting that the former term be applied in all cases where the moisture exerts a pressure against the surface to be protected. Where this is the case, the method of waterproofing should be determined by an expert and should vary as the degree of pressure that is to be counteracted. Such designing is not a function of the superintendent, but he should so acquaint himself with current practice and local conditions as to be able to form an opinion as to the adequacy of what is provided for in the contract and to intelligently advise the architect, if called upon to do so.

A sixth method of waterproofing is sometimes used in tunnels, subways and other sub-aqueous construction,—more often where the method originally provided has failed in more or less degree. It consists in locating the leaks or "weepy" places on the inner surfaces of the defective walls and enlarging the places in such manner that the seepage throughout small areas can be directed to central points by means of porcelain tubing or otherwise. The surface around the tubing is then effectually waterproofed and the outlet tube later cut off and plugged; or, in some instances, where the pressure is too great to be thus repelled, the seepage is conducted by means of these built-in tubes or arteries to permanent drains, in similar manner to the draining of "weep" holes back of wall surfacing.

CHAPTER 12
FINISHED CONCRETE SURFACES

THE finishing of concrete surfaces falls naturally into two classes: (1) for wearing surfaces and, (2) for all other exposed areas. Each may be of character, composition, texture and color to suit the usage or purpose for which it is intended or to satisfy the idea of the designer. For the school building under discussion, we find a concrete base around the outside of the entire building, specified to be uncoated, but with all ridges and other inequalities left by the forms to be rubbed down (before the concrete has acquired its final set) with blocks of carborundum or of concrete of the same mixture as that called for in the walls. In order that such surfaces might come out as smooth as possible, the superintendent gave special attention to the operation of "spading" the flux; i. e., agitating the wet mix against the outside of the forms, as soon as deposited, with a flat tool (sometimes called a "straight hoe"), thus working the larger aggregate back and allowing the finer material to flow smoothly against the forms. This should prevent all pitting of the surface and produce planes as smooth as the boards of which the forms are constructed. Any carelessness in this spading will show plainly when the forms are removed and will necessitate patching of the surface. This is generally forecasted in the specifications by the stipulation that "immediately after the forms are removed, all rough places in the concrete shall be dressed off (or rubbed, as just explained), all bonding and tie-wires cut back from the surface, and all voids and pits filled in flush with 1:2 cement mortar, and all exposed surfaces left in smooth and acceptable condition."

Such a specification is, however, scarcely sufficient. Wall forms should be removed as soon as it is safe (in about two days in summer and four in cold weather), in order that the concrete may be finished while still green. Then, "the superintendent shall be given opportunity to

inspect the exposed surfaces. All damages due to improper mixtures, insufficient rodding, premature drying or other cause shall be made good by the Contractor to the satisfaction of the Architect. All pits, spalls and loose aggregate shall be picked out and cleaned as directed, grouted and smoothly patched as specified."

This work should be done most carefully, else the patches will show, perhaps bond poorly, and later freeze off. To prevent this, the walls should be kept moist (as is elsewhere specified) and the places to be patched treated with rich grout or bonding cement. All such patches should be attended to most promptly in order that they may acquire initial set in time to be rubbed at the same time as adjoining surfaces. Workers who are adept finishers will produce walls that need no patching, and hence can use sand floats on the wet surfaces a day sooner than when waiting for patches to set. Done with fine sand and plenty of water, this method is quite as effective as that done with blocks. It lies with the superintendent to determine when such treatment, by either method, has been carried on long enough for the intended degree of smoothness.

Other methods of surface treatment are by various kinds of hand or machine tooling, as for cut stone, or by sand blasting with compressed air and fine sand. Specimen areas are, in such cases, submitted for approval, and the superintendent must be the judge of whether all areas so treated match the approved sample. There appears to be an increasing use of monolithic surfaces as just described, many architects even leaving the concrete entirely untouched, after the forms are removed. When this course is intended to be taken, one must make sure that the form work is in exact shape to produce the desired results, especially that the lines of demarcation between successive pourings do not appear in undesirable places. Sometimes false joints are called for, and strips are nailed inside of the forms to produce such an effect. All construction joints should then be made to occur at these strips and thus rendered invisible in the finished work. This is really imitation stone, not often called for. Such design is more frequently executed in pre-cast blocks.

Although the use of exposed concrete surfaces is apparently increasing, there are still many designers who specify the application of cement plaster or stucco to the rough concrete, especially if some unusual color or texture is sought. This is properly applied in three coats to a total thickness of not less than ¾ inch, "the first two coats to be composed of one part Portland cement (to which has been added 10 per cent of hydrated lime) and 3 parts of well graded clean sand. All surfaces to be plastered shall be thoroughly cleaned, picked free of loose aggregate, well brushed, drenched with clean water and dashed with 1:1½ 'soupy' cement grout, which shall be allowed to thoroughly set before plastering. The surfaces shall then be well moistened and the first coat troweled on hard and tight and well scored. This shall be kept moist 24 hours, then allowed seven days for drying, then moistened and the second coat applied, rodded straight and true in every direction. The third coat shall be an approved make of exterior stucco, from ⅛ inch to ¼ inch thick, well troweled on and finished like an approved sample."

The chief objection to exterior plastering on concrete is the prerequisite of extreme care and expert workmanship, lacking which the finished material may soon show fine cracks and eventually spall off. This is especially true where it is subjected to freezing conditions. Since exterior stucco is chiefly used as a cheap covering for tile walls and their imitation done in lath and studding, it would appear to be wasted in the disguise of more permanent construction. However, when he finds stucco designated, it is not a function of the superintendent to reason why, but to see merely that it is up to specification requirements, properly mixed and correctly applied to properly prepared surfaces.

Ornament and run-moulds are frequently used in connection with exterior plastering and need very close supervision, whether pre-cast or worked in place. Ornament cast in place demands the most careful manipulation of the flux in the forms, use of all coarser aggregate being entirely eliminated. The "waste moulds," in which the actual ornament is formed, are first submitted for approval, and hence one is thereafter concerned only in the mechanical process of filling the forms. The sheet-steel templates, used by plasterers in running mouldings, should also be submitted to the superintendent and compared with full-sized profiles on detail drawings.

Floor and paving slabs intended to have a finish coat of cement mortar (ordinarily called "cement finish") are variously specified but, more often than not, it is sought to have the surface made monolithic with the slab by demanding that the top coat or "topping" be laid "before the concrete has had time to set," then floated or troweled as required. With slabs laid on the ground, or with roof slabs above which there is no further construction work, such a process is not difficult. But it is quite impracticable to lay monolithic topping on intermediate slabs over which the workmen must proceed with the form work for the floor construction next above. For such floor finish and for terrazzo and other finish materials laid in cement mortar, a special proviso must therefore be incorporated in the specifica-

tions, to the effect that "the slab shall (if so directed by the Superintendent) be rough-picked and cleaned by means of water and steel brushes and kept thoroughly wet with clean water for six hours before laying topping. All such contact surfaces (rough, clean and wet, but without free water) shall be thoroughly covered with a thin coat of neat cement grout, applied shortly before the topping is deposited."

The need of exercising every precaution to insure a good bond between the topping and the slab cannot be exaggerated. Imperfect bond and improper troweling of the surface are the most prevalent faults of concrete floor finishes. Troweling is work for experts only. These know just when the quaking surface is right for attack, and proceed accordingly, regardless of when the whistle blows. Specifications should take cognizance of this and provide that "overtime labor shall be provided by the Contractor, without extra charge, whenever necessary to properly complete such unfinished areas." If there is any slip-up on this, the superintendent should act promptly and should have the entire topping removed before it sets, rather than allow it to harden without correct finishing. Some concrete finishers like to hasten the absorbing of surface water (which should have disappeared before troweling is begun) by dusting neat cement into it and troweling at once. This is forbidden in better specifications, as is the troweling in of the laitance. Either might be the cause of dusty wearing surfaces. It is frequently better to save troweling (and even topping) by specifying that it be omitted in all unfinished or unused areas, such as pipe spaces, dead storage areas, tunnels, cheap cellars, etc., providing merely that the surface of the slab be evenly floated to exact plane level with screeds. Such surfaces can even be troweled by one who knows how. Excellent sidewalks and railway platforms have been constructed in this manner. Concrete paving is generally left "under the float," the rough surface being better than the smooth.

The thickness of topping varies from a ¼-inch skim coat under roofing and other waterproofing to 2-inch or even 3-inch, depending upon design and other conditions. A ½-inch coat would be ample in all cases, if one could be sure of getting the monolithic bond called for; but one is so uncertain of this, so sure that there will be places where it can't be done, that a minimum of ¾-inch is the rule, a 1-inch topping being most commonly specified. However, if one is guarding against bond failure, the 1-inch thickness is not enough better than ¾-inch, and hence in better class work, architects and engineers allow from 2-inch to 3-inch for the finish on top of reinforced slabs. This simplifies construction in many ways, even permitting the running of conduits on top of slabs. Thus 2½-inch was the allowance above slabs in this school building in the entrances, corridors and toilet rooms and in the laboratories in the third story. Elsewhere, above the basement, the allowance was 1-inch, just sufficient for the laying of wood block flooring in mastic. If use of ordinary flooring, laid on sleepers, had been contemplated, the 2½-inch allowance throughout would have been a still more straightforward method. This is about right also for laying of tile, marble or terrazzo. It means a dead load of 30 pounds per square foot where these materials or concrete topping are used, though this can be reduced about 10 pounds by the use of cinder concrete for the bed. In any case, the bed and topping must be laid practically simultaneously or nothing is gained by having increased the thickness above the slab. Further precaution was provided against cracking of these school house floors by the insertion of light-weight wire mesh in the concrete bed. (See Chapter 10.)

Terrazzo, as used for floor finish, is a high grade concrete in which the coarse aggregates are colored marbles, selected to produce an intended design or color scheme, at times worked into beautiful mosaics. Naturally, it has a wide range in price, depending upon the kinds of marble used, the patterns in which it is laid, the amount of brass dividing strip used, and (because of the transportation of men and special equipment) the total square footage required. Good terrazzo can be produced at moderate cost by the use of cheap domestic marbles and is greatly to be preferred to the ordinary cement-mortar topping, because of its appearance and its greater cleanliness. Perhaps the chief trouble with terrazzo at the present time is a lack of uniformity in architects' specifications for the material as well as in those of the producers themselves.

"For instance, one manufacturer's specification calls for the surface of structural slab to finish 3 inches below plane of finished floor. On this is laid ¼ inch of sand and a thickness of tar paper, obviously to keep the sand from combining with the underbed of the terrazzo. Thus we have an effectual cut-off that should prevent the transmission of cracks in the structural slab through the finished floor resting on it; 2 inches of underbed (1:4 cement mortar) is laid on the tar paper and the ¾ inch of terrazzo deposited thereon and made monolithic therewith.

"Another manufacturer issues a detail of the same kind of construction and formerly recommended a specification to fit the detail, but has since changed it to read: 'A properly concreted floof, finished to within 1½ inches of the fin-

ished level, shall be provided under another contract.' Upon this he lays ⅞ inch of screed coat and ⅝ inch of terrazzo and makes no mention whatever of a sand cushion. Still another calls for 2 inches of 'sublayer' and ½ inch of finished terrazzo. So we have the finish varying from ½ inch to ¾ inch in thickness and the underbed from ⅞ inch to 2 inches, either cemented to the structural slab or separated from it. Evidently, neither is perfect nor crack-proof. The best reliance seems to be upon the brass strips. If cracks must be, let them be where they will be the least noticeable.

"The National Terrazzo and Mosaic Contractors' Association (headquarters in Milwaukee), has recently adopted what is intended to be a standard terrazzo specification which calls for a ¾-inch terrazzo mixture on 1¼ inches to 2¼ inches of concrete bed, the latter to be cemented to the under slab with cement grout (or, on wood sub-floor, to be deposited on waterproof paper). To what degree this specification will be generally used remains to be seen. The surface on which the 'underbed' is to be deposited should be swept clean and drenched, as otherwise it is likely to suck the moisture out of the concrete and leave it granulated. If it is deemed advisable to have the terrazzo slab adhere to the structural, a bonding cement should be used. If there is no adherence and if there are places where the terrazzo is thinner than intended (due to inequalities in the structural slab), it may later separate enough to give forth a hollow sound under foot and eventually break. It is up to the superintendent to *know* his terrazzo."*

It should be borne in mind by the designer who likes to create patterns with the brass strips that their chief purpose is not to prevent cracking but to render the cracks as nearly invisible as possible. Inasmuch as cracks in structural slabs (which are the chief cracks to be guarded against) are to be looked for parallel to the direction of structural members and at right angles to them, it is obvious that these are the directions in which the strips should run. If laid in diagonals or arcs, they serve only as pattern members and, if cracks occur, they will ignore such strips and be plainly discernible.

In this school, terrazzo was called for in the vestibules and entrance lobbies (for floor field, border and base), in the bathrooms, locker rooms and toilet rooms (for field only, tile being used for base and wainscot and in the pool), for border and base in the corridors above the basement, and for field and base in basement corridors. Above the basement rubber tiling was used for runways in corridors. Fillers 1½ inches thick in all stair treads and platforms were of terrazzo between the first and second stories and of cement mortar elsewhere. In all cases, both the terrazzo and cement-mortar filler contained a non-slip aggregate, which was also specified for the floors of bathrooms and areas surrounding the pool. This is dusted into the topping, one to two pounds to the square yard, and the superintendent must see to its uniform distribution prior to the troweling. If incorporated in the original mix, a much larger quantity is required.

Various methods are in vogue for improving the surface and wearing "life" of concrete floors, such as using "hardeners" to be mixed with the aggregates, added to the gauging water or dusted into the surface. Whichever is specified, the superintendent must familiarize himself with the maker's requirements and know that they are being carried out. If such work is done by others than the producer's own trained men, he may have to supervise the education of the contractor's employes in order to secure satisfactory results. Again must he guard against assuming too great responsibility in such procedure. He must make sure that all responsibility rests on the contractor, both as to all construction work of every description that is to be covered by floor surfacing and as to its suitability to receive the kind of material that is to be laid thereon. This is especially true of proprietary brands of surfacing, such as the various types of so-called "sanitary" flooring. Owing to the many failures of such topping, it is seldom incorporated in an architect's specification, except to be laid by the maker's own men and methods and under a most rigid guaranty. Even so, there is laid on the superintendent the customary obligation to know as best he may that the owner is getting what he is paying for; that surfaces are even as to texture, tints and planes; and, if the same material is used for base, that all lines and arrises are true and that cove and top are truly formed.

Our superintendent was fortunate in securing excellent coöperation from the contractor's general foreman, but he found that, as usual, he had to keep constant watch over sub-foremen and their men, many of whom were ever ready with the excuse that they "had always done it that way and that no one had told them that this job was any different" One such was heard to say: "No matter what I do on this job, when I look at the specifications, I find it ought to have been done some other way" On any work that is intended to be just a little better than the average, this is quite likely to be true, and hence the importance of a man's familiarizing himself with the specifications is impressed upon everyone having to do therewith.

*Quoted from "Specifications for a Hospital", by W. W. Beach Pencil Points Press, New York, 1929.

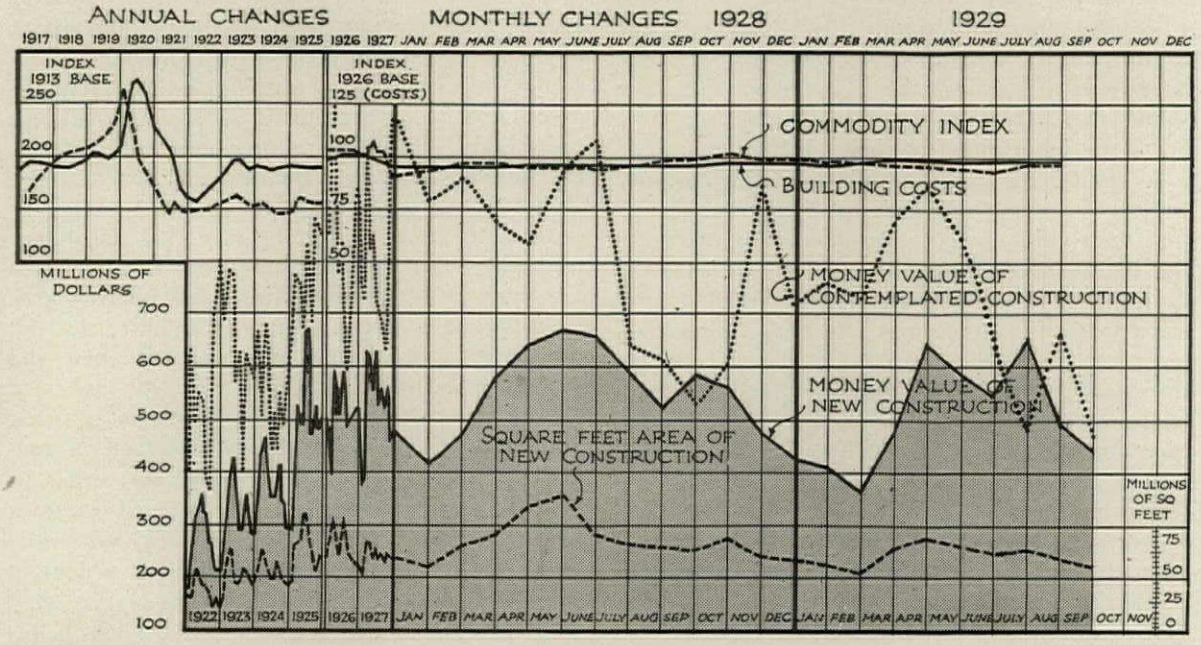
THE BUILDING SITUATION

A MONTHLY REVIEW OF COSTS AND CONDITIONS

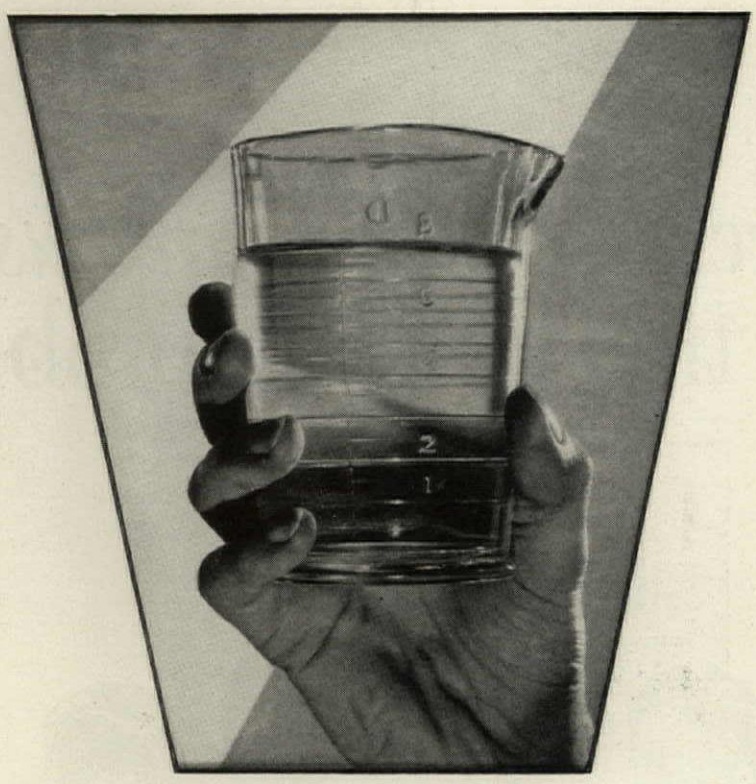
CONTRACTS awarded for September construction, amounting to $445,402,300 in the 37 states east of the Rocky Mountains, show a decline of 9 per cent from the value of contracts awarded during August, and 24 per cent from that of September a year ago, according to the F. W. Dodge Corporation. While at first glance this would seem to indicate that September construction was far below normal, it should be borne in mind that the normal construction year shows a seasonal falling off of around 6 per cent between August and September. In view of this, the decline of 9 per cent for this past September is not extreme. The unusual falling off of 24 per cent from figures for September, 1928 is largely accounted for by the abnormal increase which took place in 1928, which was just the reverse of the normal seasonal trend. Contracts awarded for the first nine months of 1929 amounted to $4,602,267,600, having fallen off approximately 10 per cent from the figures for the first nine months of 1928. In the district comprising New York state and northern New Jersey, September contracts amounted in value to $81,222,500, which is 14 per cent under the August figure and a decline of 48 per cent from that of September a year ago. For the first nine months of this year the contracts awarded in this district amounted in value to $1,083,134,200, a decline of 20 per cent from figures for the same period of 1928. In the New England states work totaling $34,297,700 was started in September. This was 3 per cent ahead of the August contracts, but 52 per cent behind September of last year. For the first nine months 1929 showed a total of $318,247,800.

In the middle Atlantic states, September construction, with a total value of $48,822,200, was 7 per cent ahead of August, but 25 per cent below September, 1928. For the three quarters ending with September, the construction started amounted to $557,215,900 and represents a falling off of 8 per cent from the first nine months of last year.

While the total construction for the first nine months of 1929 is still 10 per cent below the 1928 figures for a corresponding period, it is interesting to note that as the year progresses each quarter makes a better showing than that preceding. At the end of the first quarter, for instance, 1929 construction was running 16 per cent behind that of 1928. For the second quarter, 1929 was only 9 per cent behind, and now the third quarter is only 6 per cent below the third quarter of the last year.



THESE various important factors of change in the building situation are recorded in the chart given here: (1) *Building Costs.* This includes the cost of labor and materials; the index point is a composite of all available reports in basic materials and labor costs under national averages. (2) *Commodity Index.* Index figure determined by the United States Department of Labor. (3) *Money Value of Contemplated Construction.* Values of building for which plans have been filed based on reports of the United States Chamber of Commerce, F. W. Dodge Corp. and *Engineering News-Record.* (4) *Money Value of New Construction.* Total valuation of all contracts actually let. The dollar scale is at the left of the chart in millions. (5) *Square Foot Area of New Construction.* The measured volume of new buildings. The square foot measure is at the right of the chart. The variation of distances between the value and volume lines represents a square foot cost which is determined, first by the trend of building costs, and second, by the quality of construction.



THIS WATER *contains important information for* ARCHITECTS

WATERS from different localities may be alike in color, taste and healthfulness — and yet differ greatly in their action on pipe. Depending on their sources and the treatment they undergo, some waters are but *normally* corrosive while others are *highly* corrosive.

In writing water pipe specifications, therefore, the character of the local water supply should be carefully considered. Brass pipe will outlast rustable pipe under *all* water conditions, but not all alloys of brass will give the same satisfactory service everywhere.

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FOR HOT AND COLD WATER LINES

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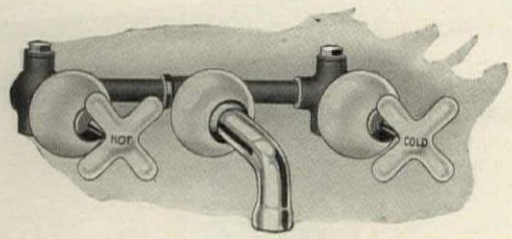
The average toilet, made as it is with a trapway no larger than a golf ball, is utterly incapable of passing the modern sanitary pad with certainty. *Yet almost every toilet is today called upon to perform this function regularly!*

The fact, then, that toilets so frequently stop up . . . with resultant annoyance and embarrassment is not to be wondered at . . . .

Yet the remedy is simple, for there is a toilet being made today which is *especially designed* to pass the sanitary pad! It is the Improved Madera—and it is the only one of several fine toilets which is made with this provision. The architect who specifies the Improved Madera does so with the assurance that his decision will be welcomed.

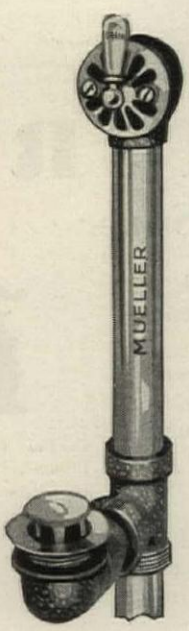
In every detail the Improved Madera is as fine as can be built. Flushing is powerful, yet quiet. Both bowl and seat opening are unusually large. No dry surfaces beneath seat opening to collect dirt. And nothing—*not even iodine*—can stain its snow-white, vitreous china surface!

The Improved Madera merits your serious consideration. Thomas Maddock's Sons Pottery, Division of Standard Sanitary Manufacturing Co., Trenton, N. J.



Mueller built-in equipment

as accessible as exposed plumbing



Mueller built-in equipment eliminates the old bugbear of the panel behind the tub. The vital parts are as accessible as in a job of exposed plumbing.

In the Mueller Over-Rim Tub Filler the replacement of a washer or other repairs can be quickly and easily made. There is only one packing in each valve and that is *outside the wall*. This fitting has all the well-known Mueller beauty of design and lasting construction with extra deep china escutcheons and large china cross handles.

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Plate H-1471—Douglas "Stratford" Closet with Solid Nickel Silver "Douglas" oscillating lever handle flush valve.

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Douglas Plumbing Fixtures with Solid Nickel Silver Trimmings are the choice of prominent architects throughout the country, because:

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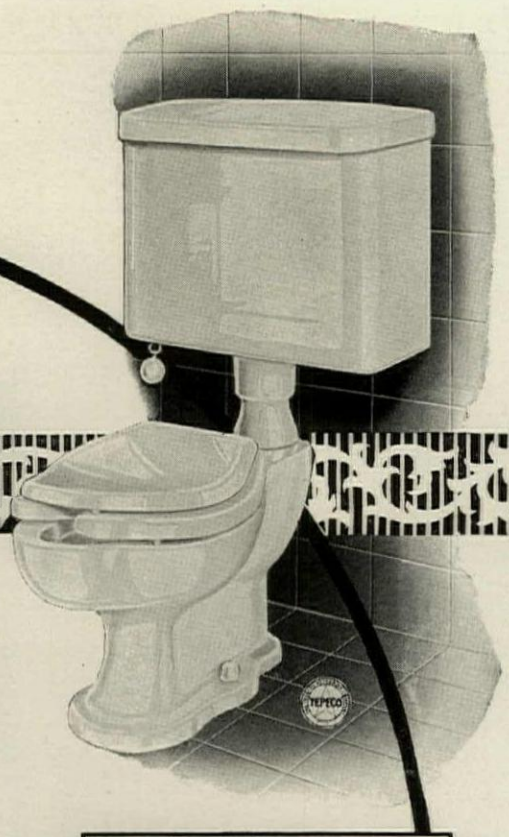

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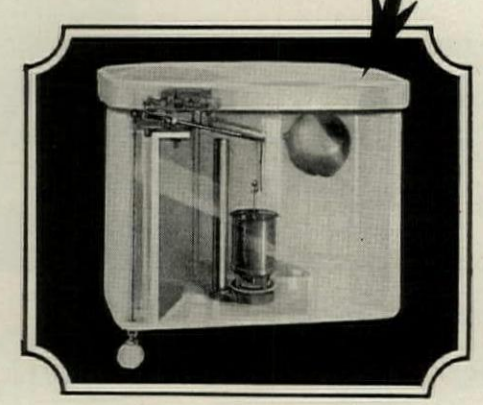
The tank is equipped with fittings that are made especially to assist its quiet operation. Furthermore, each and every part is of the most durable construction to insure a permanent installation that will not require the replacement of parts. We believe no other tank fittings on the market surpass those in the Improved Si-wel-clo.

Another evidence of the pains we have taken to make the outfit the finest, is the China Connection. It eliminates tarnished nickel and green corrosion so common on installation. Easily attached and accessible for tightening connections.



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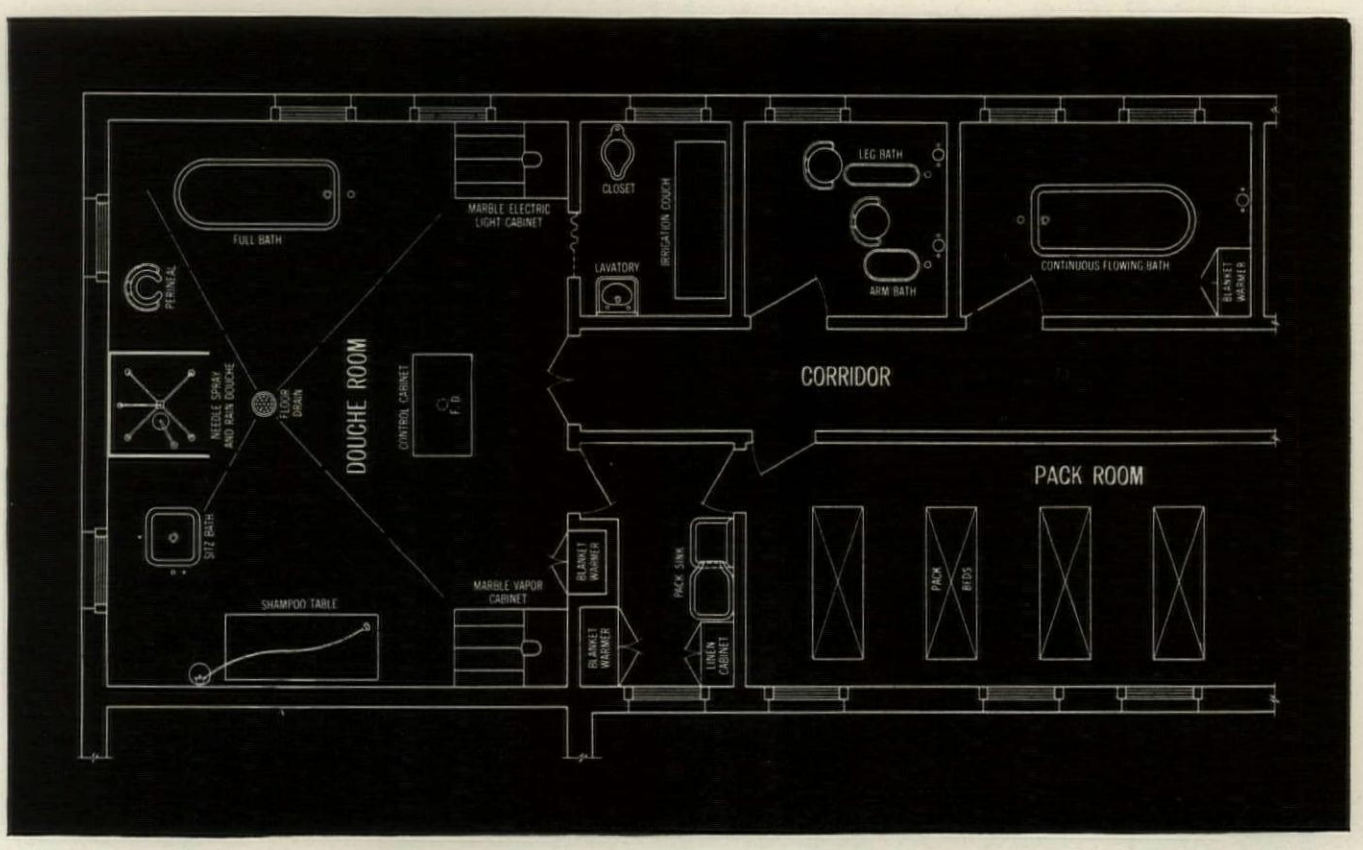

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But it must be planned with great care . . . preferably by specialists.

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"all shower heads are pretty much alike"

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There is one shower head that is so radically different and so tremendously improved that many architects are now recalling their specifications to include it.

It is called the Speakman Self-Cleaning Anystream Shower Head. It has important new features never before found in a shower head.

If you will study the accompanying illustrations you will notice that it is possible, by simply turning the lever, to vary the shower from a heavy sluicing stream to the finest stinging needle shower. The same shower head is thus made the source of whatever kind of shower the user wants.

And note well, — this shower will not stop up with sediment or scale. A turn of the lever instantly sluices away every trace of dirt. No bother of taking apart and cleaning.

Finished in sparkling, enduring Speakman Chromium plate, this superb shower head will last a lifetime. Advertised to the public in The Saturday Evening Post. Speakman Company, Wilmington, Del.

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Or you can adjust to a veritable stinging needle shower

SPEAKMAN *Showers & Fixtures*

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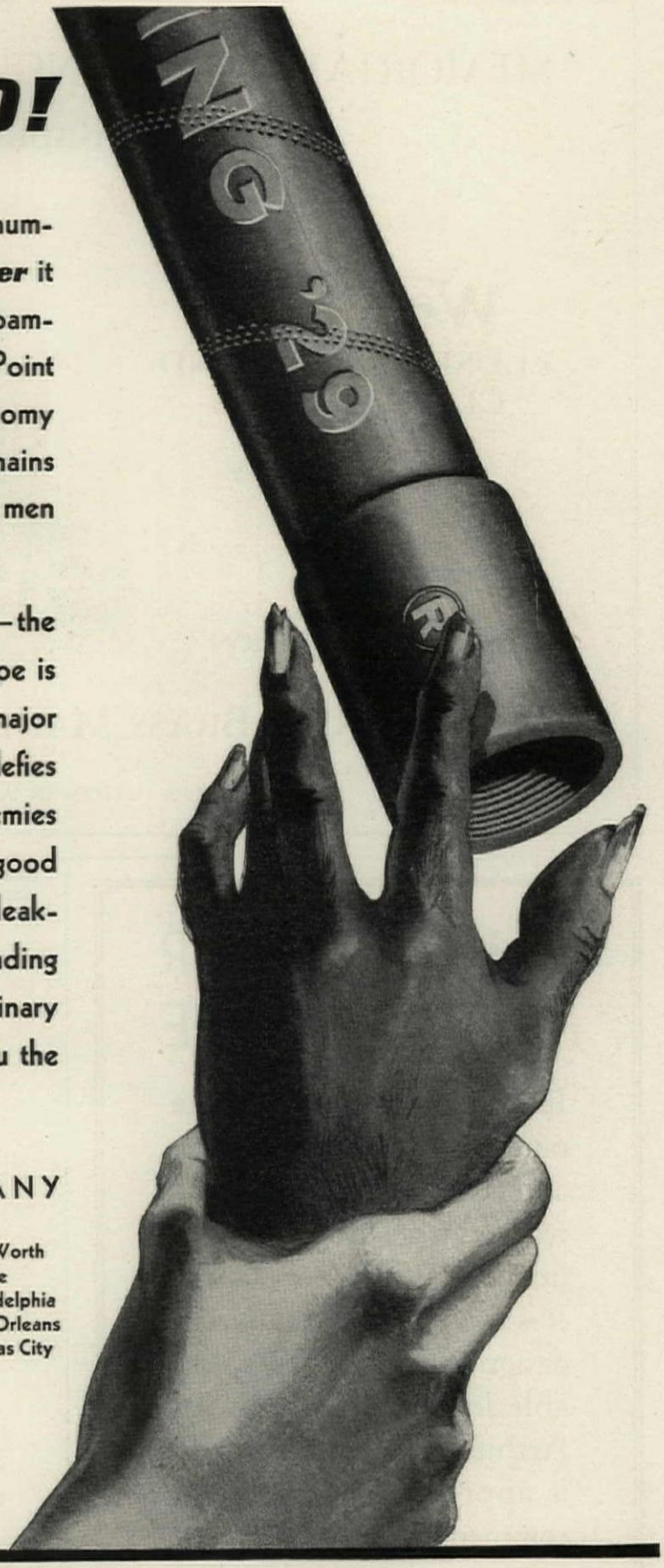
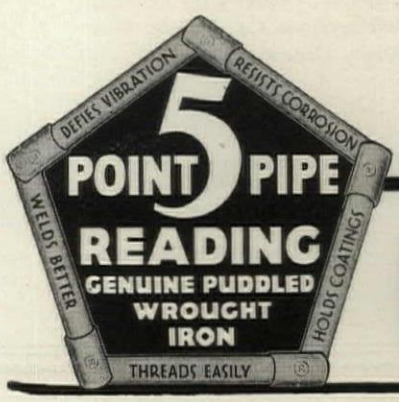


READING IRON COMPANY
Reading, Pennsylvania

Atlanta	Cincinnati	Pittsburgh	Fort Worth
Baltimore	Detroit	Cleveland	Seattle
Boston	Houston	St. Louis	Philadelphia
Buffalo	Los Angeles	Tulsa	New Orleans
Chicago	New York	San Francisco	Kansas City



GENUINE PUDDLED WROUGHT IRON
READING PIPE
DIAMETERS RANGING FROM 1/8 TO 20 INCHES

"U.S." Rainbow Line

50% Easier Pulling

Circuit Testing in one-third the time

United States Rubber Company

TRADE MARK

We'll gladly serve you through your jobber — 1790 BROADWAY . . NEW YORK

United States Rubber Company, Room No. 492, 1790 Broadway, New York, N. Y.

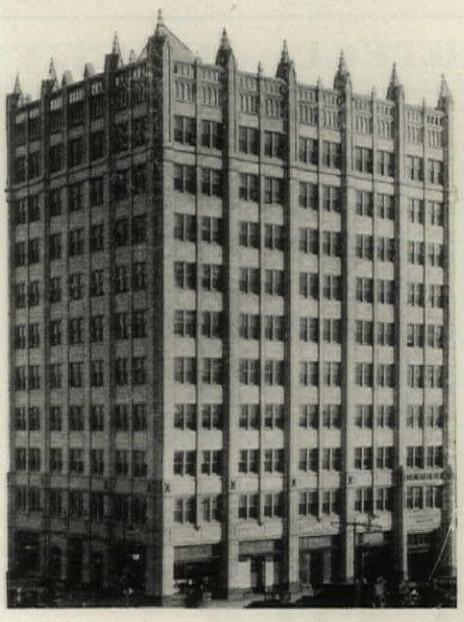
☐ Please send me free samples of the 8 colored wires comprising the "U. S." Rainbow Line.

☐ Please send me proof of the above statements.

*Name*_____ *Address*_____

*Company*_____ *Title*_____

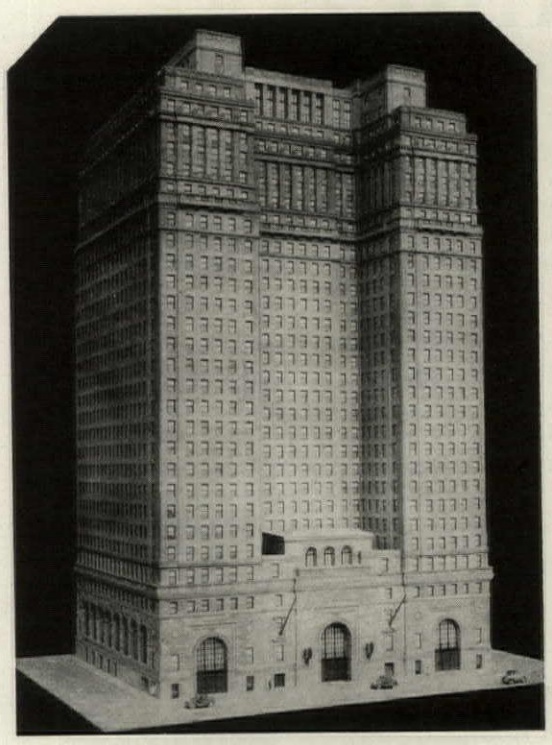
THE **RAINBOW LINE** OF "U. S." PARACORE WIRES AND CABLES



Owners of the National Reserve Life Insurance Company Building, Topeka, Kansas, need not worry about their heating and ventilating ducts for years to come. All sheet metal parts are of ARMCO Ingot Iron, the iron that fights rust and corrosion. Architect: Ralph E. Scamell, Topeka. Sheet Metal Contractor: George Warren Sheet Metal Works, Topeka.

Another of the many buildings equipped with ARMCO Ingot Iron heating and ventilating ducts—the Kahn Building, at Indianapolis. This installation has been in service for fifteen years; typical of the long, satisfactory performance of "the purest iron made." Architects: Vonnegut, Bohn & Mueller, Indianapolis. Sheet Metal Contractor: H. W. Laut & Sons Company, Indianapolis.

Out of sight but *not* out of danger...



Architects Simon and Simon, of Philadelphia, provided dependable heat and ventilation when they specified ARMCO Ingot Iron for the duct work in the Fidelity-Philadelphia Trust Company Building. Sheet Metal Contractor: Wm. J. Donovan, of Philadelphia.

HEATING and ventilating ducts, inaccessible, unseen, seldom inspected. . . . Here, especially, is sheet metal construction that should be safeguarded against costly repairs and replacements.

Your clients will appreciate your forethought in providing for these hidden parts, the dependable protection of durable ARMCO Ingot Iron. This rust-resisting pure iron will save them the annoyance and expense of costly repairs throughout the probable life of the building. And you are certain to profit in greater prestige and good will.

Architects everywhere are insisting on ARMCO Ingot Iron for important sheet metal construction. Many will accept no substitute. In places where sheet metal must serve long and reduce upkeep, this durable pure iron is unhesitatingly the first choice.

If you have sheet metal problems, there is an ARMCO Development Engineer near you, ready to assist. Ask the district office nearest you for his services.

THE AMERICAN ROLLING MILL COMPANY

Executive Offices, Middletown, Ohio

Export: **The ARMCO International Corporation**

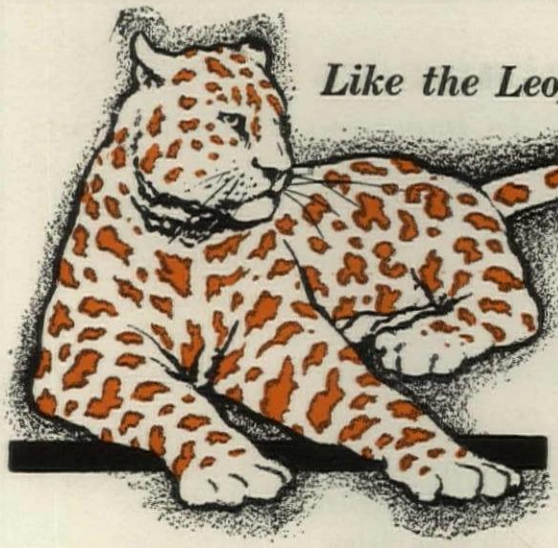
Cable Address—**ARMCO, Middletown, (O)**

District Offices:

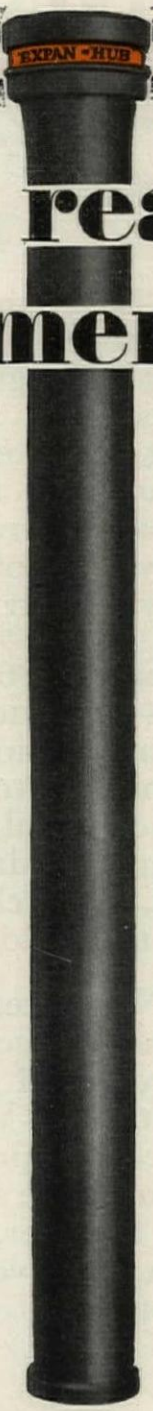
Chicago
Cincinnati
Cleveland
Detroit
New York
Philadelphia
Pittsburgh
St. Louis
San Francisco

ARMCO Ingot Iron

ARMCO INGOT IRON RESISTS RUST



Like the Leopard—Soil Pipe never changed its Spots



Now—a real Improvement

the greatest in 50 years

For years soil pipe has all been alike. Nothing to make one brand better than another. Like the leopard it never changed its spots. But now comes EXPAN-HUB to revolutionize the soil pipe industry—a soil pipe which has been characterized by Contractors, Architects and Engineers as **"The Greatest Improvement in 50 Years."**

Specially Designed Gasket

A specially designed gasket is inserted in the hub of each length of EXPAN-HUB. When the soil stack is set, instead of the lengths being placed metal-to-metal this gasket separates them. When the stack expands the gasket takes care of expansion.

Solves All Expansion Problems

This prevents buckling of the soil stack assuring permanently gas-tight joints.

This expansion problem has been a real one for years. Yet no practical solution was reached until the arrival of EXPAN-HUB.

Made Better Throughout

And EXPAN-HUB is made better throughout. More uniform quality and thickness of material makes easier cutting and less waste. And the extra thickness at the hub reduces breakage, when caulking, to a minimum.

A Soil Pipe That Helps You Get Contracts

Architects, Engineers and Owners have long looked for just such a soil pipe. They recognize its advantages immediately. So when you mention EXPAN-HUB you have an advantage over a competitor who figures on ordinary pipe.

Try EXPAN-HUB. Your Wholesaler Can Supply You.

MANUFACTURED AND SOLD BY

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122 So. Michigan Avenue, Chicago, Ill.
1749 Sacramento Street, San Francisco, Calif.

STRINGER BROS. CO., Inc.
Gadsden, Ala.
1100 W. 38th Street, Chicago, Ill.
128 Sidney Street, Cambridge, Mass.

EXPAN-HUB SOIL PIPE

LOOK FOR THE ORANGE BAND

INSIDE this beautiful towering edifice, Republic Steel Pipe was used in the heating system — circulating comfort throughout the 43 stories, for a townful of busy folk housed daily within its walls. Republic Steel Pipe is the logical material for a vital service that must be dependable and permanent.

Navarre Mercantile Building, New York
Sugarman & Berger, Architects
Joseph E. Gilbert, Inc., Gen'l Contrs.
Raisler Heating Co., Heating Contrs.

REPUBLIC STEEL PIPE

REPUBLIC IRON & STEEL CO. YOUNGSTOWN, OHIO

Cooperating with the Architectural Engineer

Standard Conveyors have but one mission to perform and that is to transport materials or merchandise. This they do most economically and efficiently, thereby effecting savings in labor and time that are often times surprisingly large.

The question of whether a Standard Conveyor System should be included in the plans for new building projects, or in the redesigning of old ones, merits serious consideration.

In the solution of this problem two heads are better than one. Therefore may we suggest to Architectural Engineers that they accept the cooperation our Conveyor Counselors are prepared to offer. Their experience is unusually broad, including the handling problems of manufacturers, wholesalers and large retail establishments. This service is available at any time.

We shall be glad to send you detailed information covering the construction features of Standard Conveyor Systems and their suitability for all types of business.

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Cleveland Office, 5005 Euclid Avenue
Dallas Office, 6313 Oram Street
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for 231 GREAT *New York Apartments*

A SPACE-SAVER THAT DOES TWO JOBS. This model serves as kitchen table, or as base for gas range. Food capacity—5 cubic feet.

BEAUTIFUL NEW APARTMENT at 82d St., and Riverside Drive, New York City, equipped with noiseless, economical Gas Refrigerators. George F. Pelham, architect.

Architects and builders choose Gas Refrigeration because of unique qualities

FIGURES show amazing success of Electrolux . . . the confidence it has gained among architects and builders. In a short 9 months, 17,077 Gas Refrigerators were installed in 251 apartment houses in Metropolitan New York. But it's not surprising, considering the many unique qualities Electrolux Gas Refrigeration has to offer.

There is no machinery in Electrolux . . . no moving parts to grind and *whirr*, to annoy tenants. The Gas Refrigerator is absolutely noiseless. A tiny gas flame does all the work of making endless, dry cold. Furthermore, Electrolux costs less to operate than any other refrigerating system.

Where Electrolux is installed, you'll find tenants will never complain about their refrigerators . . . will never call for service men with wrenches to fix machinery that's out of order. The Gas Refrigerator has nothing to ever wear out or need expensive servicing.

Architects all over the country are specifying Electrolux Gas Refrigeration for apartments. There are many models . . . for the kitchenette . . . for the home or large apartment. Write today for information. Servel Sales, Inc., Evansville, Indiana.

CHICAGO, TOO, "GOES ELECTROLUX." Apartment shown here, 2322 Lincoln Park West, is but one of many that are Electrolux-equipped.

ELECTROLUX

THE *Gas* REFRIGERATOR

A tiny gas flame takes the place of all moving parts

J-M SANACOUSTIC TILE
offers new economy in sound absorption

Johns-Manville Sanacoustic Tiles installed as ceiling of Girls' Swimming Pool,
Oak Park and River Forest Township High School, Oak Park, Ill.
Childs & Smith, Architects, Chicago, Ill.

For new construction Johns-Manville Sanacoustic Tile offers remarkable advantages both in cost and effectiveness. These simply-applied, perforated, metal tiles are a complete substitute for metal lath and plaster on furred ceilings—besides providing the most efficient sound-absorbing finish on the market. Nor is this all. J-M Sanacoustic Tiles form an interior finish that, as stated in Underwriters' Laboratories Report No. 2197, "is without fire hazard." Also these tiles have an attractive appearance, reflect light well and are permanent, while their maintenance economy is comparable only to glass or glazed tile.

J-M Sanacoustic Tiles are suitable for use in widely varying interiors. Besides their use in ordinary offices and other similar rooms they have been successfully installed for various specialized purposes, as for example ceilings in swimming pools. This use subjects both the material and its effectiveness to a severe test—which has resulted satisfactorily in every case.

Each J-M Sanacoustic Tile consists of a perforated metal container which is filled with a fireproof sound-absorbing material. The supporting Tees for these tiles may be wired directly to the furring channels. Any tile may instantly be removed to provide access to pipes, wires or the like in the furred space.

J-M Sanacoustic Tile is the ideal sound-absorbing finish for offices, bank working spaces, hospitals, restaurants, schools and other rooms where it is desired to end excessive noise.

Sanacoustic Tile is a supplement to our standard Nashkote Acoustical Treatments. For further information about J-M Sanacoustic Sound-absorbing Tile, mail the coupon below.

Johns-Manville
SANACOUSTIC SOUND-ABSORBING TILE

JOHNS-MANVILLE CORPORATION
New York Chicago Cleveland San Francisco Toronto
(Branches in all large cities)

Please send me more complete data concerning J-M Sanacoustic Tile.

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Address.....

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The Company

The KERNERATOR is made by a permanent, solidly organized and successful company, which introduced flue-fed incineration some sixteen years ago. Not a side line—this company's entire efforts and plants have always been devoted to the study, development and construction of incinerators.

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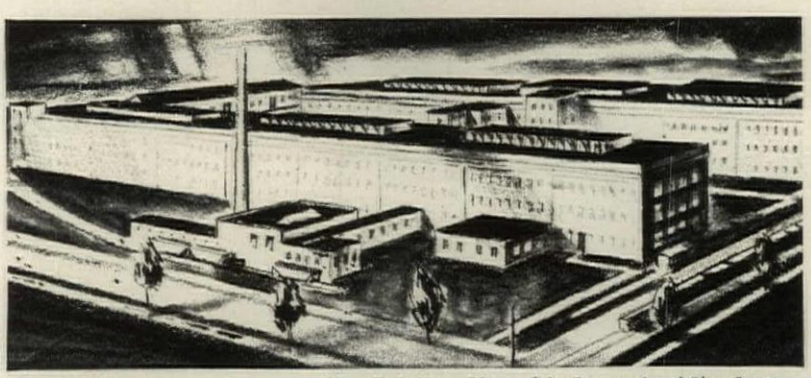
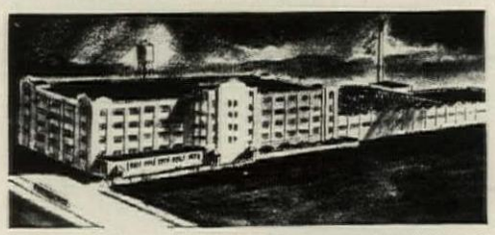
KERNER INCINERATOR CO.
715 EAST WATER STREET MILWAUKEE

57 International Shoe Co. Buildings BARRETT ROOFED since 1922

Cape Girardeau, Mo., Plant of the *International Shoe Company*. Constructed by International Shoe Co., Eng. Dept. Barrett Roofed by Swift Roofing Co., St. Louis, Mo.



Hannibal, Mo., Plant of the *International Shoe Company*. Constructed by International Shoe Co., Eng. Dept. Barrett Roofed by Swift Roofing Co., St. Louis, Mo.



Tannery of *International Shoe Company* at South Wood River, Ill. Constructed by International Shoe Co., Eng. Dept. Barrett Roofed by Swift Roofing Co., St. Louis, Mo.

St. Louis Ave. Plant *International Shoe Company*, St. Louis Mo. Constructed by International Shoe Co., Eng. Dept. Barrett Roofed by Swift Roofing Co., St. Louis, Mo.

THE Barrett Specification—stipulating known quantities, known qualities and known craftsmanship to produce a known result—appeals particularly to modern business minds. It leaves nothing to chance—takes nothing for granted.

The International Shoe Company, whose factories in seven states turn out a million pairs of shoes each week, is but one of a long list of business headliners who rely on Barrett materials and Barrett Approved Roofers for roofs that do not need attention or repairs. Fifty-seven times in the past 7½ years buildings of International Shoe Company have been Barrett Roofed.

Coal-tar pitch and gravel roofs—Barrett Roofs—40, 50 and 60 years in service and still hale and hearty, are not uncommon. Unaffected by weather, fire or atmospheric acids, there seems to be no limit to their longevity. Barrett Specification Roofs are bonded for the first 20* years against repair and maintenance expense but built to outlast by many years the term of the bond.

Five hundred and eighty-nine substantial roofing concerns, each selected on the basis of experience, ability and integrity, apply Barrett Roofs—and Barrett bonds their work. Consult with them or with us on any roofing problem.

*The Barrett Company also offers a Specification Type "A" roof which is bonded for 10 years. This type of roof is adaptable to a certain class of buildings. The same high-grade materials are used, the only difference being in quantity.

BONDED BARRETT FLASHINGS

Flashings are the most sensitive parts of any roof. Barrett Flashing Blocks and Forms are now bonded for 20 or 10 years when used with Barrett Specification Bonded Roofs. Barrett Approved Roofers will gladly tell you about this new feature of Barrett Roofing Service.

Barrett Specification Roofs

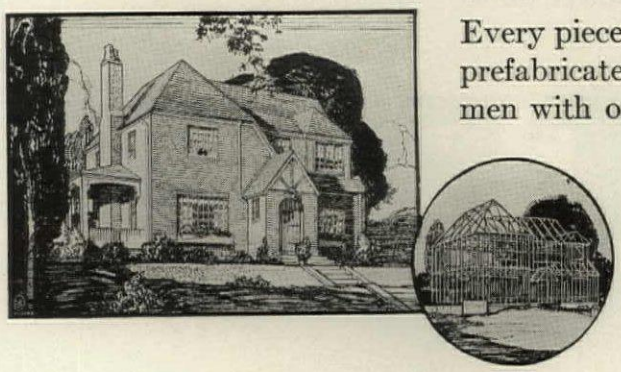
Inspected and Bonded by Barrett

THE BARRETT COMPANY, 40 Rector St., New York ✦ *In Canada* ✦ THE BARRETT COMPANY, Ltd., 5551 St. Hubert St., Montreal, P. Q.

How far beneath the surface does a "PLASTER CRACK" *begin*?

Get under the surface, right down to the framework . . . because that's where the trouble begins. Can you reasonably expect fine, smooth plaster finishes to stay that way very long when the framework is subject to shrinking and warping, settling and sagging? Every strain, every unseen movement of even a fraction of an inch has its effect on inside wall and ceiling construction. You see the final result in ugly plaster cracks.

Build your homes with Steel Framing and you insure against plaster cracks. You provide a frame that won't ever shrink or warp, and never requires inspection for weak or split material. No expansion or contraction. No sagging or settling to cause damaging movements in the structure. Steel Framing is a a permanently solid unit . . . the strongest and most rigid framework known in home building.



Every piece of the steel framework arrives at the building site prefabricated and ready for quick and easy erection by workmen with ordinary tools. No special provisions are necessary by the architect in making his plans, and the builder uses methods already familiar to him. Steel Framing is adaptable to any type of home construction; it adds the same permanence and fire safety that structural steel gives to giant skyscrapers. *Write for complete information.*

STEEL FRAME HOUSE CO., Oliver Bldg., Pittsburgh, Pa.

STEEL FRAMING

THE MODERN METHOD OF HOUSE CONSTRUCTION

Selected List of Manufacturers' Publications

FOR THE SERVICE OF ARCHITECTS, ENGINEERS, DECORATORS, AND CONTRACTORS

The publications listed in these columns are the most important of those issued by leading manufacturers identified with the building industry. They may be had without charge unless otherwise noted, by applying on your business stationery to *The Architectural Forum*, 521 Fifth Ave., New York, or the manufacturer direct, in which case kindly mention this publication.

ACOUSTICS

R. Guastavino Co., 40 Court St., Boston.
Akoustolith Plaster. Brochure, 6 pp., 8½ x 11 ins. Important data on a valuable material.

Johns-Manville Corporation, New York.
Sound-Absorbing Treatment in Banks and Offices. Booklet, 18 pp., 8½ x 11 ins. Illustrated.
Sound-Absorbing Treatment in Churches and Religious Institutions. Brochure. 22 pp., 8½ x 11 ins. Illustrated.

U. S. Gypsum Co., 205 W. Monroe St., Chicago, Ill.
A Scientific Solution of an Old Architectural Problem. Folder, 6 pp., 8½ x 11 ins. Describes Sabinite Acoustical Plaster.

ASH HOISTS

Gillis & Geoghegan, Inc., 544 West Broadway, New York.
G & G Telescopic Hoist catalog, 8½ x 11 A. I. A. Standard Classification 30il, contains complete descriptions, method of selecting correct model to fit the building's needs, scaled drawings showing space requirements and specifications.

ASH HOISTS—TELESCOPIC

Gillis & Geoghegan, Inc., 544 West Broadway, New York.
G & G Telescopic Hoist catalog, 8½ x 11 A. I. A. Standard Classification 30il, contains complete descriptions, method of selecting correct model to fit the building's needs, scaled drawings showing space requirements and specifications.

BRICK

American Face Brick Association, 1751 Peoples Life Building, Chicago, Ill.
Brickwork in Italy. 298 pp., size 7½ x 10½ ins., an attractive and useful volume on the history and use of brick in Italy from ancient to modern times, profusely illustrated with 69 line drawings, 300 half-tones, and 20 colored plates, with a map of modern and XII century Italy. Bound in linen. Price now $3.00, postpaid (formerly $6.00). Half Morocco, $7.00.
Industrial Buildings and Housing. Bound Volume, 112 pp., 8½ x 11 ins. Profusely illustrated. Deals with the planning of factories and employes' housing in detail. Suggestions are given for interior arrangements, including restaurants and rest rooms. Price now $1.00 postpaid (formerly $2.00).

Hanley Company, Bradford, Pa.
General Catalog. 16 pp. 8½ x 11 ins. Illustrated.
Bradford Reds. Folder. 8 pp., 3 x 8 ins. Illustrated.

CEMENT

Carney Company, The, Mankato, Minn.
A Remarkable Combination of Quality and Economy. Booklet, 20 pp., 8½ x 11 ins. Illustrated. Important data on valuable material.

Kosmos Portland Cement Company, Louisville, Ky.
Kosmortar for Enduring Masonry. Folder, 6 pp., 3½ x 6½ ins. Data on strength and working qualities of Kosmortar.
Kosmortar, the Mortar for Cold Weather. Folder, 4 pp., 3⅛ x 6½ ins. Tells why Kosmortar should be used in cold weather.

Louisville Cement Co., 315 Guthrie St., Louisville, Ky.
BRIXMENT for Perfect Mortar. Self-filing handbook, 8⅛ x 11 ins. 16 pp. Illustrated. Contains complete technical description of BRIXMENT for brick, tile and stone masonry, specifications, data and tests.

Portland Cement Association, Chicago, Ill.
Concrete Masonry Construction. Booklet, 48 pp., 8½ x 11 ins. Illustrated. Deals with various forms of construction.
Town and Country Houses of Concrete Masonry. Booklet, 20 pp., 8½ x 11 ins. Illustrated.
Facts About Concrete Building Tile. Brochure, 16 pp., 8½ x 11 ins. Illustrated.
The Key to Firesafe Homes. Booklet, 20 pp., 8½ x 11 ins. Illustrated.
Design and Control of Concrete Mixers. Brochure, 32 pp., 8½ x 11 ins. Illustrated.
Portland Cement Stucco. Booklet, 64 pp., 8½ x 11 ins. Illustrated.
Concrete in Architecture. Bound Volume, 60 pp., 8½ x 11 ins. Illustrated. An excellent work, giving views of exteriors and interiors.

CHURCH EQUIPMENT

John Van Range Co., Cincinnati.
Practical Planning for Church Food Service. Booklet, 32 pp., 8½ x 11 ins. Illustrated.

CONCRETE BUILDING MATERIALS

Concrete Steel Company, 42 Broadway, New York.
Modern Concrete Reinforcement. Booklet, 32 pp., 8½ x 11 ins. Illustrated.

Kosmos Portland Cement Company, Louisville, Ky.
High Early Strength Concrete, Using Standard Kosmos Portland Cement. Folder, 1 page, 8½ x 11 ins. Complete data on securing high strength concrete in short time.

CONCRETE COLORINGS

The Master Builders Co., 7016 Euclid Ave., Cleveland.
Color Mix, Colored Hardened Concrete Floors (integral). Brochure, 16 pp., 8½ x 11 ins. Illustrated. Data on coloring for floors.
Dychrome. Concrete Surface Hardener in Colors. Folder, 4 pp., 8 x 11 ins. Illustrated. Data on a new treatment.

CONSTRUCTION, FIREPROOF

Master Builders Co., Cleveland, Ohio.
Color Mix. Booklet, 18 pp., 8½ x 11 ins. Illustrated. Valuable data on concrete hardener, waterproofer and dustproofer in permanent colors.

National Fire Proofing Co., 250 Federal St., Pittsburgh, Pa.
Standard Fire Proofing Bulletin 171. 8½ x 11 ins., 32 pp. Illustrated. A treatise on fireproof floor construction.

North Western Expanded Metal Co., 1234 Old Colony Building, Chicago, Ill.
North Western Expanded Metal Products. Booklet, 8½ x 10¾ ins. 16 pp. Fully illustrated, and describes different products of this company, such as Kno-burn metal lath, 20th Century Corrugated, Plaster-Sava and Longspan lath channels, etc.
A. I. A. Sample Book. Bound volume, 8½ x 11 ins., contains actual samples of several materials and complete data regarding their use.

CONSTRUCTION, STONE AND TERRA COTTA

Cowing Pressure Relieving Joint Company, 100 North Wells St., Chicago, Ill.
Pressure Relieving Joint for Buildings of Stone, Terra Cotta or Marble. Booklet, 16 pp., 8½ x 11 ins. Illustrated. Deals with preventing cracks, spalls and breaks.

DAMPPROOFING

The Master Builders Co., 7016 Euclid Ave., Cleveland.
Waterproofing and Dampproofing Specification Manual. Booklet, 18 pp., 8½ x 11 ins. Deals with methods and materials used.
Waterproofing and Dampproofing. File. 36 pp. Complete descriptions and detailed specifications for materials used in building and concrete.

Minwax Company, Inc., 11 West 42nd St., New York.
Complete Index of all Minwax Products. Folder, 6 pp., 8½ x 11 ins. Illustrated. Complete description and detailed specifications.

Sonneborn Sons, Inc., L., 116 Fifth Ave., New York.
Specification Sheet, 8½ x 11 ins. Descriptions and specifications of compounds for dampproofing interior and exterior surfaces.

Toch Brothers, New York, Chicago, Los Angeles.
Handbook of R. I. W. Protective Products. Booklet, 40 pp., 4½ x 7½ ins.

DOORS AND TRIM, METAL

The American Brass Company, Waterbury, Conn.
Anaconda Architectural Bronze Extruded Shapes. Brochure, 180 pp., 8½ x 11 ins., illustrating and describing more than 2,000 standard bronze shapes of cornices, jamb casings, mouldings, etc.

The Kawneer Company, Niles, Michigan.
Detail sheet, 8½ x 11 ins., with A.I.A. File No. featuring Heavy Welded Bronze Doors.

Richards-Wilcox Mfg. Co., Aurora, Ill.
Fire-Doors and Hardware. Booklet, 8½ x 11 ins., 64 pp. Illustrated. Describes entire line of tin-clad and corrugated fire doors, complete with automatic closers, track hangers and all the latest equipment—all approved and labeled by Underwriters' Laboratories.

Truscon Steel Company, Youngstown, Ohio.
Copper Alloy Steel Doors. Catalog 110. Booklet, 48 pp., 8½ x 11 ins. Illustrated.

REQUEST FOR CATALOGS

To get any of the catalogs described in this section, put down the title of the catalog desired, the name of the manufacturer and send coupon to THE ARCHITECTURAL FORUM, 521 Fifth Avenue, New York.

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Name ..... Business .....

Address .....

SELECTED LIST OF MANUFACTURERS' PUBLICATIONS—*Continued from page 181*

DOORS, SOUNDPROOF

Irving Hamlin, Evanston, Ill.
The Evanston Soundproof Door. Folder, 8 pp., 8½ x 11 ins. Illustrated. Deals with a valuable type of door.

DRAINAGE FITTINGS

Josam Mfg. Co., Michigan City, Ind.
Josam Products. Booklet, 73 pp., 8½ x 11 ins. Illustrated. A valuable line of accessories.
Josam-Marsh Grease, Plaster, Sediment and Hair Interceptors. Brochure. 7 pp., 8½ x 11 ins. Illustrated.
Josam New Saw Tooth-Roof Drain. Folder, 4 pp., 8½ x 11 ins. Illustrated.

DUMBWAITERS

Sedgwick Machine Works, 151 West 15th St., New York, N. Y.
Catalog and Service Sheets. Standard specifications, plans and prices for various types, etc. 4¼ x 8¼ ins., 60 pp. Illustrated.
Catalog and pamphlets, 8½ x 11 ins. Illustrated. Valuable data on dumbwaiters.

ELECTRICAL EQUIPMENT

Baldor Electric Co., 4358 Duncan Avenue, St. Louis, Mo.
Baldor Electric Motors. Booklet, 14 pp., 8 x 10½ ins. Illustrated. Data regarding motors.

Bryant Electric Company, Bridgeport, Conn.
HooKeX Plug and Receptacle. Folder, 6 pp., 3½ x 6¼ ins. Illustrated.
KeNeX Plug and Receptacle. Folder, 6 pp., 3½ x 6¼ ins. Illustrated.
Three-wire Polarized Caps and Receptacles. Leaflet, 8½ x 10 ins. Illustrated.
Three-wire Polarized Caps and Receptacles for Heavy Duty. Leaflet, 8½ x 10 ins. Illustrated.

General Electric Co., Merchandise Dept., Bridgeport, Conn.
Wiring System Specification Data for Apartment Houses and Apartment Hotels. Booklet, 20 pp., 8 x 10 ins. Illustrated.
Electrical Specification Data for Architects. Brochure, 36 pp., 8 x 10½ ins. Illustrated. Data regarding G. E. wiring materials and their use.
The House of a Hundred Comforts. Booklet, 40 pp., 8 x 10½ ins. Illustrated. Dwells on importance of adequate wiring.

Harvey Hubbell, Inc., Bridgeport, Conn.
Electrical Specialties. Catalog No. 19. 52 pp., 8½ x 10 ins. Illustrated.

Pick-Barth Company, Inc., Albert, 1200 West 35th St., Chicago, and Cooper Square, New York.
School Cafeterias. Booklet, 6 x 9 ins. Illustrated. The design and equipment of school cafeterias with photographs of installation and plans for standardized outfits.

Prometheus Electric Corporation, 360 West 13th St., New York.
Electric Heating Specialties. Booklet, 24 pages. 8½ x 11 ins. Illustrated. Specialties for heating, cooking, hospitals, organ lofts, etc.

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Electric Power for Buildings. Brochure, 14 pp., 8½ x 11 ins. Illustrated. A publication important to architects and engineers.
Variable-Voltage Central Systems as Applied to Electric Elevators. Booklet, 12 pp., 8½ x 11 ins. Illustrated. Deals with an important detail of elevator mechanism.
Modern Electrical Equipment for Buildings. Booklet, 8½ x 11 ins. Illustrated. Lists many useful appliances.
Electrical Equipment for Heating and Ventilating Systems. Booklet, 24 pp., 8½ x 11 ins. Illustrated. This is "Motor Application Circular 7379."
Westinghouse Panelboards. Catalog 224. Booklet, 64 pp., 8½ x 11 ins. Illustrated.
Beauty; Power; Silence; Westinghouse Fans. (Dealer Catalog 45.) Brochure, 16 pp., 8½ x 11 ins. Illustrated. Valuable information on fans and their uses.
Electric Range Book for Architects (A. I. A. Standard Classification 31 G-4). Booklet, 24 pp., 8½ x 11 ins. Illustrated. Cooking apparatus for buildings of various types.
Westinghouse Commercial Cooking Equipment (Catalog 280). Booklet, 32 pp., 8½ x 11 ins. Illustrated. Equipment for cooking on a large scale.
Electric Appliances (Catalog 44-A). 32 pp., 8½ x 11 ins. Deals with accessories for home use.

ELEVATORS

Otis Elevator Company, 260 Eleventh Ave., New York, N. Y.
Otis Push Button Controlled Elevators. Descriptive leaflets, 8½ x 11 ins. Illustrated. Full details of machines, motors and controllers for these types.
Otis Geared and Gearless Traction. Elevators of All Types. Descriptive leaflets, 8½ x 11 ins. Illustrated. Full details of machines, motors and controllers for these types.
Escalators. Booklet, 8½ x 11 ins., 22 pp. Illustrated. Describes use of escalators in subways, department stores, theaters and industrial buildings. Also includes elevators and dock elevators.

ELEVATORS—Continued

Richards-Wilcox Mfg. Co., Aurora, Ill.
Elevators. Booklet, 8½ x 11 ins., 24 pp. Illustrated. Describes complete line of "Ideal" elevator door hardware and checking devices, also automatic safety devices.

Sedgwick Machine Works, 151 West 15th St., New York, N. Y.
Catalog and descriptive pamphlets, 4¼ x 8¼ ins., 70 pp. Illustrated. Descriptive pamphlets on hand power freight elevators, sidewalk elevators, automobile elevators, etc.
Catalog and pamphlets, 8½ x 11 ins. Illustrated. Important data on different types of elevators.

ESCALATORS

Otis Elevator Company, 260 Eleventh Ave., New York, N. Y.
Escalators. Booklet, 32 pp., 8½ x 11 ins. Illustrated. A valuable work on an important item of equipment.

FIREPLACE CONSTRUCTION

H. W. Covert Company, 243 East 44th Street, New York, N. Y.
Covert Fireplace Construction. Booklet, 12 pp., 8½ x 11 ins. Illustrated. Valuable data on an important topic.

FIREPROOFING

Concrete Engineering Co., Omaha, Neb.
Handbook of Fireproof Construction. Booklet, 54 pp., 8½ x 11 ins. Valuable work on methods of fireproofing.

Concrete Steel Company, 42 Broadway, New York.
Economical Fireproof Floors for Suburban Buildings. Folder. 4 pp., 8½ x 11 ins. Illustrated.

North Western Expanded Metal Co., 407 South Dearborn Street, Chicago, Ill.
A. I. A. Sample Book. Bound volume, 8½ x 11 ins. Contains actual samples of several materials and complete data regarding their use.

FLOOR HARDENERS (CHEMICAL)

Master Builders Co., Cleveland, Ohio.
Concrete Floor Treatment. File, 50 pp. Data on securing hardened dustproof concrete.
Concrete Floor Treatments—Specification Manual. Booklet, 24 pp., 8½ x 11 ins. Illustrated. Valuable work on an important subject.

Minwax Company, 11 West 42nd Street, New York, N. Y.
Concrete Floor Treatments. Folder, 4 pp., 8½ x 11 ins. Illustrated.

Sonneborn Sons, Inc., L., 116 Fifth Ave., New York, N. Y.
Lapidolith, the liquid chemical hardener. Complete sets of specifications for every building type in which concrete floors are used, with descriptions and results of tests.

Toch Brothers, New York, Chicago, Los Angeles.
Handbook of R.I.W. Protective Products. Booklet, 40 pp., 4½ x 7½ ins.

FLOORS—STRUCTURAL

Concrete Steel Company, 42 Broadway, New York.
Structural Economies for Concrete Floors and Roofs. Brochure, 32 pp., 8½ x 11 ins. Illustrated.

Truscon Steel Co., Youngstown, Ohio.
Truscon Floretyle Construction. Booklet, 8½ x 11 ins., 16 pp. Illustrations of actual jobs under construction. Lists of properties and information on proper construction. Proper method of handling and tables of safe loads.

Structural Gypsum Corporation, Linden, N. J.
Gypsteel Pre-cast Fireproof Floors. Booklet, 36 pp., 8½ x 11 ins. Illustrated. Data on flooring.

FLOORING

Armstrong Cork Co. (Linoleum Division), Lancaster, Pa.
Armstrong's Linoleum Floors. Catalog, 8½ x 11 ins., 44 pp. Color plates. A technical treatise on linoleum, including table of gauges and weights and specifications for installing linoleum floors. Newly revised, February, 1929.
Armstrong's Linoleum Pattern Book, 1929. Catalog, 9 x 12 ins., 44 pp. Color plates. Reproduction in color of all patterns of linoleum and cork carpet in the Armstrong line.
Linoleum Layer's Handbook. 5 x 7 ins., 36 pp. Instructions for linoleum layers and others interested in learning most satisfactory methods of laying and taking care of linoleum.
Enduring Floors of Good Taste. Booklet, 6 x 9 ins., 48 pp. Illustrated in color. Explains use of linoleum for offices, stores, etc., with reproductions in color of suitable patterns, also specifications and instructions for laying.

Blabon Company, Geo. W., Nicetown, Philadelphia, Pa.
Planning the Color Schemes for Your Home. Brochure, illustrated in color; 36 pp., 7½ x 10½ ins. Gives excellent suggestions for use of color in flooring for houses and apartments.
Handy Quality Sample Folder of Linoleums. Gives actual samples of "Battleship Linoleum," cork carpet, "Feltex," etc.
Blabon's Linoleum. Booklet, illustrated in color; 128 pp., 3½ x 8½ ins. Gives patterns of a large number of linoleums.
Blabon's Plain Linoleum and Cork Carpet. Gives quality samples, 3 x 6 ins. of various types of floor coverings.

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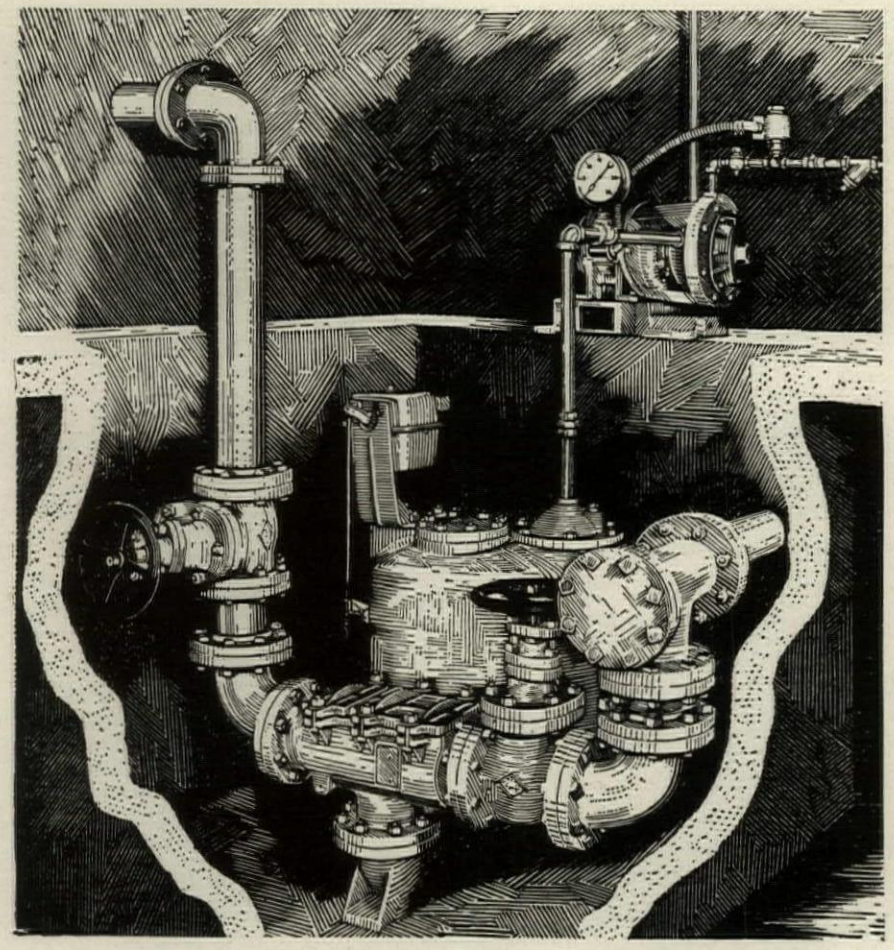

This small Jennings Ejector has a capacity of 30 g.p.m., sufficient to serve five toilets. Other sizes are furnished in capacities ranging from 50 to 1500 g.p.m. Heads upto 50 ft. Write for Bulletin 67.

Handles sewage up to 30 g. p. m.

FOR raising unscreened sewage from basements below street sewer level... handling waste from toilets, laundries or dishwashing machines... wherever the quantity runs no greater than 30 g. p. m., this small Jennings Ejector can be used to advantage.

Following the same simplified design as the larger Jennings units, it operates on the pneumatic principle without employing air valves, air storage tanks, or reciprocating compressors. It cannot clog because no vital moving parts come in contact with the sewage. Anything that will pass thru the extra large inlet, 4 inches in diameter, is readily handled. Screens are avoided.

The Nash Hytor Compressor furnishes air only when sewage is being moved. A smaller motor, with less h. p., is required than is needed for a centrifugal sewage pump of the same capacity. Power consumption is small.

Jennings Pumps

THE NASH ENGINEERING CO 12 WILSON ROAD, SOUTH NORWALK CONN.

SELECTED LIST OF MANUFACTURERS' PUBLICATIONS — *Continued from page 182*

FLOORING—Continued

Carter Bloxonend Flooring Co., Keith & Perry Bldg., Kansas City, Missouri.
Bloxonend Flooring. Booklet, 3¼ x 6¼. ins., 20 pp. Illustrated. Describes uses and adaptability of Bloxonend Flooring to concrete, wood or steel construction, and advantages over loose wood blocks.
File Folder. 9⅜ x 11¾ ins. For use in connection with A. I. A. system of filing. Contains detailed information on Bloxonend Flooring in condensed loose-leaf form for specification writer and drafting room. Literature embodied in folder includes standard Specification Sheet covering the use of Bloxonend in general industrial service and Supplementary Specification Sheet No. 1, which gives detailed description and explanation of an approved method for installing Bloxonend in gymnasiums, armories, drill rooms and similar locations where maximum resiliency is required.

Cellized Oak Flooring, Memphis, Tenn.
Style in Oak Floors. Booklet, 16 pp., 6 x 9 ins. Illustrated.

Congoleum-Nairn, Inc., 195 Belgrove Drive, Kearny, N. J.
Facts you should know about Resilient Floors. A series of booklets on floors for (1) schools, (2) hospitals, (3) offices, (4) stores, (5) libraries, (6) churches, (7) clubs and lodges, (8) apartments and hotels. Illustrated.
Specifications for Resilient Floors. Booklet, 12 pp. A reprint from Sweet's.
A New Kind of Floor Service. Brochure, 8 pp. Data on Bonded Floors.
Sealex Battleship Linoleum. Booklet, 12 pp. Illustrated. Shows typical installations.
Sealex Treadlite Tiles. Two booklets, 8 and 16 pp. Illustrated.
Colonial Planks. Brochure, 8 pp. Illustrated.

C. Pardee Works, 9 East 45th St., New York, N. Y., and 1600 Walnut St., Philadelphia, Pa.
Pardee Tiles. Bound Volume, 48 pp., 8½ x 11 ins. Illustrated.

Structural Gypsum Corporation, Linden, N. J.
Gypsteel Pre-cast Fireproof Floors. Booklet, 36 pp., 8½ x 11 ins. Illustrated. Data on floorings.

U. S. Gypsum Co., Chicago.
Pyrobar Floor Tile. Folder, 8½ x 11 ins. Illustrated. Data on building floors of hollow tile and tables on floor loading.

U. S. Rubber Co., 1790 Broadway, New York, N. Y.
Period Adaptations for Modern Floors. Brochure, 8 x 11 ins., 60 pp. Richly Illustrated. A valuable work on the use of rubber tile for flooring in interiors of different historic styles.

FURNITURE

American Seating Co., 14 E. Jackson Blvd., Chicago, Ill.
Art Ecclesiastical Booklet, 6 x 9 ins., 48 pp. Illustrations of church fitments in carved wood.
Theatre Chairs. Booklet, 6 x 9 ins., 48 pp. Illustrations of theatre chairs.

Kittinger Co., 1893 Elmwood Ave., Buffalo, N. Y.
Kittinger Club & Hotel Furniture. Booklet, 20 pp., 6¼ x 9½ ins. Illustrated. Deals with fine line of furniture for hotels, clubs, institutions, schools, etc.
Kittinger Club and Hotel Furniture. Booklet, 20 pp., 6 x 9 ins. Illustrated. Data on furniture for hotels and clubs.
A Catalog of Kittinger Furniture. Booklet, 78 pp., 11 x 14 ins. Illustrated. General Catalog.

McKinney Mfg. Co., Pittsburgh, Pa.
Forethought Furniture Plans. Sheets, 6¼ x 9 ins., drawn to ¼-inch scale. An ingenious device for determining furniture arrangement.

GLASS CONSTRUCTION

Adamson Flat Glass Co., Clarksburg, W. Va.
Quality and Dependability. Folder, 2 pp., 8½ x 11 ins. Illustrated. Data in the company's product.

Libbey-Owens Sheet Glass Co., Toledo, Ohio.
Flat Glass. Brochure, 12 pp., 5⅞ x 7⅝ ins. Illustrated. History of manufacture of flat, clear, sheet glass.

GREENHOUSES

King Construction Company, North Tonawanda, N. Y.
King Greenhouses for Home or Estate. Portfolio of half-tone prints, varnishes. 8¼ x 10½ ins.

William H. Lutton Company, 267 Kearney Ave., Jersey City, N. J.
Greenhouses of Quality. Booklet, 50 pp., 8½ x 11 ins. Illustrated. Conservatories making use of Lutton Patented Galvanized Steel V-Bar.

HARDWARE

P. & F. Corbin, New Britain, Conn.
Early English and Colonial Hardware. Brochure, 8½ x 11 ins. An important illustrated work on this type of hardware.
Locks and Builders' Hardware. Bound Volume, 486 pp., 8½ x 11 ins. An exhaustive, splendidly prepared volume.
Colonial and Early English Hardware. Booklet, 48 pp., 8½ x 11 ins. Illustrated. Data on hardware for houses in these styles.

Cutler Mail Chute Company, Rochester, N. Y.
Cutler Mail Chute Model F. Booklet, 4 x 9¼ ins., 8 pp. Illustrated.

HARDWARE—Continued

Richards-Wilcox Mfg. Co., Aurora, Ill.
Distinctive Garage Door Hardware. Booklet, 8½ x 11 ins., 66 pp. Illustrated. Complete information accompanied by data and illustrations on different kinds of garage door hardware.
Distinctive Elevator Door Hardware. Booklet, 90 pp., 10½ x 16 ins. Illustrated.

Russell & Erwin Mfg. Co., New Britain, Conn.
Hardware for the Home. Booklet, 24 pp., 3½ x 6 ins. Deals with residence hardware.
Door Closer Booklet. Brochure, 16 pp., 3½ x 6 ins. Data on a valuable detail.
Garage Hardware. Booklet, 12 pp., 3½ x 6 ins. Hardware intended for garage use.
Famous Homes of New England. Series of folders on old homes and hardware in style of each.

HEATING EQUIPMENT

American Blower Co., 6004 Russell St., Detroit, Mich.
Heating and Ventilating Utilities. A binder containing a large number of valuable publications, each 8½ x 11 ins., on these important subjects.

American Radiator Company, The, 40 West 40th St., N. Y. C.
Ideal Boilers for Oil Burning. Catalog 5½ x 8½ ins., 36 pp. Illustrated in 4 colors. Describing a line of Heating Boilers especially adapted to use with Oil Burners.
Corto—The Radiator Classic. Brochure, 5½ x 8½ ins., 16 pp. Illustrated. A brochure on a space-saving radiator of beauty and high efficiency.
Ideal Arcola Radiator Warmth. Brochure, 6¼ x 9½ ins. Illustrated. Describes a central all-on-one-floor heating plant with radiators for small residences, stores, and offices.
How Shall I Heat My Home? Brochure, 16 pp., 5¾ x 8½ ins. Illustrated. Full data on heating and hot water supply.
New American Radiator Products. Booklet, 44 pp., 5 x 7¾ ins. Illustrated. Complete line of heating products.
A New Heating Problem. Brilliantly Solved. Broadside, 4 pp., 10¾ x 15 ins. Illustrated. Data on the IN-AIRID invisible air valve.
In-Airid, the Invisible Air Valve. Folder, 8 pp., 3½ x 6 ins. Illustrated. Data on a valuable detail of heating.
The 999 ARCO Packless Radiator Valve. Folder, 8 pp., 3½ x 6 ins. Illustrated.

James B. Clow & Sons, 534 S. Franklin St., Chicago, Ill.
Clow Gasteam Vented Heating System. Brochure, 24 pp., 8½ x 11 ins. Illustrated. Deals with a valuable form of heating equipment for using gas.

C. A. Dunham Company, 450 East Ohio St., Chicago, Ill.
Dunham Radiator Trap. Bulletin 101, 8 x 11 ins., 12 pp. Illustrated. Explains working of this detail of heating apparatus.
Dunham Packless Radiator Valves. Bulletin 104, 8 x 11 ins., 8 pp. Illustrated. A valuable brochure on valves.
Dunham Return Heating System. Bulletin 109, 8 x 11 ins. Illustrated. Covers the use of heating apparatus of this kind.
Dunham Vacuum Heating System. Bulletin 110, 8 x 11 ins., 12 pp. Illustrated.
The Dunham Differential Vacuum Heating System. Bulletin 114. Brochure, 12 pp., 8 x 11 ins. Illustrated. Deals with heating for small buildings.
The Dunham Differential Vacuum Heating System. Bulletin 115. Brochure, 12 pp., 8 x 11 ins. Illustrated. Deals with heating for large buildings.

The Fulton Sylphon Company, Knoxville, Tenn.
Sylphon Temperature Regulators. Illustrated brochures, 8½ x 11 ins., dealing with general architectural and industrial applications; also specifically with applications of special instruments.
Sylphon Heating Specialties. Catalog No. 200, 192 pp., 3½ x 6¾ ins. Important data on heating.

Hoffman Specialty Company, Inc., 25 West 45th St., New York, N. Y.
Heat Controlled With the Touch of a Finger. Booklet, 46 pp., 5¾ x 8¾ ins. Illustrated.
How to Lock Out Air, the Heat Thief. Brochure, 48 pp., 5 x 7¼ ins. Illustrated.

Janette Manufacturing Company, 556 West Monroe Street, Chicago.
More Heat from Any Hot Water System on Less Fuel. Folder. 4 pp., 8½ x 11 ins. Illustrated. Deals with use of the "Hydrolator."

S. T. Johnson Co., Oakland, Calif.
Johnson Oil Burners. Booklet, 9 pp., 8½ x 11 ins. Illustrated.
Bulletin No. 4A. Brochure, 8 pp., 8½ x 11 ins. Illustrated. Data on different kinds of oil-burning apparatus.
Bulletin No. 31. Brochure, 8 pp., 8½ x 11 ins. Illustrated. Deals with Johnson Rotary Burner with Full Automatic Control.

Kewanee Boiler Corporation, Kewanee, Ill.
Kewanee on the Job. Catalog, 8½ x 11 ins., 80 pp. Illustrated. Showing installations of Kewanee boilers, water heaters, radiators. etc.
Catalog No. 78, 6 x 9 ins. Illustrated. Describes Kewanee Firebox Boilers with specifications and setting plans.
Catalog No. 79, 6 x 9 ins. Illustrated. Describes Kewanee power boilers and smokeless tubular boilers with specifications.

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The enduring qualities of these made-to-measure Carey roofs are due to the Carey control of the materials from which they are made. The long-fibre felts are Carey milled. The asphalts are Carey refined and blended. In addition, there is that intangible ingredient, a fifty-year experience, which Carey builds into every roof.

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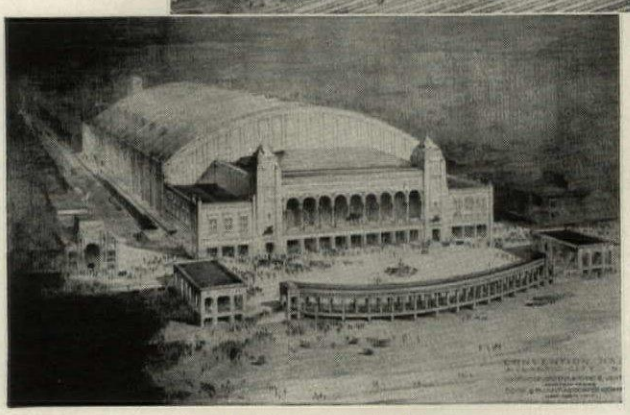
The $800,000 Liggett Building, Seattle, Washington. Also Carey protected.

An aerial view of the John Sevier R. R. yards at Nashville, Tennessee, showing the vast acreage of Carey roofs.

The stately Mitsui Bank, Tokyo, Japan, atop which is a Carey Built-up Roof.



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Our Architect's Specification Book is yours for the asking.

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SELECTED LIST OF MANUFACTURERS' PUBLICATIONS — *Continued from page 184*

HEATING EQUIPMENT—Continued

May Oil Burner Corp., Baltimore, Md.
Adventures in Comfort. Booklet, 24 pp., 6 x 9 ins. Illustrated. Non-technical data on oil as fuel.
Taking the Quest Out of the Question. Brochure, 16 pp., 6 x 9 ins. Illustrated. For home owners interested in oil as fuel.

McQuay Radiator Corporation, 35 East Wacker Drive, Chicago, Ill.
McQuay Visible Type Cabinet Heater. Booklet, 4 pp., 8½ x 11 ins. Illustrated. Cabinets and radiators adaptable to decorative schemes.
McQuay Concealed Radiators. Brochure, 4 pp., 8½ x 11 ins. Illustrated.
McQuay Unit Heater. Booklet, 8 pp., 8½ x 11 ins. Illustrated. Gives specifications and radiator capacities.

Modine Mfg. Co., Racine, Wisc.
Modine Copper Radiation. Booklet, 28 pp. 8½ x 11 ins. Illustrated. Deals with industrial, commercial and domestic heating.
A Few Short Years. Folder. 4 pp. 8½ x 11 ins. Illustrated. Heating for garages.
Dairy Plant Heating. Folder. 4 pp., 8½ x 11 ins. Illustrated.

Nash Engineering Company, South Norwalk, Conn.
Bulletin 85. Booklet. 12 pp. 10¾ x 7½ ins. Illustrated in color. Describes construction and operation of the Jennings Return Line Vacuum Heating Pump.
Bulletin 87. Brochure. 8 pp. 10¾ x 7½ ins. Illustrated in color. Deals with Sizes T and U Jennings Vacuum Heating Pump for 2500 and 5000 square feet equivalent direct radiation.
Bulletin 63. Booklet. 4 pp. 10¾ x 7½ ins. Illustrated. Describes in detail the Unit Type Motor Driven Jennings Condensation Pump.
Bulletin 52. Brochure. 6 pp. 10¾ x 7½ ins. Illustrated in color. Devoted to Jennings Standard Centrifugal Pumps for house service, boosting city water pressure to supply top stories, for circulating warm water, etc.

National Radiator Corporation, Johnstown, Pa.
Aero Radiators; Beauty and Worth. Catalog 34. Booklet, 6 x 9 ins., 20 pp., describing and illustrating radiators and accessories.
Six Great Companies Unite to Form a Great Corporation. Booklet, 28 pp., 8½ x 10½ ins. Illustrated. Valuable data on heating.

Prometheus Electric Corporation, 360 West 13th St., New York.
Electric Heating Specialties. Booklet, 24 pages. 8½ x 11 ins. Illustrated. Specialties for heating, cooking, hospitals, organ lofts, etc.

Rome Brass Radiator Corporation, 1 East 42nd Street, New York.
Proof of the Pudding. Booklet, 24 pp., 8½ x 10½ ins. Illustrated. Describes Robras, 20-20 concealed-within-the-walls, lightweight, all-brass radiators.
Within the Walls. Brochure, 16 pp., 4 x 9 ins. Illustrated. Gives facts regarding modern, out-of-sight, lightweight, Robras 20-20 radiators.
Engineering Data. Booklet, 16 pp., 8½ x 10½ ins. Illustrated. Full data and tables to facilitate selection and installation of Robras 20-20 concealed radiators for steam, water and vapor heating systems.
Small Bathrooms Made More Spacious, Brochure, 4 pp. Illustrated. Gives descriptions, sizes and prices of Robras lightweight cabinet radiators to be installed under wash basins.

Sarco Company, Inc., 183 Madison Ave., New York City, N. Y.
Steam Heating Specialties. Booklet, 6 pp., 6 x 9 ins. Illustrated. Data on Sarco Packless Supply Valves and Radiator Traps for vacuum and vapor heating systems.
Equipment Steam Traps and Temperature Regulations. Booklet, 6 pp., 6 x 9 ins. Illustrated. Deals with Sarco Steam Traps for hospital, laundry and kitchen fixtures and the Sarco Self-contained Temperature Regulation for hot water service tanks.

Spencer Heater Co., Williamsport, Pa.
Catalog. Booklet, 20 pp., 6⅛ x 9 ins. Illustrated. Complete line of magazine feed cast iron sectional and steel tubular heaters.
The Fire that Burns Uphill. Brochure, 24 pp., 6⅛ x 9¼ ins. Illustrated in color. Magazine feed heaters for steam, vapor and hot water heating.

B. F. Sturtevant Company, Hyde Park, Boston, Mass.
Tempervane Heating Units. Catalog 363. Booklet, 44 pp., 8½ x 11 ins. Illustrated. Data on "Heating Every Corner with Maximum Economy."

Trane Co., The, La Crosse, Wis.
Bulletin 14, 16 pp., 8½ x 10⅝ ins. Covers the complete line of Trane Heating Specialties, including Trane Bellows Traps, and Trane Bellows Packless Valves.
Bulletin 20. 24 pp., 8½ x 10⅝ ins. Explains in detail the operation and construction of Trane Condensation. Vacuum, Booster, Circulating, and similar pumps.
How to Cut Heating Costs. Booklet, 18 pp., 8½ x 11 ins. Illustrated.

HOISTS, TELESCOPIC

Gillis & Geoghegan, Inc. 535 West Broadway, New York.
G & G Telescopic Hoist. Booklet. 24 pp. 8½ x 11 ins. Illustrated complete data on hoists.
Ash Removal. Folder. 8½ x 11 ins. Illustrated. Hoists for removing ashes from basements.

HOSPITAL EQUIPMENT

The Frink Co., Inc., 369 Lexington Ave., New York City.
Catalog 426. 7 x 10 ins., 16 pp. A booklet illustrated with photographs and drawings, showing the types of light for use in hospitals, as operating table reflectors, linolite and multilite concentrators, ward reflectors, bed lights and microscopic reflectors, giving sizes and dimensions, explaining their particular fitness for special uses.

Holophane Company, 342 Madison Avenue, New York.
Lighting Specific for Hospitals. Booklet, 30 pp., 8½ x 11 ins. Illustrated.

The International Nickel Company, 67 Wall St., New York, N. Y.
Hospital Applications of Monel Metal. Booklet, 8½ x 11½ ins., 16 pp. Illustrated. Gives types of equipment in which Monel Metal is used, reasons for its adoption, with sources of such equipment.

Pick-Barth Company, Inc., Albert, 1200 West 35th St., Chicago, and Cooper Square, New York.
Some Thoughts About Hospital Food Service Equipment. Booklet, 22 pp., 7½ x 9¼ ins. Valuable data on an important subject.

Prometheus Electric Corporation, 360 West 13th St., New York.
Electric Heating Specialties. Booklet, 24 pages. 8½ x 11 ins. Illustrated. Specialties for heating, cooking, hospitals, organ lofts, etc.

HOTEL EQUIPMENT

Pick-Barth Company, Inc., Albert, 1200 West 35th St., Chicago, and Cooper Square, New York.
Some Thoughts on Furnishing a Hotel. Booklet, 7½ x 9 ins. Data on complete outfitting of hotels.

INCINERATORS

Home Incinerator Co., Milwaukee, Wis.
The Decent Way. Burn it with Gas. Brochure, 30 pp., 5¼ x 7¼ ins., inside. Illustrated. Incinerator sanitation equipment for residence use.
A. I. A. File, 12 pp., 8¾ x 10¾ ins., inside. Suggestions for architect on incineration, showing installation and equipment.
Specialized Home Comforts Service Plan Book. 40 pp., 8½ x 11 ins., inside. Illustrated. A complete outline of the many advantages of incineration.
Blue Star Standards in Home Building. 16 pp., 5½ x 8½ ins., inside. Illustrated. Explaining fully the Blue Star principles, covering heat, incineration, refrigeration, etc.

Josam Mfg. Co., Michigan City, Ind.
Josam-Graver Incinerators. Folder, 4 pp., 8½ x 11 ins. Illustrated.

Kerner Incinerator Company, 715 E. Water St., Milwaukee, Wis.
Incinerators (Chimney-fed). Catalog No. 15 (Architect and Builders' Edition). Size 8½ x 11 ins., 16 pp. Illustrated. Describes principles and design of Kernerator Chimney-fed Incinerators for residences, apartments, hospitals, schools, apartment hotels, clubs and other buildings. Shows all standard models and gives general information and working data.
Sanitary Elimination of Household Waste. Booklet, 4 x 9 ins. 16 pp. Illustrated. Gives complete information on the Kernerator for residences.
Garbage and Waste Disposal for Apartment Buildings. Folder, 8½ x 11 ins., 16 pp. Illustrated. Describes principle and design of Kernerator Chimney-fed Incinerator for apartments and gives list of buildings where it has been installed.
Sanitary Disposal of Waste in Hospitals. Booklet, 4 x 9 ins., 12 pp. Illustrated. Shows how this necessary part of hospital service is taken care of with the Kernerator. Gives list of hospitals where installed.
The Kernerator (Chimney-fed) Booklet. Catalog No. 17, 20 pp., 8½ x 11 ins. Illustrated. Data on a valuable detail of equipment.

INSULATION

Armstrong Cork & Insulation Co., Pittsburgh, Pa.
The Insulation of Roofs with Armstrong's Corkboard. Booklet. Illustrated. 7½ x 10½ ins., 32 pp. Discusses means of insulating roofs of manufacturing or commercial structures.
Insulation of Roofs to Prevent Condensation. Illustrated booklet, 7½ x 10½ ins., 36 pp. Gives full data on valuable line of roof insulation.
Filing Folder for Pipe Covering Data. Made in accordance with A. I. A. rules.
The Cork-lined House Makes a Comfortable Home. 5 x 7 ins. 32 pp. Illustrated.
Armstrong's Corkboard. Insulation for Walls and Roofs of Buildings. Booklet, 66 pp., 9½ x 11¾ ins. Illustrates and describes use of insulation for structural purposes.

Structural Gypsum Corporation, Linden, N. J.
Heat Insulation Value of Gypsteel. Folder, 4 pp., 8½ x 11 ins. Brochure, by Charles L. Norton, of M. I. T.

JOISTS

Bates Expanded Steel Truss Co., East Chicago, Ind.
Catalog No. 4. Booklet, 32 pp., 8½ x 11 ins. Illustrated. Gives details of truss construction with loading tables and specifications.

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SELECTED LIST OF MANUFACTURERS' PUBLICATIONS — *Continued from page 186*

JOISTS—Continued

Modern Concrete Reinforcement. Brochure, 32 pp., 8½ x 11 ins. Illustrated.

Construction Details for Installing Havemeyer Trusses. Data sheets, 8½ x 11 ins. Illustrated.

Standard Practice for Placing Havemeyer Reinforcement in Columns, Beams and Slabs. Data sheets, 8½ x 11 ins. Illustrated.

KITCHEN EQUIPMENT

The International Nickel Company, 67 Wall St., New York, N. Y.
Hotels, Restaurants and Cafeteria Applications of Monel Metal. Booklet, 8½ x 11 ins., 32 pp. Illustrated. Gives types of equipment in which Monel Metal is used, with service data and sources of equipment.

Prometheus Electric Corporation, 360 West 13th St., New York.
Electric Heating Specialties. Booklet, 24 pages. 8½ x 11 ins. Illustrated. Specialties for heating, cooking, hospitals, organ lofts, etc.

John Van Range Co., Cincinnati.
Practical Planning for Church Food Service. Booklet, 32 pp., 8½ x 11 ins. Illustrated.

Practical Planning for School Service. Booklet, 32 pp., 8½ x 11 ins. Illustrated.

LABORATORY EQUIPMENT

Alberene Stone Co., 153 West 23rd Street, New York City.
Booklet, 8¾ x 11¼ ins., 26 pp. Stone for laboratory equipment, shower partitions, stair treads, etc.

Duriron Company, Dayton, Ohio.
Duriron Acid, Alkali and Rust-proof Drain Pipe and Fittings. Booklet, 8½ x 11 ins., 20 pp. Full details regarding a valuable form of piping.

LANTERNS

Todhunter, Arthur, 119 E. 57th St., New York, N. Y.
Hand-wrought Lanterns. Booklet, 5¼ x 6¾ ins., 20 pp. Illustrated in black and white. With price list. Lanterns appropriate for exterior and interior use, designed from old models and meeting the requirements of modern lighting.

LATH, METAL AND REINFORCING

Milwaukee Corrugating Co., Milwaukee
The Milcor Manual. Booklet, 96 pp., 8½ x 11 ins. Illustrated. Data on metal lath and similar materials.

Milcor Metal Ceiling Catalog. Booklet, 288 pp., 8½ x 11 ins. Illustrated. Data on metal ceiling and wall construction.

National Steel Fabric Co., Pittsburgh, Pa.
Better Walls for Better Homes. Brochure, 16 pp., 7¾ x 11¾ ins. Illustrated. Metal lath, particularly for residences.

Steeltex for Floors. Booklet, 24 pp., 8½ x 11 ins. Illustrated. Combined reinforcing and form for concrete or gypsum floors and roofs.

Steeltex Data Sheet No. 1. Folder, 8 pp., 8½ x 11 ins. Illustrated. Steeltex for floors on steel joists with round top chords.

Steeltex Data Sheet No. 2. Folder, 8 pp., 8½ x 11 ins. Illustrated. Steeltex for floors on steel joists with flat top flanges.

Steeltex Data Sheet No. 3. Folder, 8 pp., 8½ x 11 ins. Illustrated. Steeltex for folders on wood joists.

North Western Expanded Metal Co., 1234 Old Colony Building, Chicago, Ill.
North Western Expanded Metal Products. Booklet, 8½ x 10¾ ins., 20 pp. Fully illustrated, and describes different products of this company, such as Kno-burn metal lath, 20th Century Corrugated. Plasta-saver and longspan lath channels, etc.

Longspan ¾-inch Rib Lath. Folder, 4 pp., 8½ x 11 ins. Illustrated. Deals with a new type of V-Rib expanded metal.

A. I. A. Sample Book. Bound volume, 8½ x 11 ins. Contains actual samples of several materials and complete data regarding their use.

Norwest Metal Lath. Folder, 8½ x 11 ins. Illustrated. Data on Flat Rib Lath.

Truscon Steel Company, Youngstown, Ohio.
Truscon ¾-inch Hy-Rib for Roofs, Floors and Walls. Booklet, 8½ x 11 ins., illustrating Truscon ¾-inch Hy-Rib as used in industrial buildings. Plates of typical construction. Progressive steps of construction. Specification and load tables.

LAUNDRY MACHINERY

Troy Laundry Machinery Co., Inc., 9 Park Place, New York City.
Laundry Machinery for Large Institutions. Loose-Leaf booklet, 50 pp., 8½ x 11 ins. Illustrated.

Laundry Machinery for Small Institutions. Loose-leaf brochure, 50 pp., 8½ x 11 ins. Illustrated.

Accessory Equipment for Institutional Laundries. Leather bound book, 50 pp., 8½ x 11 ins. Illustrated.

Dry Cleaning Equipment for Institutional Purposes. Brochure, 50 pp., 8½ x 11 ins. Illustrated.

LIGHTING EQUIPMENT

The Frink Co., Inc., 369 Lexington Ave., New York, N. Y.
Catalog 415, 8½ x 11 ins., 46 pp. Photographs and scaled cross-sections. Specialized bank lighting, screen and partition reflectors, double and single desk reflectors and Polaralite Signs.

Holophane Company, Inc., 342 Madison Ave., New York, N. Y.
The Lighting of Schools; A Guide to Good Practice. Booklet. 24 pp., 8½ x 11 ins. Illustrated.

Lighting Specifications for Hospitals. Brochure, 30 pp., 8½ x 11 ins. Illustrated.

Industrial Lighting. Bulletin 448A. Booklet, 24 pp., 8½ x 11 ins. Illustrated.

Holophane Catalog. Booklet, 48 pp., 8½ x 11 ins. Combination catalog and engineering data book.

The Lighting of Schools. A Guide to Good Practice. Booklet, 24 pp., 8½ x 11 ins. Illustrated.

Smyser-Royer Co., 1700 Walnut Street, Philadelphia, Pa.
Catalog "J" on Exterior Lighting Fixtures. Brochure, illustrated, giving data on over 300 designs of standards, lanterns and brackets of bronze or cast iron.

Todhunter, 119 East 57th St., New York, N. Y.
Lighting Fixtures, Lamps and Candlesticks. 24 pp., 8½ x 11 ins. Illustrated. Fine assortment of lighting accessories.

Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.
Industrial Lighting Equipment. Booklet, 32 pp., 8½ x 11 ins. Illustrated.

Commercial Lighting. Brochure, 24 pp., 8½ x 11 ins. Illustrated.

Airport and Floodlighting Equipment. Booklet, 20 pp., 8½ x 11 ins. Illustrated.

LUMBER

National Lumber Mfrs. Assn., Washington, D. C.
Use of Lumber on the Farm. Booklet, 38 pp., 8½ x 11 ins. Illustrated.

MAIL CHUTES

Cutler Mail Chute Company, Rochester, N. Y.
Cutler Mail Chute Model F. Booklet, 4 x 9¼ ins., 8 pp. Illustrated.

MANTELS

Henry Klein & Co., Inc. 40-46 West 23rd Street, New York.
Driwood Mantels. Booklet. 12 pp. 8½ x 11 ins. Illustrated. Fine line of eighteenth century English and American mantels.

Arthur Todhunter, 119 E. 57th St., New York, N. Y.
Georgian Mantels. New booklet, 24 pp., 5¾ x 6¼ ins. A fully illustrated brochure on eighteenth century mantels. Folders give prices of mantels and illustrations and prices of fireplace equipment.

MARBLE

The Georgia Marble Company, Tate, Ga.; New York Office, 1328 Broadway.
Why Georgia Marble Is Better. Booklet, 3⅛ x 6 ins. Gives analysis, physical qualities, comparison of absorption with granite, opinions of authorities, etc.

Convincing proof. 3⅛ x 6 ins., 8 pp. Classified list of buildings and memorials in which Georgia Marble has been used, with names of Architects and Sculptors.

Hurt Building, Atlanta; Senior High School and Junior College, Muskegon, Mich. Folders, 4 pp., 8½ x 11 ins. Details.

METALS

Aluminum Company of America, Pittsburgh.
Architectural Aluminum. Brochure, 30 pp., 8½ x 11 ins. Illustrated. An excellent booklet on the subject.

Central Alloy Steel Corporation, Massillon, Ohio.
Sheet Iron Primer. Booklet, 64 pp., 5¼ x 7¾ ins. Illustrated.
The Path to Permanence. Brochure, 52 pp., 8½ x 11 ins. Illustrated. Data on sheet iron.

The International Nickel Company, 67 Wall St., New York N. Y.
Monel Metal Primer. 8 folders, 4 pp., 8½ x 11 ins. Illustrated. Valuable data on use of monel in kitchens, laundries, etc.

MILL WORK—See also Wood

Curtis Companies Service Bureau, Clinton, Iowa.
Architectural Interior and Exterior Woodwork. Standardized Book, 9 x 11½ ins., 240 pp. Illustrated. This is an Architects' Edition of the complete catalog of Curtis Woodwork, as designed by Trowbridge & Ackerman. Contains many color plates.

Better Built Homes. Vols. XV-XVIII, incl. Booklet, 9 x 12 ins., 40 pp. Illustrated. Designs for houses of five to eight rooms, respectively, in several authentic types, by Trowbridge & Ackerman, architects for the Curtis Companies.

Curtis Details. Booklet, 19½ x 23½ ins., 20 pp. Illustrated. Complete details of all items of Curtis woodwork, for the use of architects.

Curtis Cabinet and Stair Work. Booklet, 48 pp., 7¾ x 10½ ins. Illustrated.

Curtis Windows. Brochure, 7¾ x 10½ ins. Illustrated.

Curtis Interior Doors. Booklet, 7¾ x 10½ ins. Illustrated.

Curtis Entrances and Exterior Doors. Brochure, 7¾ x 10½ ins. Illustrated.

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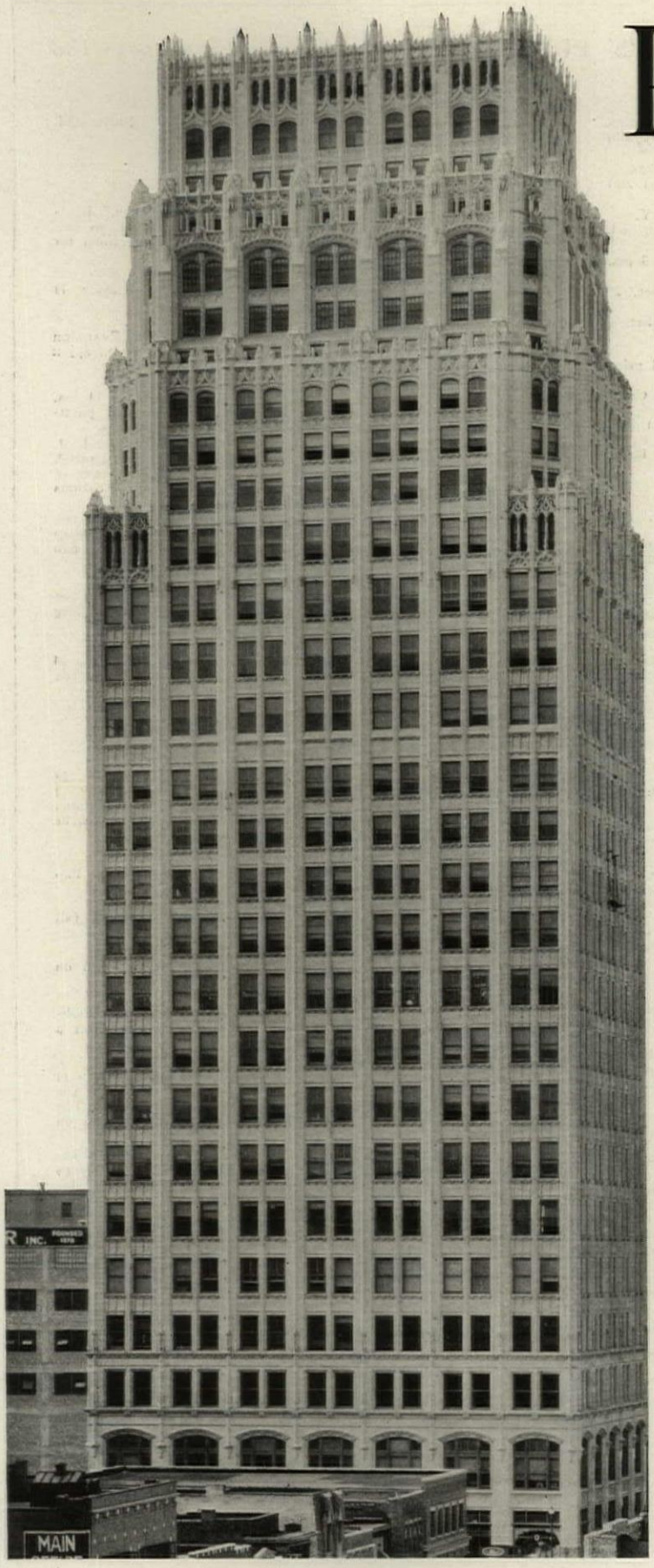

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Comfort is assured for top-floor offices in this Kansas City skyscraper, and the reason is roof insulation.

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TOP-FLOOR offices will be preferred space in the Southwestern Bell Telephone Building, Kansas City, Mo., for the rooms are always comfortable—warm in winter and cool in summer. Year-round comfort was provided by the architects, Messrs. Hoit, Price, and Barnes, when they specified insulation adequate to reduce heat leakage, out and in. The insulation used was Armstrong's Corkboard.

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Complete data on roof insulation will be supplied promptly on request. Armstrong Cork & Insulation Company, 900 Concord Street, Lancaster, Pennsylvania.

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for the Roofs of All Kinds of Buildings

SELECTED LIST OF MANUFACTURERS' PUBLICATIONS — *Continued from page 188*

MILL WORK—See also Wood—Continued

Hartmann-Sanders Company, 2155 Elston Ave., Chicago, Ill.
Column Catalog, 7½ x 10 ins., 48 pp. Illustrated. Contains prices on columns 6 to 36 ins. diameter, various designs and illustrations of columns and installations.
The Pergola Catalog. 7½ x 10 ins., 64 pp. Illustrated. Contains illustrations of pergola lattices, garden furniture in wood and cement, garden accessories.

Klein & Co., Inc., Henry, 11 East 37th St., New York, N. Y.
Two Driwood Interiors. Folder, 4 pp., 6¼ x 9 ins. Illustrated. Use of moulding for paneling walls.
A New Style in Interior Decoration. Folder, 4 pp., 6¼ x 9 ins. Illustrated. Deals with interior woodwork.
Driwood Period Mouldings in Ornamented Wood. Booklet, 28 pp., 8½ x 11 ins. Illustrated.
How Driwood Period Mouldings in Ornamented Wood Set a New Style in Decoration. Folder.

Roddis Lumber and Veneer Co., Marshfield, Wis.
Roddis Doors. Brochure, 24 pp., 5¼ x 8½ ins. Illustrated price list of doors for various types of buildings.
Roddis Doors, Catalog G. Booklet, 184 pp., 8½ x 11 ins. Completely covers the subject of doors for interior use.
Roddis Doors for Hospitals. Brochure, 16 pp., 8½ x 11 ins. Illustrated work on hospital doors.
Roddis Doors for Hotels. Brochure, 16 pp., 8½ x 11 ins. Illustrated work on doors for hotel and apartment buildings.

MORTAR AND CEMENT COLORS

Clinton Metallic Paint Co., Clinton, N. Y.
Clinton Mortar Colors. Folder, 8½ x 11 ins., 4 pp. Illustrated in colors, gives full information concerning Clinton Mortar Colors with specific instructions for using them.
Color Card. 3¾ x 6½ ins. Illustrates in color the ten shades in which Clinton Mortar Colors are manufactured.
Something New in Stucco. Folder, 3½ x 6 ins. An interesting folder on the use of coloring matter for stucco coated walls.

ORNAMENTAL PLASTER

Jacobson & Co., 241 East 44th St., New York, N. Y.
A Book of Old English Designs. Brochure, 47 plates, 12 x 9 ins. Deals with a fine line of decorative plaster work.
Architectural and Decorative Ornaments. Cloth bound volume, 184 pp., 9 x 12 ins. 18 plates. Price, $3.00. A general catalog of fine plaster ornaments.
Geometrical ceilings. Booklet, 23 plates, 7 x 9 ins. An important work on decorative plaster ceilings.

PAINTS, STAINS, VARNISHES AND WOOD FINISHES

Minwax Company, Inc., 11 West 42nd St., New York.
Color Card and Specifications for Minwax Brick and Cement Coating. Folder, 4 pp., 8½ x 11 ins. Illustrated.

National Lead Company, 111 Broadway, New York, N. Y.
Handy Book on Painting. Book, 5½ x 3¾ ins., 100 pp. Gives directions and formulæ for painting various surfaces of wood, plaster, metals, etc., both interior and exterior.
Red Lead in Paste Form. Booklet. 6¼ x 3½ ins., 16 pp. Illustrated. Directions and formulæ for painting metals.
Came Lead. Booklet, 6 x 8¼ ins., 12 pp. Illustrated. Describes various styles of lead cames.

Pratt & Lambert, Inc., Buffalo, N. Y.
Specification Manual for Paint, Varnishing and Enameling. Booklet, 38 pp., 7½ x 10⅝ ins. Complete specifications for painting, varnishing and enameling interior and exterior wood, plaster, and metal work.

Sherwin-Williams Company, 601 Canal Rd., Cleveland, Ohio.
Painting Concrete and Stucco Surfaces. Bulletin No. 1. 8½ x 11 ins., 8 pp. Illustrated. A complete treatise with complete specifications on the subject of Painting of Concrete and Stucco Surfaces. Color chips of paint shown in bulletin.
Enamel Finish for Interior and Exterior Surfaces. Bulletin No. 2, 8½ x 11 ins., 12 pp. Illustrated. Thorough discussion, including complete specifications for securing the most satisfactory enamel finish on interior and exterior walls and trim.
Painting and Decorating of Interior Walls. Bulletin No. 3, 8½ x 11 ins., 20 pp. Illustrated. An excellent reference book on Flat Wall Finish, including texture effects, which are taking the country by storm. Every architect should have one on file.
Protective Paints for Metal Surfaces. Bulletin No. 4, 8½ x 11 ins., 12 pp. Illustrated. A highly technical subject treated in a simple, understandable manner.

Sonneborn Sons, Inc., L., Dept. 4, 116 Fifth Ave., New York. N. Y.
Paint Specifications. Booklet, 8½ x 10¾ ins., 4 pp.

Toch Brothers, New York, Chicago, Los Angeles.
Architects' Specification Data. Sheets in loose leaf binder, 8½ x 11 ins., dealing with an important line of materials.

U. S. Gutta Percha Paint Co., Providence, R. I.
Barreled Sunlight. Booklet, 8½ x 11 ins. Data on "Barreled Sunlight" with specifications for its use.

PARCEL DELIVERY DEVICES

Receivador Sales Company, Grand Rapids, Mich.
Architects' Portfolio. Booklet, 12 pp., 8½ x 11 ins. Illustrated. Deals with delivery problems and their solution.

PARTITIONS

Circle A. Products Corporation, New Castle, Ind.
Circle A. Partitions Sectional and Movable. Brochure. Illustrated. 8½ x 11¼ ins., 32 pp. Full data regarding an important line of partitions, along with Erection Instructions for partitions of three different types.

Dahlstrom Metallic Door Company, Jamestown, N. Y.
Dahlstrom Standard Steel Partitions. Booklet, 24 pp., 8½ x 11 ins. Illustrated.

Irving Hamlin, Evanston, Ill.
Hamlinized Folding Partitions Made from Hamlin's Evanston Soundproof Doors, Sectional and Movable. Folder, 4 pp., 8½ x 11 ins. Illustrated.

Hauserman Company, E. F., Cleveland, Ohio.
Hollow Steel Standard Partitions. Various folders, 8½ x 11 ins. Illustrated. Give full data on different types of steel partitions, together with details, elevations and specifications.

Improved Office Partition Company, 25 Grand St., Elmhurst, L. I.
Telesco Partition. Catalog, 8¼ x 11 ins., 14 pp. Illustrated. Shows typical offices laid out with Telesco partitions, cuts of finished partition units in various woods. Gives specifications and cuts of buildings using Telesco.
Detailed Instructions for Erecting Telesco Partitions. Booklet, 24 pp., 8½ x 11 ins. Illustrated. Complete instructions, with cuts and drawings, showing how easily Telesco Partition can be erected.

Richards-Wilcox Mfg. Co., Aurora, Ill.
Partitions. Booklet, 7 x 10 ins., 32 pp. Illustrated. Describes complete line of track and hangers for all styles of sliding parallel, accordion and flush-door partitions.

U. S. Gypsum Co., Chicago, Ill.
Pyrobar Partition and Furring Tile. Booklet, 8½ x 11 ins., 24 pp. Illustrated. Describes use and advantages of hollow tile for inner partitions.

PIPE

American Brass Company, Waterbury, Conn.
Bulletin B-1. Brass Pipe for Water Service. 8½ x 11 ins., 28 pp. Illustrated. Gives schedule of weights and sizes (I.P.S.) of seamless brass and copper pipe, shows typical installations of brass pipe, and gives general discussion of the corrosive effect of water on iron, steel and brass pipe.

American Rolling Mill Company, Middletown, Ohio.
How ARMCO Dredging Products Cut Costs. Booklet, 16 pp., 6 x 9 ins. Data on dredging pipe.

Clow & Sons, James B., 534 S. Franklin St., Chicago, Ill.
Catalog A. 4 x 16½ ins., 700 pp. Illustrated. Shows a full line of steam, gas and water works supplies.

Cohoes Rolling Mill Company, Cohoes, N. Y.
Cohoes Pipe Handbook. Booklet, 40 pp., 5 x 7½ ins. Data on wrought iron pipe.

Duriron Company, Dayton, Ohio.
Duriron Acid, Alkali, Rust-proof Drain Pipe and Fittings. Booklet, 20 pp., 8½ x 11 ins. Illustrated. Important data on a valuable line of pipe.

National Tube Co., Frick Building, Pittsburgh, Pa.
"National" Bulletin No. 2. Corrosion of Hot Water Pipe, 8½ x 11 ins., 24 pp. Illustrated. In this bulletin is summed up the most important research dealing with hot water systems. The text matter consists of seven investigations by authorities on this subject.
"National" Bulletin No. 3. The Protection of Pipe Against Internal Corrosion, 8½ x 11 ins., 20 pp. Illustrated. Discusses various causes of corrosion, and details are given of the deactivating and deareating systems for eliminating or retarding corrosion in hot water supply lines.
"National" Bulletin No. 25. "National" Pipe in Large Buildings. 8½ x 11 ins., 88 pp. This bulletin contains 254 illustrations of prominent buildings of all types, containing "National" Pipe, and considerable engineering data of value to architects, engineers, etc.
Modern Welded Pipe. Book of 88 pp., 8½ x 11 ins., profusely illustrated with halftone and line engravings of the important operations in the manufacture of pipe.

PLASTER

Best Bros. Keene's Cement Co., Medicine Lodge, Kans.
Information Book. Brochure, 24 pp., 5 x 9 ins. Lists grades of plaster manufactured; gives specifications and uses for plaster.
Plasterers' Handbook. Booklet, 16 pp., 3½ x 5½ ins. A small manual for use of plasterers.

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SELECTED LIST OF MANUFACTURERS' PUBLICATIONS — *Continued from page 190*

PLASTER—Continued

Interior Walls Everlasting. Brochure, 20 pp., 6¼ x 9¼ ins. Illustrated. Describes origin of Keene's Cement and views of buildings in which it is used.

PLUMBING EQUIPMENT

Clow & Sons, James B., 534 S. Franklin St., Chicago, Ill.
Catalog M. 9¼ x 12 ins., 184 pp. Illustrated. Shows complete line of plumbing fixtures for Schools, Railroads and Industrial Plants.

Crane Company, 836 S. Michigan Ave., Chicago, Ill.
Plumbing Suggestions for Home Builders. Catalog, 3 x 6 ins., 80 pp. Illustrated.
Plumbing Suggestions for Industrial Plants. Catalog, 4 x 6½ ins., 34 pp. Illustrated.
Planning the Small Bathroom. Booklet, 5 x 8 ins. Discusses planning bathrooms of small dimensions.

John Douglas Co., Cincinnati, Ohio.
Douglas Plumbing Fixtures. Bound volume, 200 pp., 8½ x 11 ins. Illustrated. General catalog.
Another Douglas Achievement. Folder, 4 pp., 8½ x 11 ins. Illustrated. Data on new type of stall.
Hospital. Brochure, 60 pp., 8½ x 11 ins. Illustrated. Deals with fixtures for hospitals.

Duriron Company, Dayton, Ohio.
Duriron Acid, Alkali and Rust-Proof Drain Pipe and Fittings. Booklet, 8½ x 11 ins., 20 pp. Full details regarding a valuable form of piping.

Imperial Brass Mfg. Co., 1200 W. Harrison St., Chicago, Ill.
Watrous Patent Flush Valves, Duojet Water Closets, Liquid Soap Fixtures, etc. 8½ x 11 ins., 136 pp., loose-leaf catalog, showing roughing-in measurements, etc.

Maddock's Sons Company, Thomas, Trenton, N. J.
Catalog K. Booklet, 150 pp., 8½ x 10⅞ ins. Illustrated. Data on vitreous china plumbing fixtures with brief history of Sanitary Pottery.

Speakman Company, Wilmington, Del.
Catalog K. Booklet, 150 pp., 8½ x 10⅞ ins. Illustrated. Data on showers and equipment details.

Trenton Potteries Company, Trenton, N. J.
The Blue Book of Plumbing. Bound volume, 182 pp., 8½ x 10½ ins. Illustrated.

PNEUMATIC TUBE SYSTEMS

G & G Atlas Systems, Inc., 544 West Broadway, New York.
12 pp., 8½ x 11. Illustrated booklet of tube systems for retail stores and other buildings.
4 pp., 8½ x 11. Data Sheet showing schematic diagrams for hotel, bank, factory and wholesale buildings, table of sizes, space requirements and preliminary layout steps. A. I. A. 35h21.

PUMPS

Kewanee Private Utilities Co., 442 Franklin St., Kewanee, Ill.
Bulletin E. 7¾ x 10¾ ins., 32 pp. Illustrated. Catalog. Complete descriptions, with all necessary data, on Standard Service Pumps, Indian Brand Pneumatic Tanks, and Complete Water Systems, as installed by Kewanee Private Utilities Co.

The Trane Co., La Crosse, Wis.
Trane Small Centrifugal Pumps. Booklet, 3¾ x 8 ins., 16 pp. Complete data on an important type of pump.

RADIO EQUIPMENT

Radio Corporation of America, Woolworth Building, New York City, N. Y.
R. C. A. Antenna Distribution System for Multiple Receivers. Booklet, 16 pp., 8½ x 11 ins. Illustrated. Apparatus for apartment houses and similar large buildings.
R. C. A. Centralized Radio Receiving Equipment. Brochure, 8 pp., 9 x 11 ins. Illustrated. Radio equipment for hotels, hospitals, etc.

RAMPS

Ramp Buildings Corporation, 21 East 40th St., New York, N. Y.
Building Garages for Profitable Operation. Booklet, 8½ x 11 ins. 16 pp. Illustrated. Discusses the need for modern mid-city, parking garages, and describes the d'Humy Motoramp system of design, on the basis of its superior space economy and features of operating convenience. Gives cost analyses of garages of different sizes, and calculates probable earnings.
Garage Design Data. Series of informal bulletins issued in loose-leaf form, with monthly supplements.

REFRIGERATION

The Fulton Syphon Company, Knoxville, Tenn.
Temperature Control of Refrigeration Systems. Booklet, 8 pp., 8½ x 11 ins. Illustrated. Deals with cold storage, chilling of water, etc.

North Western Expanded Metal Company, Chicago, Ill.
Designing Data. Book, 6 x 9 ins., 96 pp. Illustrated. Covers the use of Econo Expanded Metal for various types of reinforced concrete construction.

REINFORCED CONCRETE—See also Construction, Concrete

Longspan ¾-inch Rib Lath. Folder, 4 pp., 8½ x 11 ins. Illustrated. Deals with a new type of V-Rib expanded metal.

Truscon Steel Company, Youngstown, Ohio.
Shearing Stresses in Reinforced Concrete Beams. Booklet, 8½ x 11 ins., 12 pp.

RESTAURANT EQUIPMENT

John Van Range Company, Cincinnati.
Planning Restaurants That Make Money. Booklet, 78 pp., 8½ x 11 ins. Illustrated. Excellent work on equipment.

ROOFING

The Barrett Company, 40 Rector St., New York City.
Architects' and Engineers' Built-up Roofing Reference Series; Volume IV Roof Drainage System. Brochure, 64 pp., 8½ x 11¼ ins. Gives complete data and specifications for many details of roofing.

Federal Cement Tile Co., 608 S. Dearborn Street, Chicago.
Catalog and Roof Standards. Booklet, 36 pp. 8½ x 11 ins. Illustrated. Describes Featherweight Concrete Insulating Roof Slabs, including complete data, weights and dimensions, specifications and detail drawings. Also includes complete information on Featherweight Concrete Roof Slabs for use with ornamented slate or copper covering. The catalog is profusely illustrated and contains also a partial list of users.
Examples of Theaters and Theater Roofs. Brochure, 16 pps., 8½ x 11 ins., Illustrated. Contains views of theaters designed by some of the country's leading architects.

Heinz Roofing Tile Co., 1925 West Third Avenue, Denver, Colo.
Plymouth-Shingle Tile with Sprocket Hips. Leaflet, 8½ x 11 ins. Illustrated. Shows use of English shingle tile with special hips.
Italian Promenade Floor Tile. Folder, 2 pp., 8½ x 11 ins. Illustrated. Floor tiling adapted from that of Davanzati Palace.
Mission Tile. Leaflet, 8½ x 11 ins. Illustrated. Tile such as are used in Italy and Southern California.
Georgian Tile. Leaflet, 8½ x 11 ins. Illustrated. Tiling as used in old English and French farmhouses.

Johns-Manville Corporation, New York.
The New Book of Roofs. Brochure, 24 pp., 8½ x 11 ins. Illustrated. Roofing from the Architect's point of view.

Ludowici-Celadon Company, 104 So. Michigan Ave., Chicago, Ill.
"Ancient" Tapered Mission Tiles. Leaflet, 8½ x 11 ins., 4 pp. Illustrated. For architects who desire something out of the ordinary this leaflet has been prepared. Describes briefly the "Ancient" Tapered Mission Tiles, hand-made with full corners and designed to be applied with irregular exposures.

Milwaukee Corrugating Co., Milwaukee.
Milcor Architectural Sheet Metal Guide. Booklet. 72 pp., 8½ x 11 ins. Illustrated. Metal tile roofing, skylights, ventilators, etc.
Milcor Sheet Metal Handbook. Brochure. 128 pp., 8½ x 11 ins. Illustrated. Deals with rain-carrying equipment, etc.

Structural Gypsum Corporation, Linden, N. J.
Relative Effectiveness of Various Types of Roofing Construction in Preventing Condensation of the Under Surface. Folder, 4 pp., 8¼ x 11 ins. Important data on the subject.
Gypsteel Pre-cast Fireproof Roofs. Booklet, 48 pp., 8½ x 11 ins. Illustrated. Information regarding a valuable type of roofing.

U. S. Gypsum Co., Chicago, Ill.
Pyrobar Roof Construction. Booklet, 8 x 11 ins., 48 pp. Illustrated. Gives valuable data on the use of tile in roof construction.
Sheetrock Pyrofill Roof Construction. Folder, 8½ x 11 ins. Illustrated. Covers use of roof surfacing which is poured in place.

SCHOOL EQUIPMENT

John Van Range Co., Cincinnati.
Practical Planning for School Service. Booklet, 32 pp., 8½ x 11 ins. Illustrated.

SEWAGE DISPOSAL

Kewanee Private Utilities, 442 Franklin St., Kewanee, Ill.
Specification Sheets. 7¾ x 10¾ ins., 40 pp. Illustrated. Detailed drawings and specifications covering water supply and sewage disposal systems.

Nash Engineering Company, South Norwalk, Conn.
Bulletin 97. Booklet. 16 pp. 10¾ x 7½ ins. Illustrated in color. Describes the design, construction and operation of the Jennings Suction Sump Pump.
Bulletin 11. Brochure. 8 pp. 10¾ x 7½ ins. Illustrated in color. Deals with Nash Hytor Vacuum Pumps for air and gases.
Bulletin 67. Booklet. 16 pp. 10¾ x 7½ ins. Illustrated in color. Describes Type A Jennings Sewage Ejector for handling Unscreened sewage and raising it from basements below sewer level.
Bulletin 103. Brochure. 16 pp. 10¾ x 7½ ins. Illustrated in color. Deals with small size Type B Jennings Sewage Ejector.

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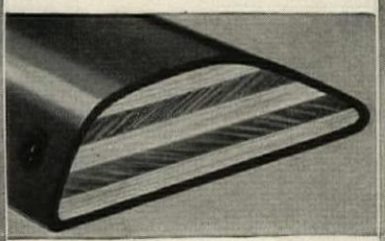
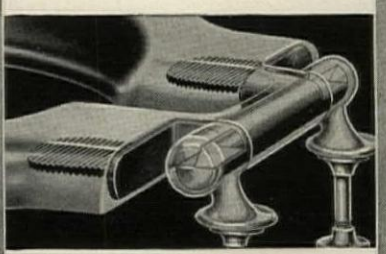


Note the Laminated Construction — a core of alternating-grain layers of hardwood — sealed and bonded to the whole by Whale-bone-ite. It is warp-proof and is guaranteed against warping, cracking and splitting.



The Whale-bone-ite steel hinge is moulded integral with the Seat forming an unbreakable unit. Covered with Whale-bone-ite, the hinge is as handsome as the Seat. It cannot tarnish. It is easy to clean.

Laminated like whale-bone-ite... Same shock-defying strength

Because *laminated* wood is many times stronger than wood itself, and remarkably light in weight.

It's just the same with toilet seats. We and others have tried to make them as strong, as light and as sanitary by other methods. But it can't be done. Only *laminated* construction can give the abuse-defying strength of Whale-bone-ite.

Fourteen years and a million seats in use have proved that the careless public cannot smash Whale-bone-ite—that Whale-bone-ite can be guaranteed for the life of the building—that Whale-bone-ite immediately ends all replacement expense.

Today, nearly all seats going into public toilets are of laminated construction.

Whale-bone-ite Seats are found quite generally in the guest bathroom of fine hotels as well as in public institutions where service requirements are severe. Many new apartment houses are equipping all toilets with them.

Brunswick
WHALE·BONE·ITE
TOILET SEATS

THE BRUNSWICK-BALKE-COLLENDER CO. Dept. A-9, 623 South Wabash Avenue, Chicago

Atlanta, Birmingham, Boston, Buffalo, Charlotte, Chattanooga, Chicago, Cincinnati, Cleveland, Dallas, Denver, Des Moines, Detroit, Harrisburg, Houston, Kansas City, Los Angeles, Memphis, Milwaukee, Minneapolis, Nashville, Newark, New Haven, New Orleans, New York, Philadelphia, Pittsburgh, Richmond, San Antonio, San Francisco, Seattle, St. Louis, Tampa, Washington, Montreal, Ottawa
Sydney, Australia; Havana; Buenos Aires; Adelaide, Australia; Johannesburg, South Africa

SELECTED LIST OF MANUFACTURERS' PUBLICATIONS — *Continued from page 192*

SCREENS

American Brass Co., The, Waterbury, Conn.
Facts for Architects About Screening. Illustrated folder, 9½ x 11¾ ins., giving actual samples of metal screen cloth and data on fly screens and screen doors.

Athey Company, 6015 West 65th St., Chicago, Ill.
The Athey Perennial Window Shade. An accordion pleated window shade, made from translucent Herringbone woven Coutil cloth, which raises from the bottom and lowers from the top. It eliminates awnings, affords ventilation, can be dry-cleaned and will wear indefinitely.

Orange Screen Co., Maplewood, N. J.
Orsco Aluminum Screens. Booklet, 8 pp., 8 x 11 ins. Illustrated. Data on a valuable line of screens.
Orsco Screens and Other Products. Brochure, 20 pp., 8 x 11 ins. Illustrated. Door and window screens and other hardware.

SHADE CLOTH AND ROLLERS

Columbia Mills, Inc., 225 Fifth Avenue, New York, N. Y.
Window Shade Data Book. Folder, 28 pp., 8½ x 11 ins. Illustrated.

SHELVING-STEEL

David Lupton's Sons Company, Philadelphia, Pa.
Lupton Steel Shelving. Catalog E. Illustrated brochure, 40 pp., 8½ x 11 ins. Deals with steel cabinets, shelving, racks, doors, partitions, etc.

STEEL PRODUCTS FOR BUILDING

Bethlehem Steel Company, Bethlehem, Pa.
Steel Joists and Stanchions. Booklet, 72 pp., 4 x 6¾ ins. Data for steel for dwellings, apartment houses, etc.

Steel Frame House Company, Pittsburgh, Pa. (Subsidiary of McClintic-Marshall Corp.)
Steel Framing for Dwellings. Booklet, 16 pp., 8½ x 11 ins. Illustrated.
Steel Framing for Gasoline Service Stations. Brochure, 8 pp., 8½ x 11 ins. Illustrated.
Steel Frame Standard Gasoline Service Stations. Booklet, 8 pp., 8½ x 11 ins. Illustrated. Three standard designs of stations.

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
The Arc Welding of Structural Steel. Brochure, 32 pp., 8½ x 11 ins. Illustrated. Deals with an important structural process.

STONE, BUILDING

Indiana Limestone Company, Bedford, Ind.
Volume 3, Series A-3. Standard Specifications for Cut Indiana Limestone work, 8½ x 11 ins., 56 pp. Containing specifications and supplementary data relating to the best methods of specifying and using this stone for all building purposes.
Volume 1. Series B. Indiana Limestone Library, 6 x 9 ins., 36 pp. Illustrated. Giving general information regarding Indiana Limestone, its physical characteristics, etc.
Volume 4. Series B. Booklet. New Edition, 8½ x 11 ins., 64 pp. Illustrated. Indiana Limestone as used in Banks.
Volume 5. Series B. Indiana Limestone Library. Portfolio, 11⅛ x 8¾ ins. Illustrated. Describes and illustrates the use of stone for small houses with floor plans of each.
Volume 6. Series B. Indiana Limestone School and College Buildings. 8½ x 11 ins., 80 pp. Illustrated.
Volume 12. Series B. Distinctive Homes of Indiana Limestone. 8½ x 11 ins., 48 pp. Illustrated.
Old Gothic Random Ashlar. 8½ x 11 ins., 16 pp. Illustrated.

STORE FRONTS

Brasco Manufacturing Co., 5025-35 South Wabash Ave., Chicago, Ill.
Catalog No. 33. Series 500. All-Metal Construction. Brochure, 20 pp., 8½ x 11 ins. Illustrated. Deals with store fronts of a high class.
Catalog No. 34. Series 202. Standard construction. Booklet, 16 pp. 8½ x 11 ins. Illustrated, complete data on an important type of building.
Detail Sheets. Set of seven sheets, 8½ x 11 ins., printed on tracing paper, giving full-sized details and suggestions for store front designs.
Davis Solid Architectural Bronze Sash. Set of six sheets, 8½ x 11 ins., printed on tracing paper. Full-sized details and suggestions for designs of special bronze store front construction.

The Kawneer Company, Niles, Mich.
Catalog M, 1929 Edition, 64 pages, 8½ x 11 ins., with the A.I.A. File No., profusely illustrated. General Catalog.
Detail Sheet and descriptive folder, 8½ x 11 ins., with A.I.A. File No. featuring "B" Store Front Construction, designed along modernistic lines.

STORE FRONTS—Continued

Modern Bronze Store Front Co., Chicago Heights, Ill.
Introducing Extruded Bronze Store Front Construction. Folder, 4 pp., 8½ x 11 ins. Illustrated. Contains full-sized details of metal store fronts.

Zouri Drawn Metals Company, Chicago Heights, Ill.
Zouri Safety Key-Set Store Front Construction. Catalog, 8½ x 10½ ins., 60 pp. Illustrated. Complete information with detailed sheets and installation instructions convenient for architects' files.
International Store Front Construction. Catalog, 8½ x 10 ins., 70 pp. Illustrated. Complete information with detailed sheets and installation instructions convenient for architects' files.
Store Fronts by Zouri. Booklet, 30 pp., 9 x 12 ins. Illustrated.

TELEPHONE SERVICE ARRANGEMENTS

All Bell Telephone Companies. Apply nearest Business Office, or American Telephone and Telegraph Company, 195 Broadway, New York.
Planning for Home Telephone Conveniences. Booklet, 52 pp., 8½ x 11 inches. Illustrated.
Planning for Telephones in Buildings. Brochure, 74 pp., 8½ x 11 inches. Illustrated.

TERRA COTTA

National Terra Cotta Society, 19 West 44th St., New York, N. Y.
Standard Specifications for the Manufacture, Furnishing and Setting of Terra Cotta. Brochure, 8½ x 11 ins., 12 pp. Complete Specification, Glossary of Terms Relating to Terra Cotta and Short Form Specification for incorporating in Architects' Specification.
Color in Architecture. Revised Edition. Permanently bound volume, 9½ x 12¼ ins., containing a treatise upon the basic principles of color in architectural design, illustrating early European and modern American examples. Excellent illustrations in color.
Present Day Schools. 8½ x 11 ins., 32 pp. Illustrating 42 examples of school architecture with article upon school building design by James O. Betelle, A. I. A.
Better Banks. 8½ x 11 ins., 32 pp. Illustrating many banking buildings in terra cotta with an article on its use in bank design by Alfred C. Bossom, Architect.

TILE, HOLLOW

National Fire-Proofing Co., 250 Federal Street, Pittsburgh, Pa.
Natco. The Complete line of Structural Clay Tile. Booklet. 39 pp. 8½ x 11 ins. Illustrated. A General Catalog.
Natco Double Shell Load Bearing Tile Bulletin. 8½ x 11 ins., 6 pp. Illustrated.
Natco Face Tile for the Up-to-Date. Farm Bulletin. 8½ x 11 ins.
Natcoflor Bulletin. 8½ x 11 ins., 6 pp. Illustrated.
Natco Header Backer Tile Bulletin. 8½ x 11 ins., 4 pp. Illustrated.
Natco Unibacker Tile Bulletin. 8½ x 11 ins., 4 pp. Illustrated.

TILES

Hanley Company, Bradford, Pa.
Hanley Quarry Tile. Folder. 4 pp., 5 x 8 ins. Illustrated.

C. Pardee Works, 9 East 45th St., New York, N. Y., and 1600 Walnut St., Philadelphia, Pa.
Pardee Tiles. Bound volume, 48 pp., 8½ x 11 ins. Illustrated.

United States Quarry Tile Co., Parkersburg, W. Va.
Quarry Tiles for Floors. Booklet, 120 pp., 8½ x 11 ins. Illustrated. General catalog. Details of patterns and trim for floors.
Art Portfolio of Floor Designs. 9¼ x 12¼ ins. Illustrated in colors. Patterns of quarry tiles for floors.

VALVES

Crane Co., 836 S. Michigan Ave., Chicago, Ill.
No. 51. General Catalog. Illustrated. Describes the complete line of the Crane Co.

C. A. Dunham Co., 450 East Ohio St., Chicago, Ill.
The Dunham Packless Radiator Valve. Brochure, 12 pp., 8 x 11 ins. Illustrated. Data on an important type of valve.

Jenkins Brothers, 80 White Street, New York.
Office Buildings Yesterday and Today. Folder, 8½ x 11 ins. Illustrated. Valves for use in office buildings.
The Valve Behind a Good Heating System. Booklet, 4½ x 7¼ ins., 16 pp. Color plates. Description of Jenkins Radiator Valves for steam and hot water, and brass valves used as boiler connections.
Jenkins Valves for Plumbing Service. Booklet, 4½ x 7¼ ins. 16 pp. Illustrated. Description of Jenkins Brass Globe, Angle Check and Gate Valves commonly used in home plumbing, and Iron Body Valves used for larger plumbing installations.

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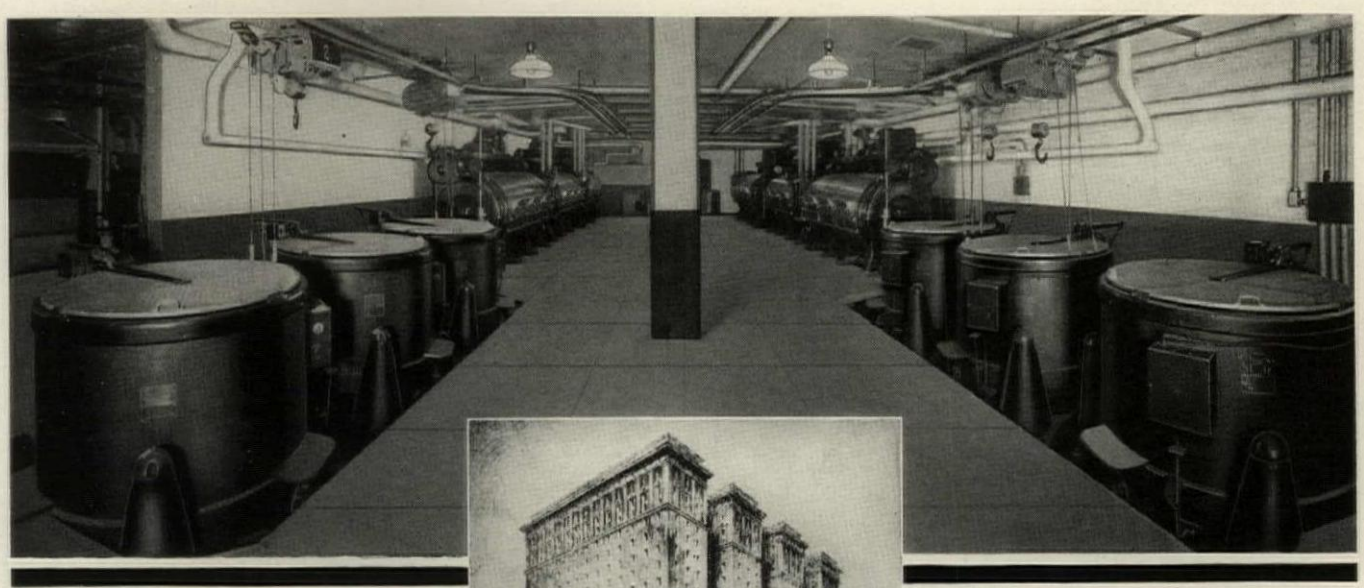

The Hotel Pennsylvania, which has one of the most interesting laundry installations in New York City.

A VIEW of the Hotel Pennsylvania's laundry department, designed with the collaboration of American Laundry Machinery Company engineers. This mass-producing installation enabled the hotel to save more than seventeen hundred square feet of floor space, and the wages of seven washroom employes.

AND one of the most *businesslike*, that interesting laundry at the Hotel Pennsylvania, in New York City. An out-and-out mass-production department, re-equipped with the latest mass-production "American" machines, floor space and labor have been cut almost in half.

In this skilfully designed department, six Mammoth Cascade washers and six American-Perry Extractors do the work of three times as many smaller machines. And six men handle the huge output of immaculately laundered linens.

The engineers of The American Laundry Machinery Company, who were privileged to work with the architects in the planning of the Hotel Pennsylvania laundry, can give you some helpful information about it—about general hotel laundry practise. Their services are at your disposal, any time.

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The Canadian Laundry Machinery Co., Ltd.
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Agents: British-American Laundry Machinery Co., Ltd.
Underhill St., Camden Town, London, N.W.1, England

SELECTED LIST OF MANUFACTURERS' PUBLICATIONS — *Continued from page 194*

VENETIAN BLINDS

Burlington Venetian Blind Co., Burlington, Vt.
Venetian Blinds. Booklet, 7 x 10 ins., 24 pp. Illustrated. Describes the "Burlington" Venetian blinds, method of operation, advantages of installation to obtain perfect control of light in the room.

Columbia Mills, Inc., 225 Fifth Ave., New York.
Columbia Venetian Blinds. Booklet, 6 pp., 8½ x 11 ins. Illustrated. Complete data and specifications.

VENTILATION

American Blower Co., Detroit, Mich.
American H. S. Fans. Brochure, 28 pp., 8½ x 11 ins. Data on an important line of blowers.

Duriron Company, Dayton, Ohio.
Acid-proof Exhaust Fans. Folder, 8 x 10½ ins., 8 pp. Data regarding fans for ventilation of laboratory fume hoods.
Specification Form for Acid-proof Exhaust Fans. Folder, 8 x 10½ ins.

Staynew Filter Corporation, Rochester, N. Y.
Protectomotor High Efficiency Industrial Air Filters. Booklet, 20 pp., 8½ x 11 ins. Illustrated. Data on valuable detail of apparatus.

WATERPROOFING

Master Builders Company, Cleveland, Ohio.
Waterproofing and Dampproofing and Allied Products. Sheets in loose index file, 9 x 12 ins. Valuable data on different types of materials for protection against dampness.
Waterproofing and Dampproofing File. 36 pp. Complete descriptions and detailed specifications for materials used in building with concrete.

Minwax Company, Inc., 11 West 42nd St., New York.
Waterproofing Stadia. Folder, 4 pp., 8½ x 11 ins. Illustrated.
Transparent Waterproofings for All Masonry Walls and Surfaces. Folder, 4 pp., 8½ x 11 ins. Illustrated.
Data Sheet on Membrane Waterproofing. Folder, 4 pp., 8½ x 11 ins. Illustrated.

Sommers & Co., Ltd., 342 Madison Ave., New York, N. Y.
"Permantile Liquid Waterproofing" for making concrete and cement mortar permanently impervious to water. Also circulars on floor treatments and cement colors. Complete data and specifications. Sent upon request to architects using business stationery. Circular size, 8½ x 11 ins.

Sonneborn Sons, Inc., L., 116 Fifth Ave., New York, N. Y.
Pamphlet, 3¾ x 8¾ ins., 8 pp. Explanation of waterproofing principles. Specifications for waterproofing walls, floors, swimming pools and treatment of concrete, stucco and mortar.

Toch Brothers, New York, Chicago, Los Angeles.
Architects' Specification Data. Sheets in loose leaf binder, 8½ x 11 ins., dealing with an important line of materials.

WEATHER STRIPS

Athey Company, 6035 West 65th St., Chicago, Ill.
The Only Weatherstrip with a Cloth to Metal Contact. Booklet, 16 pp., 8½ x 11 ins. Illustrated. Data on an important type of weather stripping.

WINDOWS

Detroit Steel Products Co., 2250 E. Grand Boulevard, Detroit.
Fenestra Blue Book. Brochure, 75 pp., 8½ x 11 ins. Illustrated. Data on steel windows.

The Kawneer Company, Niles, Mich.
Circular, 8½ x 11 with A.I.A. File No. featuring full size details and specifications of Heavy Type Sealair Independent Balanced Sash Window.
Circular, 8½ x 11 with A.I.A. File No. featuring full size details and specifications of Light Independent Balanced Sash Sealair Windows.
Circular, 8½ x 11 with A.I.A. File No. featuring full size details and specifications of In-swinging Sash Sealair Windows. The above to be furnished in non-ferrous metal and steel.

David Lupton's Sons Company, Philadelphia, Pa.
Lupton Pivoted Sash. Catalog 12-A. Booklet, 48 pp., 8½ x 11 ins. Illustrates and describes windows suitable for manufacturing buildings.

WINDOWS, CASEMENT

Detroit Steel Products Co., 2250 E. Grand Boulevard, Detroit.
Fenestra Casements. Booklet, 14 pp., 8½ x 11 ins. Illustrated. Discusses casements, particularly for residences.
Fenestra Screen Casements. Brochure, 16 pp., 8½ x 11 ins. Illustrated.
Decorating With Casements. Booklet, 18 pp., with inserts in color 6 x 8½ ins. Deals with use of decorations, particularly draperies, with casement windows.

Hope & Sons, Henry, 103 Park Ave., New York, N. Y.
Catalog, 12¼ x 18½ ins., 30 pp. Illustrated. Full-size details of outward and inward opening casements.

WINDOWS, CASEMENT—Continued

David Lupton's Sons Company, Philadelphia, Pa.
Lupton Casement of Copper Steel. Catalog C-217. Booklet, 24 pp., 8⅝ x 11 ins. Illustrated brochure on casements, particularly for residences.
Lupton Creates a Complete Casement. Folder, 8½ x 11 ins. Illustrated data on a casement providing for screens, shades and draperies.
Lupton Heavy Casements. Detail Sheet No. 101, 4 pp., 8½ x 11 ins. Details and specifications only.

Richards-Wilcox Mfg. Co., Aurora, Ill.
Casement Window Hardware. Booklet, 24 pp., 8½ x 11 ins. Illustrated. Shows typical installations, detail drawings, construction details, blue-prints if desired. Describes AIR-way Multifold Window Hardware.
Architectural Details. Booklet, 8½ x 11 ins., 16 pp. Tables of specifications and typical details of different types of construction.
List of Parts for Assembly. Booklet, 8½ x 11 ins., 16 pp. Full lists of parts for different units.

WINDOW SCREENS

Detroit Steel Products Co., 2250 E. Grand Boulevard, Detroit.
Fenestra Screen Casements. Brochure, 16 pp., 8½ x 11 ins. Illustrated.

Orange Screen Company, Maplewood, N. J.
New Vogue Aluminum Frame Screens. Booklet, 12 pp., 3½ x 8½ ins. Illustrated.

WINDOW SHADES AND ROLLERS

Columbia Mills, Inc., 225 Fifth Avenue, New York, N. Y.
Window Shade Data Book. Folder, 28 pp., 8½ x 11 ins. Illustrated.
Window Shade Rollers. Brochure, 24 pp., 8 x 11 ins. Illustrated. Rollers and accessories.

WINDOWS, STEEL AND BRONZE

David Lupton's Sons Company, Philadelphia, Pa.
A Rain-shed and Ventilator of Glass and Steel. Pamphlet, 4 pp., 8⅝ x 11 ins. Deals with Pond Continuous Sash. Sawtooth Roofs, etc.
How Windows Can Make Better Homes. Booklet, 3⅞ x 7 ins., 12 pp. An attractive and helpful illustrated publication on use of steel casements for domestic buildings.

Truscon Steel Company, Youngstown, Ohio.
Drafting Room Standards. Book, 8½ x 11 ins., 120 pages of mechanical drawings showing drafting room standards, specifications and construction details of Truscon Steel Windows, Steel Lintels, Steel Doors and Mechanical Operators.
Truscon Solid Steel Double-Hung Windows. 24 pp. Booklet, 8½ x 11 ins. Containing illustrations of buildings using this type of window. Designs and drawings of mechanical details.
Continuous Steel Windows and Mechanical Operators. Catalog 126. Booklet, 32 pp., 8½ x 11 ins. Illustrated.

WOOD—See also Millwork

American Walnut Mfrs. Association, 618 So. Michigan Boulevard, Chicago, Ill.
American Walnut. Booklet, 7 x 9 ins., 46 pp. Illustrated. A very useful and interesting little book on the use of walnut in Fine Furniture with illustrations of pieces by the most notable furniture makers from the time of the Renaissance down to the present.
American Walnut for Interior Woodwork and Paneling. 7 x 9 ins. Illustrated. Discusses interior woodwork, giving costs, specifications of a specimen room, the different figures in Walnut wood, Walnut floors, finishes, comparative tests of physical properties and the advantages of American Walnut for woodwork.

Curtis Companies Service Bureau, Clinton, Iowa.
Curtis Cabinet and Stair Work. Booklet, 47 pp., 7¾ x 10½ ins. Illustrated.
Curtis Windows. Brochure, 7¾ x 10½ ins. Illustrated.
Curtis Interior Doors. Booklet, 7¾ x 10½ ins. Illustrated.
Curtis Entrances and Exterior Doors. Brochure, 7¾ x 10½ ins. Illustrated.

National Lumber Mfrs. Assn., Washington, D. C.
Airplane Hangar Construction. Booklet, 24 pp., 8½ x 11 ins. Use of lumber for hangars.

WOOD FINISH

Minwax Company, Inc., 11 West 42nd St., New York.
Color card and specification for Minwax Flat Finish. Folder, 4 pp., 8½ x 11 ins. Illustrated. Deals with a penetrative, preservative stain finish giving stain and soft wax effect.

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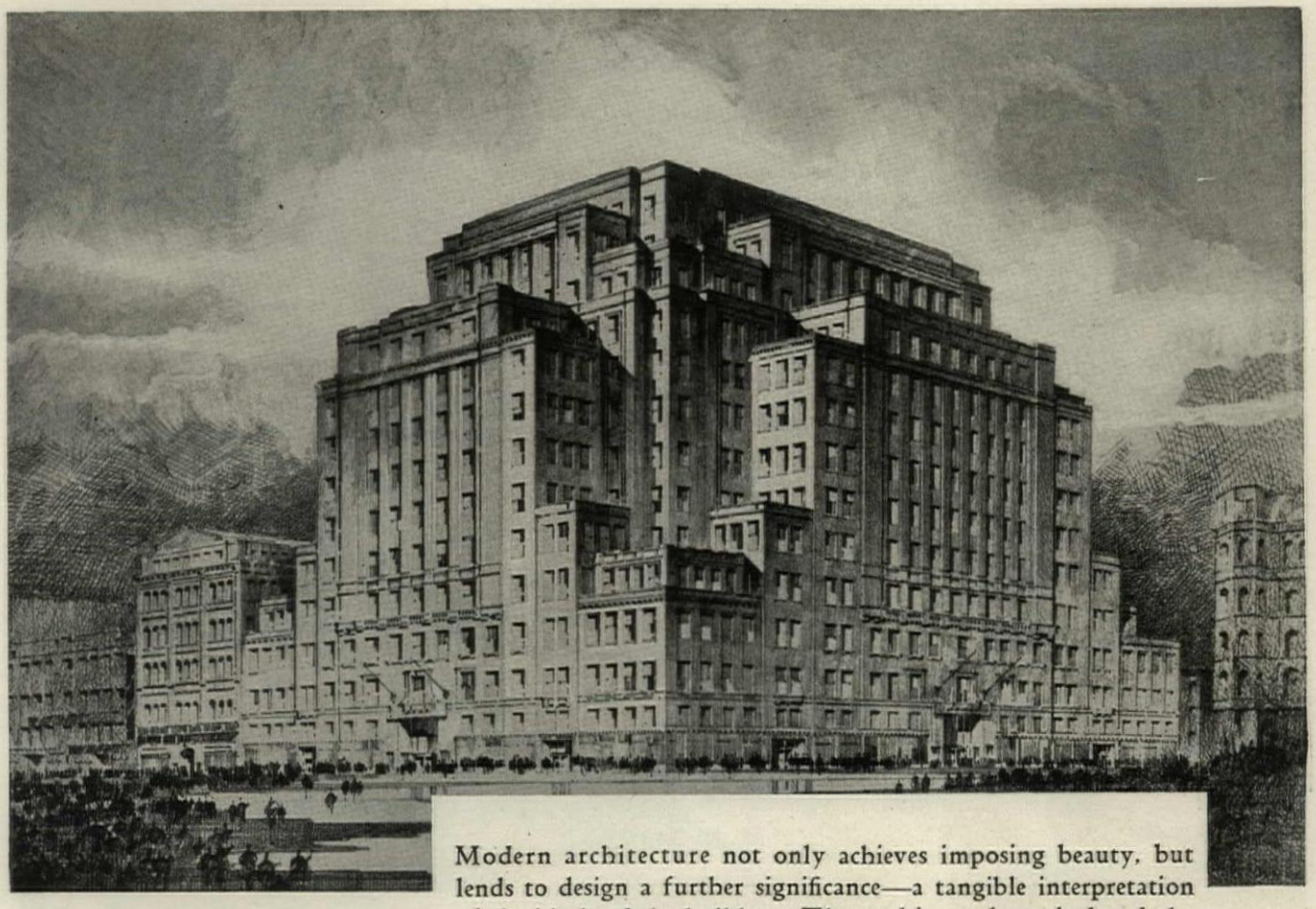

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CARNEGIE STEEL COMPANY

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34

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Hotel St. Regis Ball Room
Sloan & Robertson, Architects

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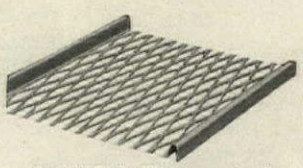
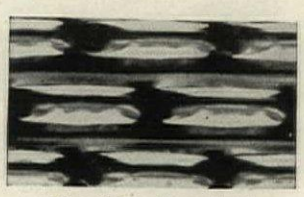
To be good and sound, for long keeping, an apple must have a healthy core. The buildings of tomorrow demand this same qualification — and the metal lath you specify for wall, ceiling and concrete floor construction must be of the highest grade. Kalman offers you an unusually high-quality line of metal lath to choose from. Specifying any one of them will give you the permanency that is demanded in improved, fire-safe construction.



3/8" Rib Kalmanlath



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Havemeyer Metal Lath for ceilings is secured to Havemeyer Trusses by means of wire and pliers. It is a fast, easy operation, a simple wire twist being all that is required.

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Concrete Steel Co.

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Beautiful interiors of lasting worth with this guaranteed lumber

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WHEN you specify "National Tree" lumber it actually means that your lumber specifications are guaranteed . . . that you can be assured that the lumber you want used has the National Lumber Manufacturers Association guarantee; that each piece of lumber shipped to the dealer and bearing its trade-mark—the "National Tree"—is of the quality indicated thereon by the official marks of the expert grader . . . that it is carefully manufactured "American Standard Lumber from America's Best Mills."

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Name .....
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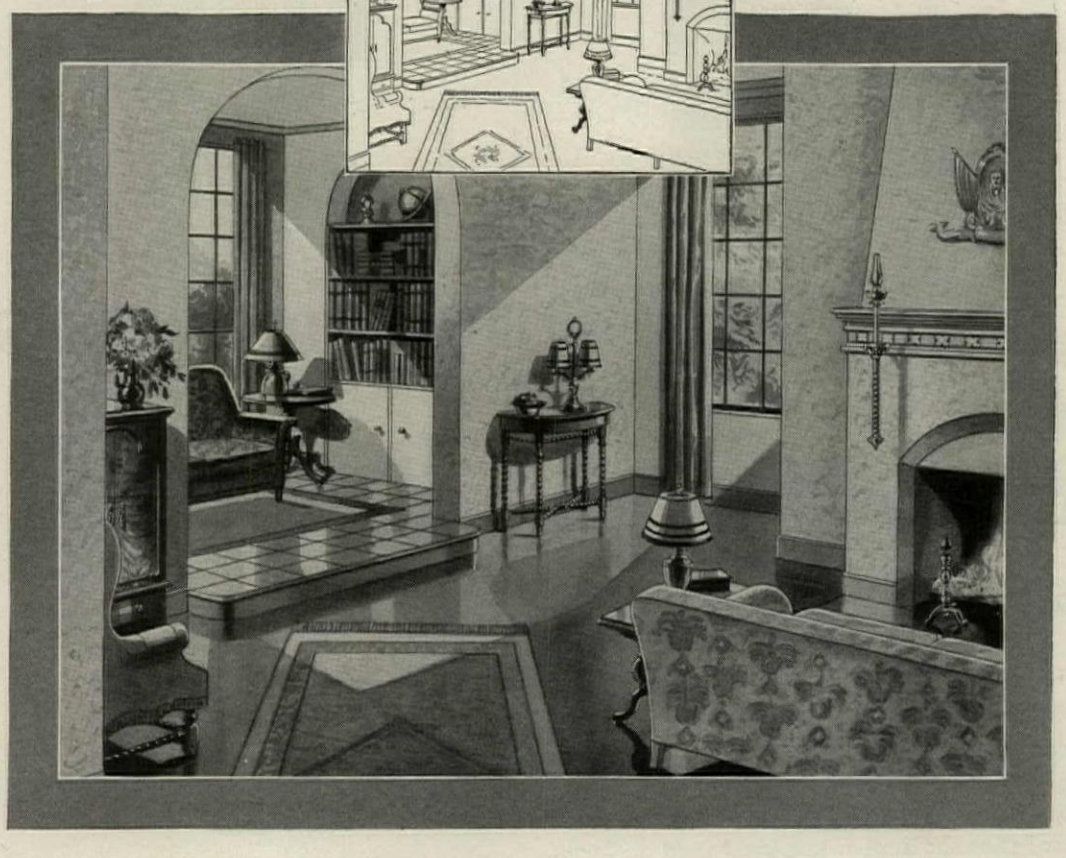
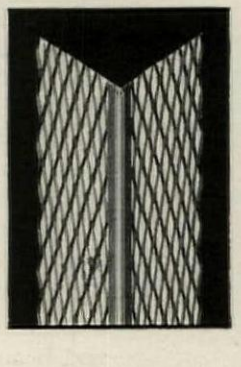
Beauty of Line and Curve

is permanently preserved by this expansion Corner Bead



Milcor Expansion Corner Bead is precision-made on patented Milcor machines. It is available for both inner and outer angles.

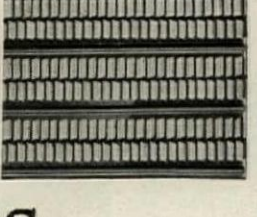


THE *Milcor* Expansion Corner Bead is an outstanding development in metal building materials. It has patented wings of expanded metal which not only provide an ideal plaster key right to the corner . . . but in addition, tend to absorb shocks or blows and dissipate them over the entire wing.

In this way, *Milcor* Expansion Corner Bead protects and permanently preserves the graceful lines and curves it creates. When used over metal lath, the plaster keys through both the wing of the bead and mesh of the lath, making formerly vulnerable points the strongest in the walls . . . Complete information on *Milcor* Products is available in the "*Milcor* Manual". You should have a copy for your files.

Milcor Expansion Casing for doors, windows and wall recesses is also distinguished by expanded metal wings. It cannot pull away during settlement and will not leave cleavage cracks.

Milcor Stay-Rib Metal Lath is an ideal plaster base. It is reinforced with longitudinal ribs to give it additional strength and to provide maximum protection against plaster cracks.



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Concrete Rib Floor Construction

De Paul Hospital
St. Louis, Mo.

O'Meara & Hills
Architects

Schuett & Meier
Engineers

W. J. Lynch Co.
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Consider the tremendous saving in concrete when Concrete Rib floors are specified. This cross section illustrates the saving in "dead weight" construction

Turning Plans Into Reality

The positive need for quiet and safety . . . together with the ever-important demands for economy and high-speed operation . . . dictated concrete rib floors of Meyer Steelform Construction for the De Paul Hospital at St. Louis, Mo.

Concrete rib floors formed with Meyer Steelforms offer the utmost in sound-proof floor construction, the air space between the ribs acting as an insulator. This desired feature combined with the tremendous saving in concrete and strength of the structure make Meyer-built concrete rib floors the most practical for hospital construction.

If you have a hospital project on the boards at this time . . . or if you are at work on a school, apartment building or sky-scraper . . . let us show you how Meyer Steelforms can help you to realize a construction that will do full justice to your plans. A note from you will bring a representative to your office at the time you specify.

CONCRETE ENGINEERING COMPANY

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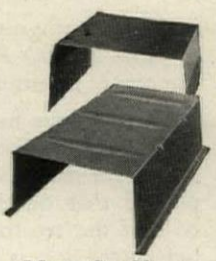


Meyer Steelforms are furnished in 1, 2 and 3 ft. lengths.

Standard widths are 20 in. and 30 in.; special widths —10 in. and 15 in.

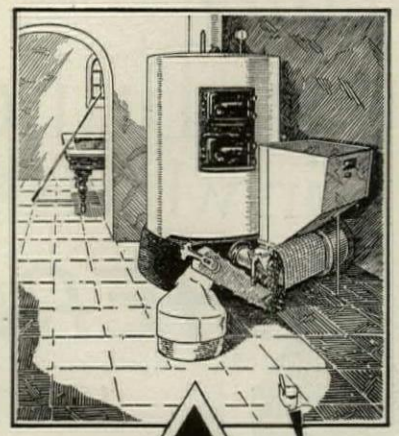
MEYER Steelforms

THE STANDARD

THE ORIGINAL REMOVABLE STEEL FORMS FOR CONCRETE RIB FLOOR CONSTRUCTION

MODERNIZE

THE HOME HEATING PLANT



The ELECTRIC FURNACE-MAN is the most industrious of all the *electric servants* in the home, for he works night and day unceasingly--feeds coal, removes ashes, maintains uniform heat throughout the house and supplies hot water.

Provides AUTOMATIC HOME HEAT with absolute SAFETY—CLEANLINESS—DEPENDABILITY—HIGHEST EFFICIENCY and MAXIMUM ECONOMY.

The ELECTRIC FURNACE-MAN burns Anthracite in the economical Buckwheat sizes. There are no drafts to regulate—no grates to shake. There is no smudge, smoke or odor. The entire equipment is self-contained and compact — no unnecessary weight — sturdy, fool-proof and reliable. Quickly adapted to any heating plant—steam, vapor, hot water, warm air, at remarkably low cost. Thousands of satisfied customers. Endorsed by Anthracite Operators' Conference.

See demonstration. Distributors and dealers in over 300 cities. Write for attractive, illustrated booklet.

DOMESTIC STOKER COMPANY
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Heating *and* Ventilating Units

You can specify PeerVent Units with complete confidence. They are positively silent in operation, highly efficient, and dependable. Peerless Units built eighteen years ago are still giving perfect satisfaction. The lastest PeerVent is improved throughout—better radiator, better motor, better fans, and better controls. Catalogue F-4.

Peerless Unit Ventilation Co., Inc.
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Positive Rapid Circulation on ALL Hot Water Systems

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You can assure highest efficiency on every hot water system you plan by specifying a HYDROLATOR. Forces rapid circulation. Positive in action. Overcomes traps and restrictions.

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Stimulates Circulation.
Reduces Fuel Costs.
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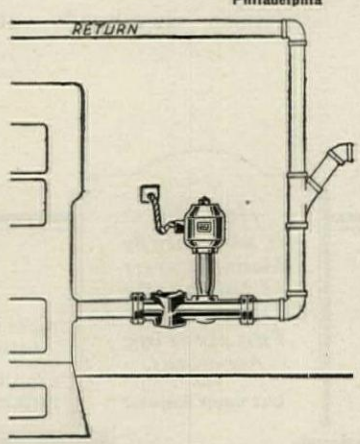
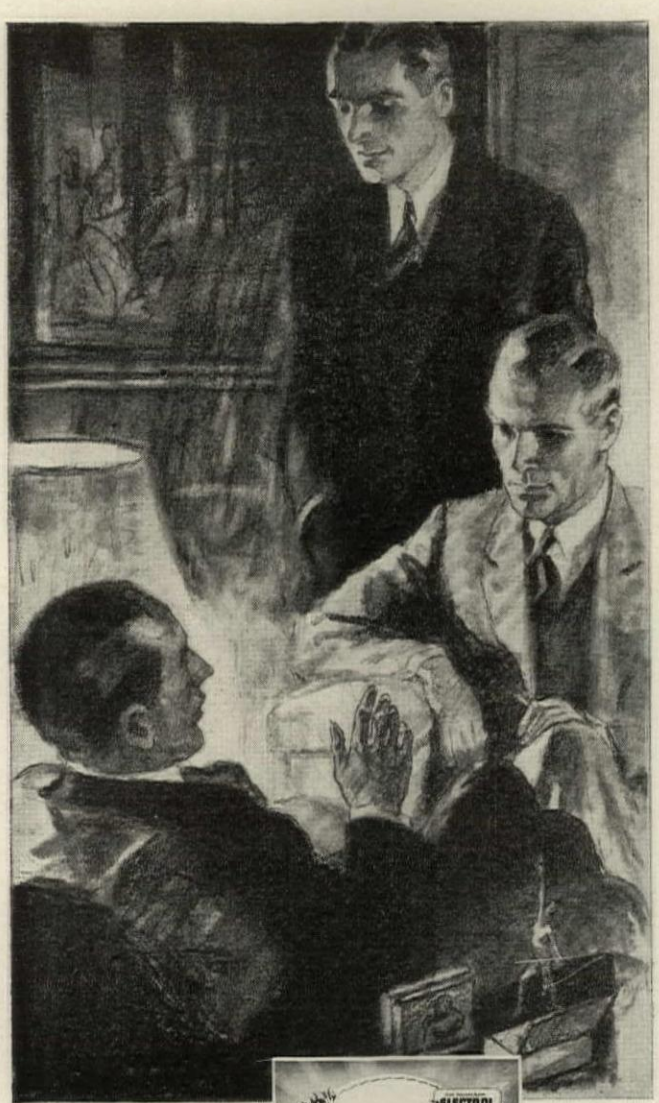


"*Afford it?* — we couldn't afford to be without it"



Home builders and home owners who are still holding to a less efficient heating method, are paying for the advantages of Electrol without enjoying them.

The greater fuel economy, labor-saving conveniences, cleanliness and healthful comfort of Electrol Automatic Oil Heat are amazingly low in cost—much less than you would expect.

The widespread preference for this finer burner among people to whom cost does not matter, as well as the generous praise which users everywhere accord Electrol, may have caused you to think it high priced. A mistaken idea—as any owner, and hundreds of architects will tell you.

Electrol's distinguished performance and long, trouble-free life make it not only outstanding in value but also the most acceptable form of heating for even the modest home where economy must rule. Home builders of limited resources find the price surprisingly low. And the first cost is final. No extras come later.

You will find the Electrol dealer will work with you conscientiously on any job. He has some interesting figures to show you on the surprisingly low fuel consumption of Electrol.

A Consultation Service for Architects

Electrol has a staff of engineers who devote their entire time to the formulation of heating plans and specifications from information sent us by architects. Electrol welcomes the opportunity to put this free service at your disposal.

ELECTROL INCORPORATED
227 East 45th St. New York City

ELECTROL

The OIL BURNER *with the Master Control*

LISTED AS STANDARD BY THE UNDERWRITERS' LABORATORIES

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Modern Interiors Demand this New Vogue in Heating

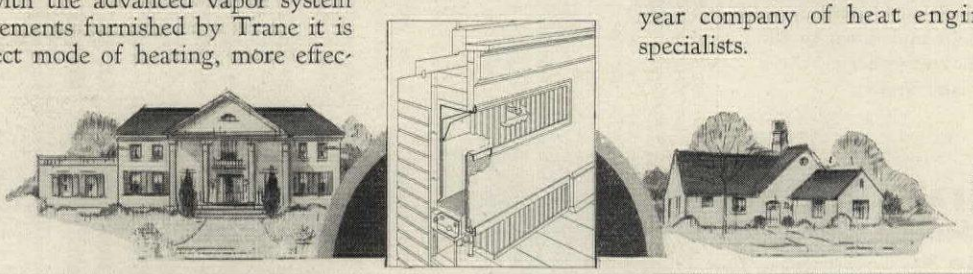
With the advent of Trane Concealed Heating there is no longer need to tolerate or allow for radiators.

Walls, corners, floors and windows are free of obstruction for unhampered architectural treatment of interiors.

Trane Concealed Heating apparatus is installed between the walls: out of view, out of the room entirely: circulating the heat through the trim, blending Trane grille embedded *in* the wall.

And with the advanced vapor system improvements furnished by Trane it is a perfect mode of heating, more effective and economical than radiators or other types: combining extreme home refinement with utmost heating efficiency. In spite of the many advantages of Trane Concealed Heating, its cost is but slightly above ordinary cast iron radiation. Installation is extremely simple due to the light weight and complete assembly at the plant.

Write now for the new Trane book of interesting details — design, construction and installation, and the reliability assured by this forty-four year company of heat engineering specialists.



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For the Moderate Price Home As Well As the Most Palatial Residence.

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Please send booklet on latest styles in Concealed Heating.

The Dunham Differential Vacuum Heating System

was selected for Seattle's outstanding new Exchange Building

Architect: John Graham, Seattle *Heating Contractor:* Rautman Plumbing & Heating Co., Seattle
Consulting Engineer: C. H. Knowles, Seattle *General Contractor:* A. W. Quist, Seattle

Occupying a commanding site in the center of Seattle's banking and financial district at Second Avenue and Marion Street, the new Exchange Building will be one of the largest, finest and most modern office buildings in the Pacific Northwest, embodying the latest ideas in architectural design, interior finish, service features and efficiency of arrangement. The vertical lines of its 23 stories predominate, emphasizing the height of the building, while the absence of pronounced horizontal projections prevents rising street noises and echoes from being caught, insuring a high degree of quiet.

The Exchange Building will house Seattle's Stock Exchange and the group of other activities known as the Merchants' Exchange. The building is within 600 feet of 11 banks containing 90% of the city's bank deposits, and fronts on two important north and south arteries, First and Second Avenues, South. The offices on the First Avenue and Marion Street sides will have the advantage of splendid marine and mountain views, the Olympic Range presenting a jagged, snow covered skyline across Puget Sound to the West and Northwest.

Service through the Exchange Building will be the finest obtainable. Nine high speed signal-controlled auto-leveling electric elevators will serve the upper floors. The building will be heated with a Dunham Differential Vacuum Heating System, with the exception of the first four floors and the blast and hot water heaters, which will operate on a Dunham Vacuum Return Line System.

To secure maximum economy in operation the Differential System is divided into four zones, the building being zoned according to exposure. Each zone has a set of Sub-Atmospheric Pressure Reducing Valves with a controlling thermostat properly located in that zone. The returns from each zone gravitate to its differential pump in the basement. There are five of these pumps installed—one for each zone and one reserve unit. The mains feeding the 818 radiators (approximately 17,300 sq. ft. on the differential system) are located in the pipe space above the sixteenth floor, feeding up to the twenty-third floor and down to the fifth floor. The Sub-Atmospheric Valves are located in this same space.

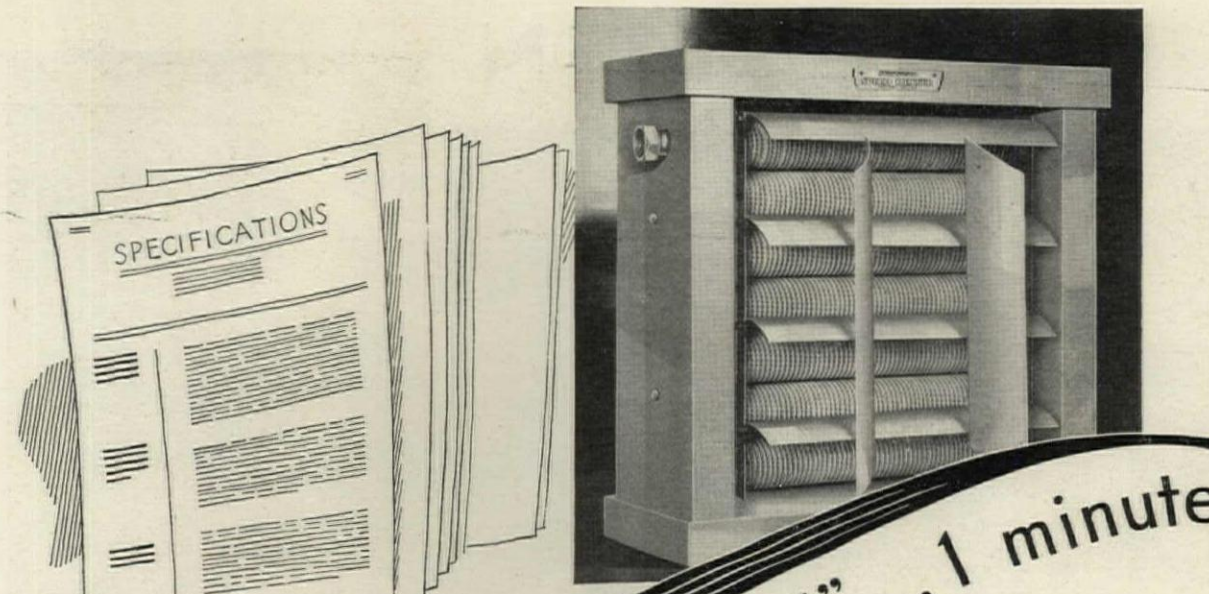
Look for the name DUNHAM

This nameplate identifies a genuine Dunham Thermostatic Radiator Trap

The Dunham Differential Vacuum Heating System and individual parts of the apparatus used in that system are fully protected by United States Patents Nos. 1,644,114 and 1,706,401, and Canadian Patents Nos. 282,193, 282,194 and 282,195. Additional patents in the United States, Canada and foreign countries are now pending.

C. A. DUNHAM CO.
Dunham Building
450 East Ohio St.
CHICAGO

Over eighty sales offices in the United States, Canada and the United Kingdom bring Dunham Heating Service as close to you as your telephone. Consult your telephone operator for the address of our office in your city. An engineer will counsel with you on any project.



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The SPEED HEATER . . . a new Sturtevant product at a democratic price!

Mr. Keyman: You may know that methods of heating our industrial plants and large floor areas are rapidly changing. Valuable steam need no longer be cooped up in bulky radiators and coils.

SPEED HEATERS put *all* steam to work...make for more comfortable heating...at lower initial cost...at a much lower operating cost.

When we asked 2000 architects if they were interested in such savings, 1100 answered "yes" and asked for full details.

May we send *you* these details? The handy coupon will bring them to you. Sign it up and send it out today!

THE PRICE IS WAY DOWN

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B. F. STURTEVANT CO.
Hyde Park, Boston, Mass.

Kindly send me a copy of the Speed Heater Data Book.

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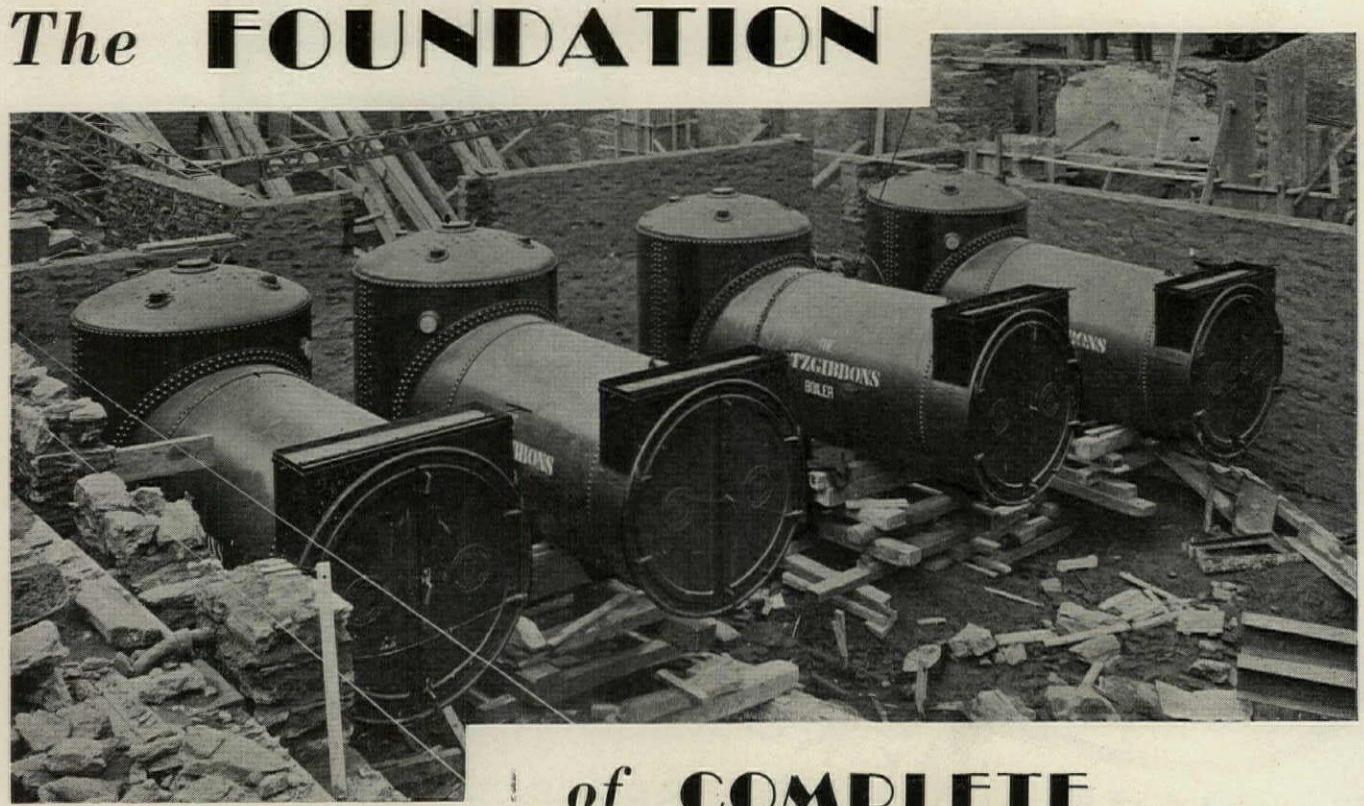
SPEED HEATERS "More Heat Less Steam"

The FOUNDATION of COMPLETE HEATING SATISFACTION



A battery of four Fitzgibbons Boilers in the foundation of one of the largest new apartment houses in New York City. Each boiler has a rating of 28,000 sq. ft. of radiation.
Architect: Schwartz & Gross.
Heating Contractors: Jarcho Bros., Inc.
Builder and Owner: Bricken Construction Co.

A NEW STANDARD of architectural design is working a revolutionary change in the appearance of New York and other big cities. A new grace of line and beauty of form mark every up-going apartment house, office building and hotel with the unmistakable stamp of modernism.

But the problem of heating these buildings has not changed, except to take on added importance. In these days of keen renting competition, heating plays a more vital part than ever. And the mammoth proportions of modern buildings place especial emphasis on the economical side of the heating installation. More essential than ever is the need for keeping operating costs at lowest figures.

FITZGIBBONS STEEL BOILERS
The best in steel boiler heat

With a foundation of Fitzgibbons Steel Heating Boilers, complete heating satisfaction for all concerned is assured. Architect, Heating Contractor and Owner invariably find that the *scientific* advantages of Fitzgibbons design and construction fill the present day need for adequate heating at lowest cost, whatever may be the heating system or the fuel employed.

Ample proof of this is furnished by the large percentage of new buildings which are going up around a sound foundation of Fitzgibbons Boilers.

Full explanations and illustrations of the exclusive features which attain complete combustion with notably faster and more efficient heat transfer, are given in the Fitzgibbons Steel Heating Boiler Catalog. Ratings and dimensions of the complete line covering 300 to 36,000 sq. ft. steam radiation are also included.

Write for a copy—today.

FITZGIBBONS BOILER CO., Inc.
570 SEVENTH AVENUE NEW YORK, N. Y.
Works: Oswego, N. Y.

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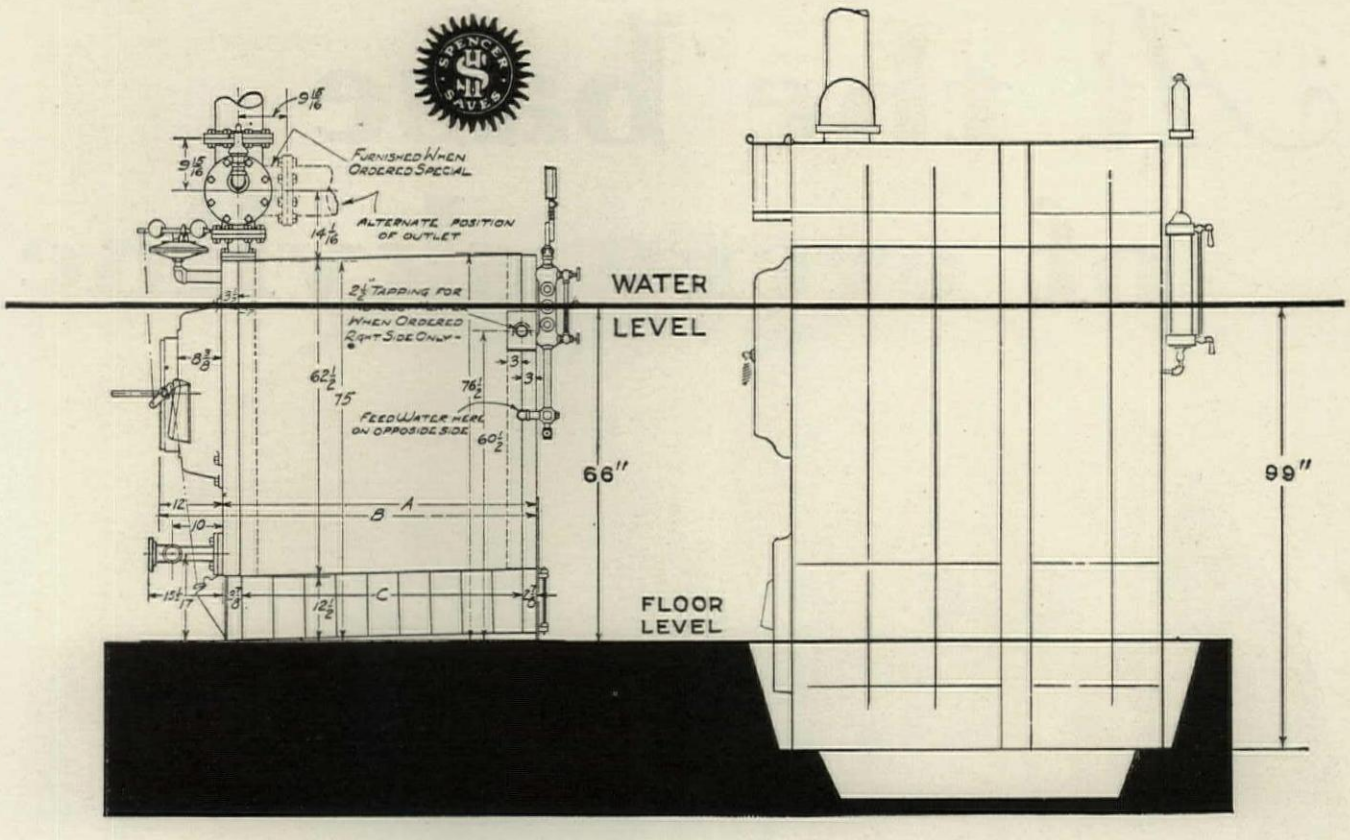


Thirty inches of water at one hundred dollars an inch

The positive economy of Spencer steel boilers, as well as the cast-iron sectional type, is so important that their other features are sometimes overlooked. This particular job was in a building where the boiler room was originally planned for a locomotive type of steel boiler.

There is the first advantage. A Spencer steel boiler, even the biggest one, is built in sections small enough to go through a narrow passage and a door. There is no need to deliver the boiler on the job months in advance, to let it accumulate rust and mortar. There is no need to tear out a wall to get it in.

In this case, the building was started and when the excavation got down to the boiler room floor level, the contractor struck, not water—but rock.

You can see what happened, in the two drawings above. The Spencer water line, in the biggest steel Spencer boiler made, is only 66 inches above the bottom of the boiler. Other steel boilers, of the same capacity, have a water line that is as high as 99 inches above the bottom of the boiler. With a difference of thirty inches in the excavation required, the installation of a Spencer steel tubular boiler in this case saved slightly more than three thousand dollars. This is one case where the low water line was worth more than a hundred dollars an inch to the builder.

Have you seen, recently, a catalog of Spencer Steel Tubular Boilers? From every standpoint of economy—low cost fuel, saving in the elimination of a night fireman, low installation cost—these boilers appeal to building owners. They burn No. 1 Buckwheat anthracite with no blowers, and no machinery, at half the cost of domestic sizes. They burn small sizes of coke at tremendous economy—in fact at a lower cost per square foot than can be secured with soft coal.

Write for the new Spencer catalog No. 29. It illustrates the Spencer cast-iron sectional and steel tubular boilers, all with the storage magazine for fuel, and the sloping Gable-Grates, that make them unusually efficient boilers for burning solid fuels. Spencer Heater Company, Williamsport, Penna.

SPENCER
Magazine Feed
HEATERS
for steam, vapor or hot water

REVIEWS OF MANUFACTURERS' PUBLICATIONS

DOWD CONCRETE FORM SYSTEM, INC., 111 W.Washington St., Chicago. "Better Concrete Columns at Less Cost."

Architects, engineers and builders are interested in any improvement which makes possible the building of strong, accurately formed concrete columns at reasonable cost. This folder deals with a system of forms used for securing columns of either steel skeleton or reinforced concrete, for building foundation piers or for fireproofing wooden columns. Fitting the forms together is quite simple; so is the dismantling of the forms when used. The folder, fully illustrated, gives every detail of data likely to be needed.

GRASSELLI CHEMICAL CO. INC., Guardian Building, Cleveland. "Looking Ahead 20 Years in Wood Utility."

Architects, engineers and builders know that wood in any form rarely fails because it is worn out; its failure is due almost always to the fact that it has rotted. This of course is particularly true where wood is subject to dampness either actually in water, as where wharves or piers are supported upon wood piles or else where wood is more or less embedded in the ground, as is the case with railroad ties, the wooden supporting members used in mines, or in fence posts or telegraph or telephone poles which are driven into the ground. "Rot in wood is caused by fungi, or parasitical plants that grow in timber and feed on the wood substance, so that the wood is soon weakened and finally crumbles. Decaying wood has a low resistance to breakage and fire. Wood-destroying fungi develop rapidly in warm and damp atmospheres, such as prevail generally in mines, paper and textile mills, and especially in wooden structures of all kinds in the southern sections of the United States and countries to the south. In addition to rot, another destroyer prevalent in many regions is the termite, or white ant, which eats into and soon weakens the wood, completely destroying it. White ants are particularly active in tropical countries, but are now rapidly spreading in various sections of the United States. Grubs or wood-boring beetles and other insects that hatch in the bark of unpeeled timber also do much damage by burrowing holes in the wood of posts, mine timbers, and lumber." This valuable booklet deals with the preserving of wood from decay by the use of zinc chloride. "Until recent years the use of treated wood has been generally restricted to large industrial users. Railroads, telephone and telegraph companies, which use enormous quantities of timber, are effecting great savings. The use of treated wood is rapidly extending to other industries where decay must be reckoned with as a cost factor. Some new industries using zinc chloride treated wood in large quantities are textile mills, paper mills, mines, highway construction for guard and sign posts and guard rails, outdoor advertising signs, etc. Industries using wood for construction purposes have even greater need for long-time service than railroads and mines, on account of the higher cost of installation. The renewal cost for a railroad tie or mine set is small in comparison with the renewal cost of an equal quantity of lumber in roofs or floors of mills and other buildings. The use of treated wood in construction of buildings is increasing, but existing installations are too recent to provide long-time service records. However, there is no guesswork about the prolonged life that can be attained with properly preserved wood for mill construction. Wood cross ties, fence posts, mine ties, mine sets, poles and loading platforms properly preserved with zinc chloride have been in service in this country for many years, showing from three to ten times greater life than untreated wood." This brochure goes with minute detail into the nature of zinc chloride and its use in this way, giving all the data which would be likely to interest an architect, builder, or engineer. "Grasselli Service to American industry has been continuous since 1839. The name 'Grasselli' has been associated with a great many industrial chemicals, the quality of which has always been of the highest standard. One of the best known Grasselli products is zinc chloride, the standard salt wood preservative described in this manual. The Grasselli Chemical Company offers the coöperation and counsel of its wood-preserving engineering department to textile mill, paper mill and mine operators, and to architects, building contractors and lumber dealers, as well as to others who are interested in the application and use of wood preservatives. This service is available to small or large users."

SAMUEL CABOT, INC., 141 Milk Street, Boston. "Cabot's Old Virginia White." Its value for certain building types.

For some buildings, particularly of frame and of certain architectural types, there is nothing in the way of wall finishes quite as appropriate and pleasing as the ordinary whitewash so widely used in the southern states. The use of whitewash, however, is attended with several disadvantages. Since it is highly perishable, it must be frequently renewed, and during wet weather its fresh whiteness becomes a rather dismal and streaky gray until with the return of dry weather it recovers its pristine appearance. Use of Cabot's famous "Old Virginia White" gives every advantage possessed by whitewash without its drawbacks. "It is neither paint nor stain but half-way between,—heavier than stain but not like the heavy opaque coating of paint." There is nothing better for buildings of a southern type than Old Virginia White with green blinds or shutters and roof shingles stained brown, moss green or slate gray as described in this folder.

INDIANA LIMESTONE COMPANY, Bedford, Ind. "Sculpture Groups on the Michigan Avenue Bridge, Chicago."

Perhaps the wide use of limestone as a building material has somewhat obscured its desirability for use in sculpture. This brochure deals with limestone used in this way, and particularly in connection with the sculptured adornments of the bridge upon which Michigan Avenue crosses the Chicago River. These fine groups of statuary, of heroic size, are the works of two widely known sculptors, —James Earl Fraser and Henry Hering,—and portray scenes from the early history of Chicago. "The group on the east pylon at the north end of the bridge depicts La Salle and Marquette on their explorations into the heart of the new world. Surrounding them are the friendly Indian guides who piloted them on this epochal voyage through the heart of the North American continent, down the Ohio and Mississippi Rivers to the Gulf of Mexico. Above them is a symbolical figure of France, with torch and shield, urging the doughty explorers onward in the interests of the crown of France. The group on the west pylon at the north end of the bridge represents the settling of Chicago by the early pioneers, long before the days of the covered wagon. Above the group there hovers the symbolical figure of America rolling back 'the veil' of the unknown country for these sturdy pioneers. The group on the west pylon at the south end, standing approximately on the site of the original Fort Dearborn, represents its defense,—actually, however, it commemorates the massacre of its garrison. The group of the east pylon at the sound end of the bridge represents the regeneration of Chicago after the great fire of 1871. The 'I will' female figure symbolizes the determination of Chicago to rebuild in a big way." The brochure mentions many other examples of sculpture for which limestone has been used. Among these are "the very notable heroic-sized figures in attic frieze and pediment group on the Brooklyn Museum of Arts and Sciences, and equally notable figures surmounting the entablature of the St. Louis Art Museum; the heroic-sized figures of lions and urns of the new Indiana War Memorial; the figure groups in friezes and figures on piers and buttresses of the Nebraska State Capitol, and the figures above the entablature of the new Criminal Court Building, Chicago; the archaic figure groups in the friezes of the Medina Athletic Club, Chicago; The Princeton Battle Monument; the richly carved Astor Memorial Gothic Cross, in Trinity Churchyard, New York; the clock figure group of the Grand Central Terminal, New York; the rich Gothic figure work on both exterior and interior of the Chicago University Chapel; the sphinx of the Temple of Scottish Rites, Washington; the sea horses of the Baltimore War Memorial; the entablature figures on Bush House, London; the entrance step pedestal groups of the Parliament Building, at Winnipeg; the frieze and pediment figure groups of such important buildings as the Mississippi, Indiana, Georgia and Kentucky State Capitol buildings; the Philadelphia Public Library; the Delgado Art Museum, New Orleans; Shelby County Court House, Memphis; and numerous other fine court houses, and many other memorials and fountains.

The most *Luxurious* heating system

▼

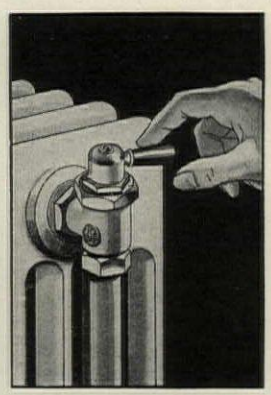
Entire System is controlled locally from each room...

WHEN Hoffman Controlled Heat is specified, each member of the owner's family is assured made-to-order comfort. It is the modern heating system for these modern days when women's scanty raiment brings the need for more heat than is comfortable for wool-clothed men. For Hoffman Controlled Heat delivers to each room as much or as little heat as its occupant desires, without effect on the temperature of other rooms.

A finger touch on the lever handle of the radiator valve commands the radiator to deliver full heat, three-quarters, half, one-quarter or none at all. The entire system is controlled locally from any room. Only as the call comes for more heat, does the supply of steam increase.

No matter what standard boiler and radiators you specify, no matter whether oil, gas or coal is used, you can add the modern equipment that makes it a Hoffman Controlled Heat system. This equipment comprises, (1) Hoffman No. 7 Modulating Valves for radiators, which are easily adjustable on the job for quick, sure balancing of the system, (2) Hoffman return line valves which automatically open for passage of water and air and close to steam, (3) the Hoffman Damper Regulator which automatically controls the draft, (4) the Hoffman Differential Loop which safeguards the water line of the boiler at all times and, (5) the No. 15 Vacuum Valve that vents air and prevents its return through the vent port.

We have recently had so many inquiries from architects and heating engineers regarding Hoffman Controlled Heat that we have published a booklet giving all the facts. A request on your letterhead brings you a copy of this booklet without obligation. In it you will find the whole interesting story. Address Hoffman Specialty Company, Inc., Dept. EF-11, Waterbury, Connecticut.



HOFFMAN CONTROLLED HEAT

REVIEWS AND ANNOUNCEMENTS

THE ARCH CONSTRUCTION CO., 2126 Poland St., New Orleans. "The Oldest Type of Building Construction."

History of architecture credits to the ingenuity of the Romans the invention of the arch, and there exist all over the world countless old buildings with arched roofs, to say nothing of certain ancient aqueducts which were constructed upon the arch principle. In later years riveted steel trusses, able because of their strength to carry tension which masonry could not support, have come into use, and now with building upon a vast scale going on everywhere, the steel arch is counted upon to do what nothing else could do. This brochure, issued by a firm specializing in arch construction, illustrates and describes several structures built under its supervision,—large garages, hangars, cotton sheds, warehouses, and other structures of one story where a clear space is required, or on the top floors of taller buildings.

PROMETHEUS ELECTRIC CORPORATION, 360 West 13th Street, New York. "Electric Heating Specialties."

The energy of electricity is being used for countless purposes; it furnishes power for running machinery of every imaginable kind, it supplies light, and when the energy is used in other ways it supplies heat for warming houses, rooms and organ lofts, for cooking, and for giving service in other ways. This booklet deals with a wide variety of appliances for using current to give heat. "The Prometheus Electric Corporation, namesake of the Greek god, also seeks might and happiness for man through the modern application of heat,—electricity. For over 25 years this company, composed of expert engineers, has put electrical heat to practical usage. During these years of pioneering and experimentation, the Prometheus engineers have applied electricity to heating in a host of new and marvelous ways. They introduced the first heating elements produced by a platinum deposit on mica,—a startling invention in its day. As a result of keen research and new discoveries, they applied electrical heat in rapid succession to flat-irons, sterilizers, stoves, ranges, heaters, toasters, percolators, hair-curlers, and other devices that contribute enormously to modern comfort and convenience. Prometheus products embrace almost every conceivable type of electric heating equipment, from massive naval submarine heaters to dainty boudoir radiators. When the builders of the first New York subway required electrical heaters, the Prometheus heater won the approval of the contractors by every test and experiment. When the navy demanded heating units for the submarine to protect sailors against intense cold in the icy depths of the sea, the Prometheus Electric Heaters measured up successfully to the exacting demands of governmental specifications. When kitchens and laundries demanded quicker service, Prometheus Towel and Clothes Dryers were installed. When bathroom comfort required warmth on chilly mornings, Prometheus heaters were used, and they were adapted for kitchens of hotels, clubs and private residences everywhere. In the field of sterilization, the Prometheus Electric Corporation bears the distinction of being the first company in America to manufacture electric sterilizers. Today in governmental and private hospitals, in the operating rooms of doctors and surgeons, and in offices of dentists, Prometheus sterilizers accomplish the destruction of bacteria.

"From small beginnings the Prometheus Electric Corporation has grown into an institution producing the latest type of heating elements to meet diversified demands in many fields and industries. Prometheus products measure successfully to the rigid specifications of the United States army and navy engineers and to countless manufacturers who use Prometheus heating units for their own products. The list of inspiring gifts which Prometheus engineers have made to man through the practical application of the principle of electric heating is almost without end. In its field this organization has been preëminently the pioneer and leader, and from its wealth of research and experience can assure anyone that any product which bears its name represents the final word in electrical heating and that the spirit of its efforts is the same as that by which the god, Prometheus, was motivated when he brought fire to man." The booklet contains a list of well known architects who have specified Prometheus specialties for installation in their buildings.

Harrison & Turnock, architects and engineers, announce their removal from 500 Board of Trade Building to 1001 Architects' Building, Indianapolis.

Announcement is made of the dissolution of the firm of William Reichert & Sidney C. Finck, architects. Mr. Finck will continue practice at 35 South Dearborn Street, Chicago.

Sam Biderman, A.I.A., announces his removal from the Athletic Club Building to the Thomas Building, Dallas Tex. He desires catalogs and other publications having to do with the designing, planning and equipment of banks.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912, OF THE ARCHITECTURAL FORUM.

Published Monthly at New York, N. Y., for October 1, 1929

State of New York, } ss.:
County of New York, }

Before me, a Notary Public, in and for the State and County aforesaid, personally appeared H. J. Brown, Jr., who having been duly sworn according to law, deposes and says that he is the business manager of THE ARCHITECTURAL FORUM and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption required by the Act of August 24, 1912, embodied in Section 443, Postal Laws and Regulations, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business manager, are:

Publisher—National Trade Journals, Inc., 521 Fifth Avenue, New York, N. Y.
Editor—Parker Morse Hooper, 521 Fifth Avenue, New York, N. Y.
Managing Editor—Kenneth K. Stowell, 521 Fifth Avenue, New York, N. Y.
Business Manager—H. J. Brown, Jr., 521 Fifth Avenue, New York, N. Y.

2. That the owners are:

National Trade Journals, Inc., 521 Fifth Avenue, New York, N. Y.
Maynard S. Bird, 63 Wall Street, New York, N. Y.
Goldman-Sachs & Co., 30 Pine Street, New York, N. Y.
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C. Stanley Taylor, 40 East 49th Street, New York, N. Y.
John T. Wilson, 521 Fifth Avenue, New York, N. Y.
Rupert T. Zickl, 63 Wall Street, New York, N. Y.

3. That the known bondholders, mortgagees and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: None.

4. That the two paragraphs next above giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also, that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities, than as so stated by him.

H. J. BROWN, JR.
Business Manager

Sworn to and subscribed before me this 24th day of September, 1929
(Seal) MADELINE DIETRICH.
(My commission expires March 30, 1931.) Notary Public

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IN your client's behalf you are interested in getting a concrete floor hardening job that will give long and satisfactory service. A Sonneborn job will give you such service.

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Architects who are interested in jobs that will stand up, will realize the ultimate economy and service of intrusting hardening work to Sonneborn, who guarantee every job, and stand behind their guarantee, and always make good.

The Sonneborn Method calls for the use of Lapidolith, the original concrete floor hardener, and for the correct application of Lapidolith by a Sonneborn Service Crew trained to apply Lapidolith in the right way and in the proper amount.

We are prepared to quote a price in advance direct to the architect so there can be no misunderstanding between architect and contractor about the cost of the work. We can compete on price but do so reluctantly, because we cannot give at a low price as fine a job as that which is possible to supply at a fair price.

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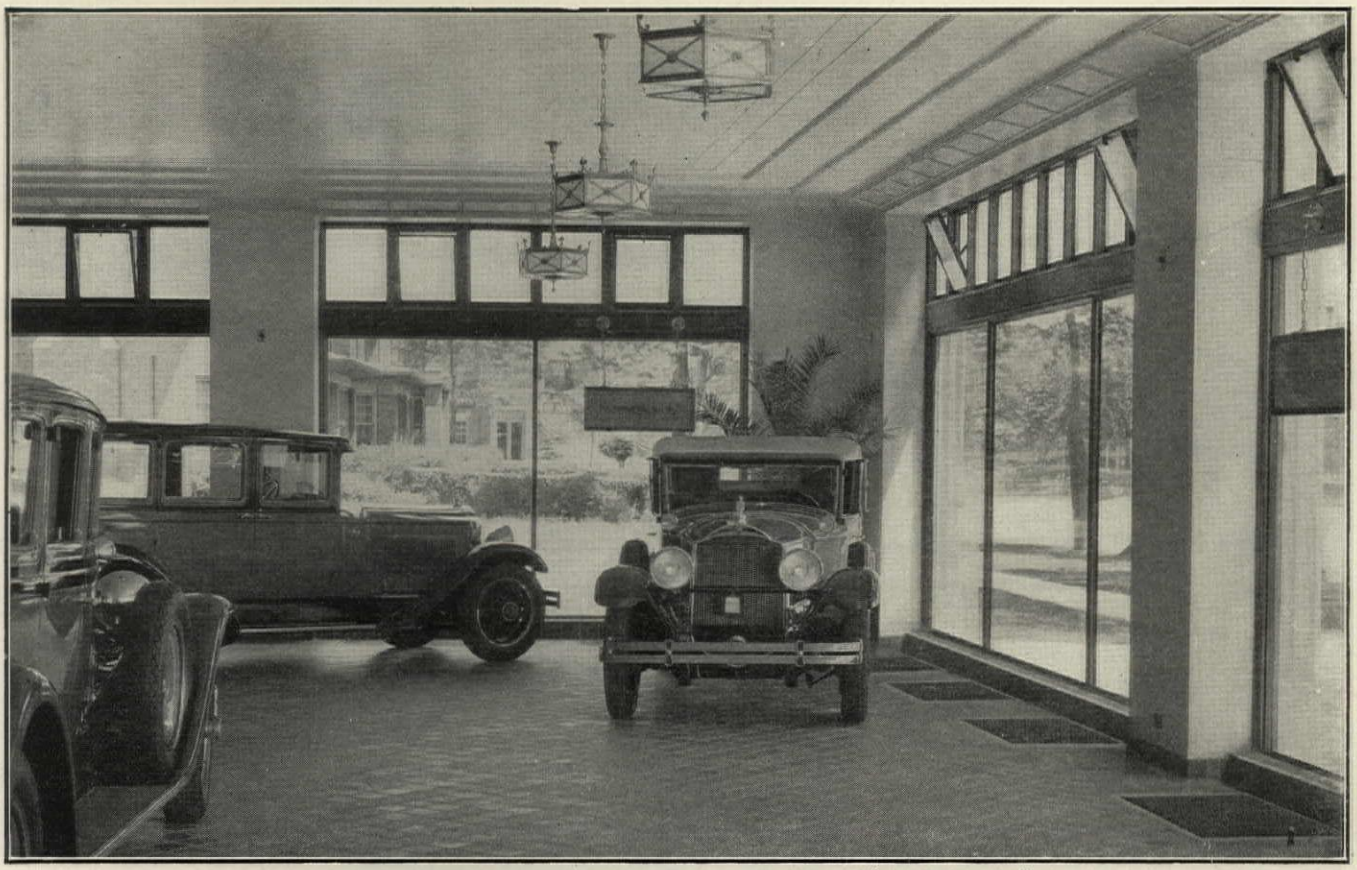
Part 2—Architectural Engineering and Business



Packard Sales and Service Showroom, Detroit, Michigan. Albert Kahn, *Architect.*

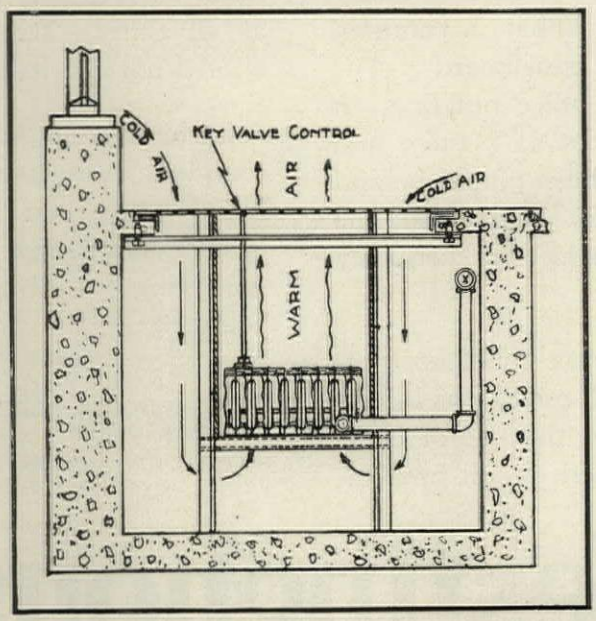
A New Way to Hide ROBRAS 20-20 Radiators

In the Floor — Out of Sight — Out of the Way

THE problem of heating a showroom where the show windows come to the floor line can at last be handled to provide adequate heat where it is needed, and yet provide that the radiators be out of sight and out of the way.

In the showroom pictured here ROBRAS 20-20 Radiators were suspended below the floor much in the manner in which the old direct-indirect radiators were installed. The light weight of ROBRAS 20-20 Radiators, however, made such an installation considerably less expensive.

Arrangement is made to allow the heated air to pass through ducts through the *center* part of each floor grille. Cool air is drawn through the side sections of the grille, through two ducts on either side to below the radiators. This air is heated by passing through the radiator and is discharged through the center grille. In addition to the advantages brought out by their light weight, the small size of ROBRAS 20-20 Radiators make such an installation possible without cluttering up the basement with huge ducts and radiator casings.



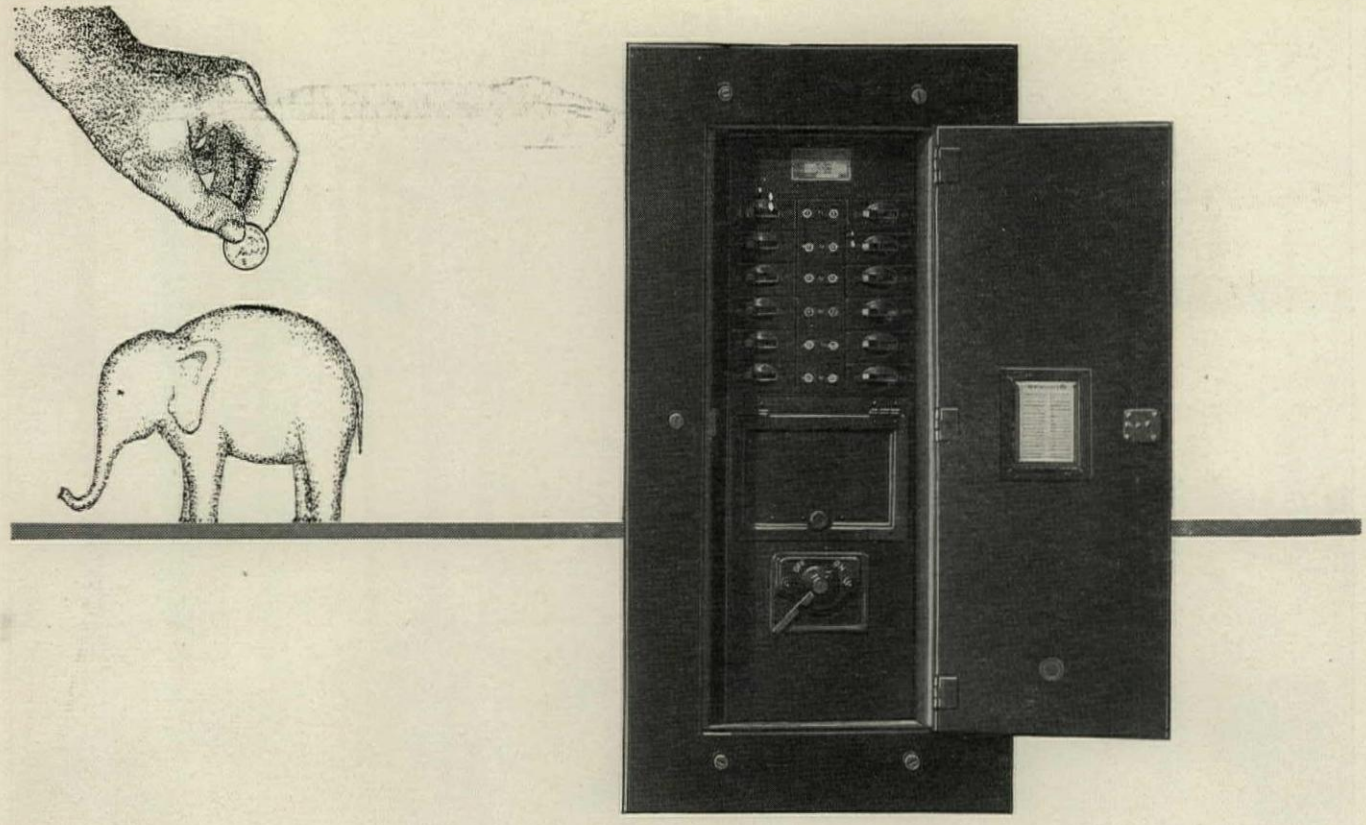
Method of installing ROBRAS 20-20 Radiators below floor level.

This installation and similar adaptions have proved most successful in those showrooms and show windows where limited space prohibits the use of an old-fashioned radiator.

Sweet's catalogue, your A. I. A. File or one of our offices can give you additional information and help you to solve similar problems.

ROME BRASS RADIATOR
CORPORATION

ONE EAST FORTY-SECOND STREET · NEW YORK CITY



Will your panelboards be banks?

IN the new buildings you are designing, can the panelboards be used as banks and hairpin holders? That is common practice with fuse-type panelboards. For instance, in a certain office building, an inspection disclosed that 65 pennies and 85 pieces of wire had been placed behind fuses in the panelboards. Obviously, the protection to the wiring was seriously impaired.

The Westinghouse Nofuz panelboard effectively prevents such conditions as this and entirely eliminates the use of oversized fuses. A 15-ampere circuit-breaker, which can open 5000 amperes without a flash, assures perfect safety to the wiring at all times. Its calibration cannot be altered nor can its action be blocked.

Ask the nearest Westinghouse office for complete information on this new panelboard and then insure your building against overfusing and fuse shorting by specifying "Westinghouse Nofuz Panelboards."

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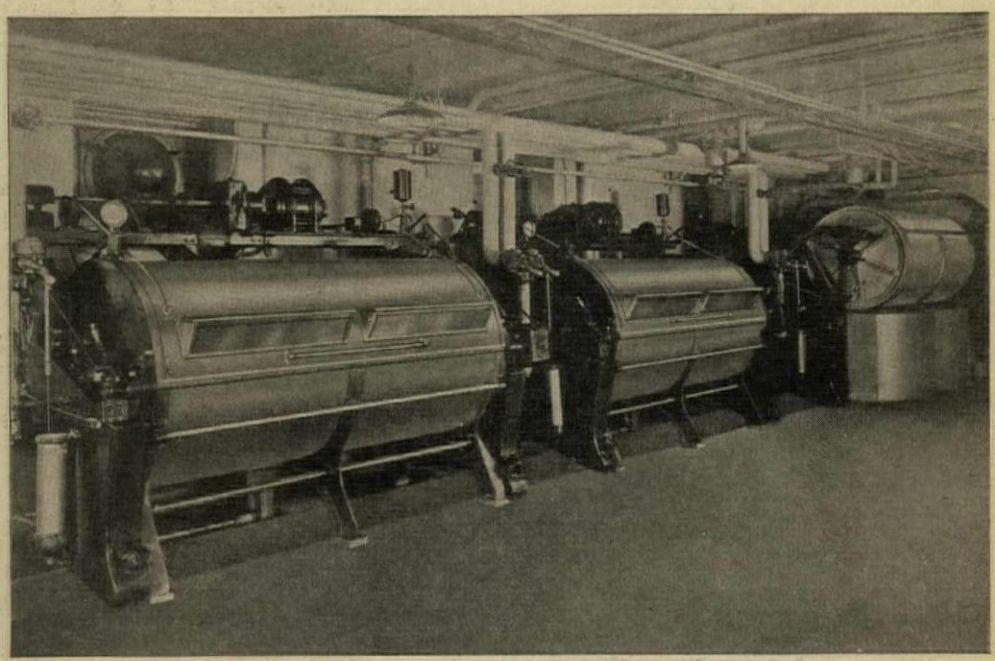
Hospital Laundries



Battery of Monel Metal American-Perry Laundry Machines installed in The Hahnemann Hospital, Philadelphia, Pa., by THE AMERICAN LAUNDRY MACHINERY CO., of Cincinnati, Ohio.

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BASICALLY, the requirements of a hospital laundry are the same as those of the ordinary commercial laundry.

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MAY WE SEND YOU ADDITIONAL LITERATURE?

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Monel Metal is a technically controlled Nickel-Copper alloy of high Nickel content. It is mined, smelted, refined, rolled and marketed solely by The International Nickel Company, Inc. The name "Monel Metal" is a registered trade mark.

THE INTERNATIONAL NICKEL COMPANY, INC., 67 WALL STREET, NEW YORK, N. Y.

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National Electric Products Corporation
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