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.

The quality leaves its imprint.
Pennsylvania National Guard Armory, Latrobe, Pa., J. F. Kuntz—Architect

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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THE ARCHITECTURAL FORUM

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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.

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WEATHER RESISTING
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YOUNGSTOWN steel pipe costs no more to install than ordinary pipe—and you do not pay a premium for the pipe itself. Consequently it is only sound business to write "Youngstown" into your building specifications.

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You can go to any Youngstown Sheet and Tube office with the assurance that your problem will receive the prompt, courteous attention of a specialist, and without the slightest obligation.

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

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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.
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A NEW BOOK FOR YOU—
"Planning Restaurants that Make Money" contains 80 pages of practical information, photographs and data of value in planning any type of restaurant. This is not a catalog, but a reference work. A copy will be sent free on request—entirely without obligation.

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.

To the control of dampness Toch Brothers bring an experience of over 80 years of successful damp- and water-proofing accomplishment on construction projects of every type in every corner of the world. For every damp-and waterproofing problem there is a Toch Brothers "R. I.W." product that offers complete and economical protection. The scientific resources of Toch Brothers' laboratories and the studied recommendation of their experts are at your disposal. Your inquiry is invited.

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The Invisible Superintendent at the Mortar Box Puts the Required Strength in the Mortar

WHEN the architect specifies one part BRIXMENT, three parts sand (no lime, no portland), the strength of the mortar is certain. If oversanded, BRIXMENT mortar works short and, since there is no lime in the mix, the necessary plasticity can be secured only by using the proper amount of BRIXMENT.

BRIXMENT mortar has greater strength than that required by the building code of any city for the heaviest load-bearing walls. Its strength increases with age, becoming greater than that of the brick itself. When tested in piers it approaches that of straight 3-to-1 portland-cement mortar. This makes it suitable for foundation, load-bearing or parapet walls and even for tall, free-standing stacks.

BRIXMENT makes a stronger, tighter bond between the brick and the mortar. It is ground finer and hardens more slowly than portland, thus permitting deeper penetration and a more thorough keying into the pores of the brick. Louisville Cement Company, Incorporated, Louisville, Kentucky.

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Our Contribution
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for the ventilation of schools, hospitals, offices and other buildings presenting an acute ventilating problem.

HERMAN NELSON
Invisible Radiator

...supersedes all previous radiators, radiator cabinets or enclosures. Occupies no room space and makes possible any desired decorative scheme or furniture arrangement. Indestructible in service.

THE HERMAN NELSON
HEATER

It operates at steam pressures from 1 to 150 lbs., and offers the better and more economical way of diffusing heat in Factories, Railroad Shops, Roundhouses, Mills, Warehouses, Garages, Gymnasiums and Industrial Buildings.

SIX YEARS AGO when the Herman Nelson light weight, compact, indestructible radiator was placed on the market, it was immediately accepted as the greatest advance in the art of Heating and Ventilation in a generation. It has made possible heating and ventilation dependability and performance hitherto unattainable.

The Herman Nelson Wedge Core Radiator is an exclusive feature of all Herman Nelson Heating and Ventilating Products and accounts for their unequalled performance.

HEATING  VENTILATING  COOLING  DRYING  CONDENSING

THE HERMAN NELSON CORPORATION  Moline, Illinois

Builders of Successful Heating and Ventilating Equipment for over 20 Years

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

NO LONGER need space wasting radiators intrude upon beauty in the home, office, or monumental building. An Architect's ideal has been made a reality by the Herman Nelson Invisible Radiator.

Once walled in, this compact modern heating unit offers all the advantages of finest radiator heat, yet permits of unlimited scope in the arrangement of furniture or decorative scheme.

Indestructible, rust-proof and leak-proof, it never requires service. Even freezing does not harm it.

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For Steam, Hot Water, Vapor or Vacuum Heating.
Why does this kind of job build reputation for you?

The architect's reputation is his greatest asset. It is the one channel through which new business can come. That is why architects everywhere guard it so carefully. When you specify an "All-American" heating plant you are making certain that you are leaving behind you an installation that will always be a credit to you. Not only are all the different items in an "All-American" installation designed to work together, but the American Radiator Company guarantees every part of the equipment.

That is why many of the most celebrated architects have eliminated the words "or equal" from their specifications. They simply specify that the boiler, radiators and all accessories must be products of the American Radiator Company.

American Radiator products are accepted as a standard by which others are judged. They are backed by the guarantee of the world's largest manufacturer of heating equipment. You can build reputation and be sure of having perfectly satisfied clients by standardizing on American Radiator products.

American Radiator Company

40 West 40th Street, New York
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.

Banks, hotels, hospitals, newspapers, libraries, mail-order houses, retailers, wholesalers, factories and large offices of all kinds use G&G Atlas Pneumatic Dispatch Tubes for speedily (30 ft. a second) distributing mail, telegrams, inter-office papers and light-weight articles among scattered departments. "Mechanical Messengers are faster and more dependable than human messengers."

Catalog in Specification Data, 1929 Ed., pp. 228-229

G&G ATLAS SYSTEMS, INC.
544 West Broadway New York
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LUMBER now takes its place among materials which can be specified with the certainty that there will be no substitution of inferior quality.

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.

Progressive lumber dealers now have—or can get—the items listed on this page to fill your specifications for 4-Square Lumber.

WEYERHAEUSER FOREST PRODUCTS
ST. PAUL, MINNESOTA

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Species and Grade are Marked and Guaranteed

TRIMMED SQUARE. PACKAGED. READY TO USE. GUARANTEED
INSTRUCTIONS

OTIS SIGNAL CONTROL ELEVATORS

THE following is a list of Otis Signal Control Elevators as noted below.* Most of these installations are now completed.

Thomas Jefferson Hotel, Birmingham, Ala.  
First National Bank, Montgomery, Ala.  
Protective Life Bldg., Birmingham, Ala.  
Atlanta City Hall, Atlanta, Ga.  
Independence Trust Co., Charlotte, N.C.  
Central National Bank, Richmond, Va.  
Chicago Motor Club, Chicago  
Northern Trust Co., Chicago  
First National Bank, Youngstown, Ohio  
American Insurance Union Citadel, Columbus, Ohio  
Beggs Building, (Acme Development Co.) Columbus, Ohio  
The Hippodrome Bldg., Cleveland, Ohio  
Dayton-Biltmore Hotel, Dayton, Ohio  
Fidelity Building, Dayton, Ohio  
Argonaut Realty Corp., Detroit, Mich.  
Central Savings & Loan Co., Youngstown, Ohio  
Park Plaza Apartments, St. Louis, Mo.  
Gunter Hotel, San Antonio, Texas  
Dallas National Bank, Dallas, Texas  
Southwestern Bell Tel. Co., Oklahoma City, Okla.  
Linwood Medical Arts Bldg., Austin, Texas  
Lee-Higgenson Building, New York  
Consolidated Gas Co. of N.Y., (Addition) New York  
Midland Savings Building, Denver, Colo.  
Northwestern Bell Tel. Co., Des Moines, Iowa  
F. W. Woolworth Company, Denver, Colo.  
Union Bank Building, Philadelphia, Pa.  
Paulsen Medical & Dental Bldg., Spokane, Wash.  
Union Elec. Light & Power Co., St. Louis, Mo.  
Canada Building, Windsor, Ont., Canada  
City Trust & Savings Bank, Youngstown, Ohio  
Southern New England Tel. & Tel. Co., Bridgeport, Conn.  
Drake Towers, Chicago  
The Masonic Temple, Portsmouth, Ohio  
Battle Creek Sanitarium, Battle Creek, Mich.  
The Barbizon, New York  
Ampico Tower Building, New York  
Shoping Tower, Seattle, Wash.  

*This list contains only installations having two or three Otis Signal Control Elevators. One hundred and twenty-six buildings having from four to thirty-three of this type elevator were listed in two previous advertisements.

OTIS ELEVATOR COMPANY
OFFICES IN ALL PRINCIPAL CITIES OF THE WORLD
Allow for Future Requirements in Planning Home Telephone Arrangements

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.
Switch life depends upon switch contacts

This new contact spring which eliminates burning at "make" must not be Overlooked

Switch contacts are the important parts of a toggle switch. They are the parts which should have most consideration in selecting a switch. For even though the function of the contacts is simply to make and break a circuit, the life of the switch depends upon the way this function is performed.

The most frequent cause of switch failure has been burning of contacts at the "make". No switch contact spring could receive the enormous inrush of current at the instant of "make" without burning. This trouble is particularly severe when a switch is used to control the now commonly used type "C" lamp.

Illustrated above is the new Hubbell Toggle Switch with a radically different contact spring, developed especially to overcome burning at the "make". This new contact spring is a notable achievement in toggle switch design. It positively overcomes burning at the "make" — even when in circuit with type "C" lamps. It guarantees the new Hubbell Toggle Switch freedom from the chief switch trouble — burned and pitted contacts.

Note the other worthwhile features incorporated in the new line of Hubbell Shallow Flush Toggle Switches. Clip the right hand corner of this page to your letterhead for full details.

Electrically and Mechanically Perfect in Design — "Approved"

A radically new form of contact spring scientifically designed so that two different rates of vibration are set-up in the spring; one tending to counteract the other. Thus recoil is practically eliminated in the ends of the contact spring when the solid metal contact blade strikes between them. As a result, burning and pitting of the spring is prevented — even when in circuit with type "C" lamps.

An automatic "kick off" prevents sticking of blades in contact.

Commutator support is perfectly insulated.

Commutator blades are rigidly riveted to carrier, insuring positive alinement.

Spring arm is pivoted on a round shaft, seated in a symmetrical bearing, facilitating faster, smoother action without wear.

Operating mechanism is separate from the bridge and perfectly insulated.

A solid bridge with ears lies in a recess across Bakelite cover — entirely insulated; perfect alinement and rigidity insured.

Each wiring terminal is held by two screws. Bakelite case completely encloses mechanism.

A complete line to meet any need —

9801 — Single Pole, 5 amps. 250 volts; 10 amps. 125 volts
9802 — Double Pole, 10 amps. 250 volts
9803 — 3-way, 5 amps. 250 volts; 10 amps. 125 volts
9804 — 4-way, 2 amps. 250 volts; 5 amps. 125 volts
9805 — Single Pole, 20 amps. 250 volts
9806 — Double Pole, 20 amps. 250 volts

Hubbell Screwless Plates of Bakelite
Ask for a description of these self-alining switch and outlet plates. You can obtain them in any color or finish to exactly match any background.
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.

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 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 aesthetic 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
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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 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.

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VOLUME LI

NOVEMBER 1929

CONTENTS

PART ONE—ARCHITECTURAL DESIGN

Cover Design: Metal Window Grille, Hartford County Building, Hartford. From a Photograph by Sigurd Fischer

The Editor's Forum Page 37

The Alhambra, Granada

From a Water Color by Carroll Bill

PLATE ILLUSTRATIONS

Hartford County Building, Hartford

Paul P. Cret and Smith & Bassette 97-112

Y. M. C. A. Building, Hackensack, N. J.

Louis E. Jallade 113-116

Alterations to House of Frank L. Bateman, Esq., Barrington, Ill.

Huszagh & Hill 117-119

House of Ralph D. Huszagh, Esq., Winnetka, Ill

Huszagh & Hill 120

House of J. Manley Clark, Esq., Freeport, Ill.

Huszagh & Hill 121

Church of St. Thomas the Apostle, Chicago

Barry Byrne 122-124

Some Recent Buildings in Holland

125-128

LETTERPRESS

A Spanish Holiday—1 Carroll Bill 433

The Spirit of Modern Art Raymond M. Hood 445

The Barcelona Exposition

William Fraschlyn Paris 481

Prieure de Pontboup, Moret-sur-Loing

Milton D. Lowenstein 529

And Now—A "Modern" House R. W. Sexton 537

The Wye House Orangery J. Donnell Tileghman 541

Two Rooms at Southampton, N. Y.

543

PART TWO—ARCHITECTURAL ENGINEERING AND BUSINESS

Building the Tower From a Drawing by Tabu

Clifford Wayne Spencer 557

LETTERPRESS

Artificial Marble and Scagliola

Acoustics of Picture Theaters

Clifford M. Swan 545

The Orchestra Shell of the Hollywood Bowl

Arthur T. North 551

Chilled Air Distribution in Theaters

William Goodman 553

Electrical Wiring of Office Buildings, II

Nelson C. Ross 565

The Arrangement of Specifications

Ernest O. Brostrom 573

The Supervision of Construction Operations

Wilfred W. Beach 575

The Building Situation

582

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BUILDING THE TOWER

From a Drawing by Tabu

The Architectural Forum
THE
ARCHITECTURAL
FORUM

VOLUME LI

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-
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
cases, however, that the rear wall of the audi-
torium 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 pro-
duce 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 num-
ber of theaters the rear wall is segmental, follow-
ing 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 re-
member 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 through-
out the theater and consequently a better distribu-
tion 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 absorbive 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 ante-chambers, 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 absorbive 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 over-emphasized and not appear to be as disturbing as in an ordinary auditorium. Still, they are excitants of the auditory nerves and should be eliminated.
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
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 hands 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
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 aero-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 3/4 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
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.

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-
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 3/2 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-
The Piccadilly Theater, Chicago, has a Downward System of Chilled Air Distribution
C. W. & George L. Rapp, Architects

Capacity 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 dehumidified atmosphere is surprisingly refreshing and stimulating, however.
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
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

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**Silk Fiber Being Spread to Give the Veining of Siena Marble**

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**Insert and Mosaic Work is Cast in Large Sections**

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
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.

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...
for firms without established reputation to com-
pete, with their bids based on inferior materials
and labor, and the reputable firms, in self-preser-
vation, are forced to do likewise. This forced
attempt to save invariably results in a loss to the
appearance and finish of the work proportionate-
ly 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 abso-
lute 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 admit-
ted 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 mix-
ing 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 work-
man. The surface coating of superfine Keene's
cement is then poured over the threads to a thick-
ness 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. Chees-
cloth 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 per-
fect bond. Burlap reinforcing is usually includ-
ed in this backing to give it added strength. The
backing is poured to the required thickness (us-
tually 3/4 or 7/8 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
need that cannot be supplied by natural stone, its chief raison d'être 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 desir-
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.
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 switchboard for the operation of 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 Hoists.
- 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.
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 bus 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
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,
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 underground 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 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
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](image-url)
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 moldings, 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 moldings 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 molding 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 molding. 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 moldings, separate conduits being used from the terminal cabinets to the moldings on each side of the corridor. The telephone wires pass from the terminals, through the conduits to the moldings, and are concealed in the wire spaces in the moldings, passing from room to room through the bushings or tubes. The moldings 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 moldings, permitting the ready installation of low-tension wires between the offices on the different floors. This equipment

![Diagram](attachment:image_url)

**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 $3\frac{3}{4}\times 1\frac{3}{4}$-inch ducts and one $1\frac{1}{2}\times 1\frac{1}{8}$-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-
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, employees' 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 employees 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 moldings, 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 3/4-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 endrolling 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 adequately represent the confusion of the archiletter and punctuation mark, and they could not papyrus scrolls. And catalogs! Scramble every rolling specifications that reminded one of ancient dimensions, contracts of legal cap size, and end-free 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 Debilice'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 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.
DOORS:

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 ventilator of approved type. Doors marked Gl. are to be glazed.

FRAMES:

The exterior frames to be built of W. P. as 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 W. P. with square edged stops nailed in place.

WINDOW FRAMES:

Box frames to be standard brick frames and may be built of W. 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:

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 tenoned 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:

All interior trim for doors, windows, etc. shall be Y. P. strictly clear finish materials free from all defects, all machine sanded moldings, hand sanded.
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, striping, 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 charge 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
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-repellent 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 concrete, the Association recommends clean, 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-repellent capacity.

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 Portland cement mortar applied in successive coats, the first troweled directly on the clay and each applied with a strong arm.

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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 can 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.

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 sump was constructed as detailed, with proper connections in and out.
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 kept moist (as is elsewhere specified) and smoothly patched as specified."

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 ⅜ 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-
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 ⅜-inch skim coat under roofing and other waterproofing to 2-inch or even 3-inch, depending upon design and other conditions. A ⅜-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 ⅜ 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 ½ cement mortar) is laid on the tar paper and the ¼ 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 floor, finished to within 1½ inches of the fin-
ished level, shall be provided under another contract.' Upon this he lays 7/8 inch of screed coat and 3/4 inch of terrazzo and makes no mention whatever of a sand cushion. Still another calls for 2 inches of 'sublayer' and 3/4 inch of finished terrazzo. So we have the finish varying from 1/2 inch to 3/4 inch in thickness and the underbed from 3/8 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 3/4-inch terrazzo mixture on 1 3/4 inches to 2 1/4 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 floor 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 3/4 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 employees 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 cooperation 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.
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 below 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, 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.

**THE BUILDING SITUATION**

**A MONTHLY REVIEW OF COSTS AND CONDITIONS**

**ANNUAL CHANGES**

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**COMMODITY INDEX**

**BUILDING COSTS**

**MONEY VALUE OF CONTEMPLATED CONSTRUCTION**

**MONEY VALUE OF NEW CONSTRUCTION**

**SQUARE FEET AREA OF NEW CONSTRUCTION**

**MILLIONS OF DOLLARS**

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**SQUARE FEET OF NEW CONSTRUCTION**

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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.
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.

To meet all different water conditions, The American Brass Company offers two alloys of Anaconda Brass Pipe.

For normally corrosive waters—Anaconda 67 Brass Pipe. This pipe contains not less than 67% copper. It is guaranteed to be structurally sound and physically perfect. It is semi-annealed and seamless.

For highly corrosive waters—Anaconda 85 Red-Brass Pipe. This pipe contains not less than 85% copper, and is offered as the best corrosion-resisting pipe obtainable. It, too, is fully guaranteed.

Proved by 16 years of testing!

These two alloys will serve all water conditions. This has been proven in 16 years of exhaustive research—when various alloys of brass pipe were tested, to determine which alloys would best resist various degrees of corrosion. The laboratory tests were then checked with tests of actual use—and Anaconda 67 Brass Pipe and 85 Red-Brass Pipe is the result.

An important service to architects

Today, the Technical Department of The American Brass Company is prepared to help determine the character of the local water supply and recommend the best alloy of pipe for use under specific conditions. You are cordially invited to communicate with The American Brass Company, General Offices, Waterbury, Conn.
Architects who are husbands know this delicate problem

It exists in nearly every home—a situation brought about, chiefly, by the changing hygienic habits of women. And with it, in many cases, go expense, annoyance—and not infrequently embarrassment.

To state the case bluntly:

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.

The new Mueller Pop-up Drain for tubs is another Mueller refinement that eliminates bathroom troubles. All working parts are removable from the inside of the tub without breaking a joint. Positive in action and so simple there is nothing that can get out of order. Send for special information.

MUELLER CO. (Established 1857), Decatur, Illinois; Branches: New York, 135th St. and Walnut Ave., Bronx; Dallas, San Francisco, Los Angeles; Canadian Factory: MUELLER, Limited, Sarnia.
Douglas Solid Nickel Silver Trimmings have the everlasting brilliance of starlight.

**DOUGLAS FIXTURES**

*Trimmed with Solid Nickel Silver*

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

— They retain their lustrous beauty under severest usage.
— They can absolutely be depended upon to render long and uninterrupted service.
— They are easy to keep clean, and cannot be marred by acids.
— The Solid Nickel Silver Trimmings, specially designed by DOUGLAS for convenient and satisfactory operation, stay silvery bright indefinitely.

We have devoted years of careful study to modern building needs, and have developed and perfected fine plumbing fixtures to meet the special requirements of hospitals, hotels, schools, office buildings, industrial plants and residences. Our complete catalog is yours for the asking. Write for it NOW—no obligation!

---

**THE JOHN DOUGLAS COMPANY**

Specialists in High-Grade Plumbing Fixtures

Established in 1887

Cincinnati, Ohio

Solid Nickel Silver is a product of The International Nickel Company, Inc., of New York, largest producers of high content nickel alloys in the world.

Chromium or nickel plated trimmings have a thin skin of plating—1/5000 of an inch thick—over a brass base. This plating soon wears off and the trimmings become very unsightly.

DOUGLAS
IN ATLANTA'S CITY HALL—SOLID NICKEL SILVER FIXTURES BY DOUGLAS

It is only natural that one of the South’s most beautiful public buildings—Atlanta’s new City Hall—should be equipped with plumbing fixtures of Solid Nickel Silver. This attractive material meets the highest architectural standards of quality... The hardness, toughness and strength of Solid Nickel Silver insure better wear-resistance for valve seats. Solid Nickel Silver fixtures are distinguished by a permanent silver-like lustre, comparable to the beauty of Pure Nickel and other high Nickel alloys. They are not easily marred or broken during installation or use. In short, Solid Nickel Silver plumbing fixtures constitute the most durable as well as the most attractive type of high quality sanitary equipment now available.
HYGIENIC

WE WERE the first manufacturer to advocate and advertise the quiet flushing closet to the American people. For years the Quiet Si-wel-clo dominated the market and our exploitation of it has measurably raised the standard of closets furnished to the public. Now comes the Improved Quiet Si-wel-clo—a hygienic improvement, the advantage of which every man and woman will instantly recognize.

In the improved Si-wel-clo both bowl and seat are correctly designed to encourage the natural position of the body which aids organs and muscles to function thoroughly and naturally. In addition, the comfort of the saddle seat minimizes the unhygienic tendency, especially noticeable in children, to grudge sufficient time for proper elimination. The decided dip in the rim elevates the front and rear of the bowl opening and minimizes the possibility of soiling.

Another improvement, and a very important one, of the new Si-wel-clo is the strong positive action and over-size passageway which quickly and positively passes to the sewer anything that is desirable to dispose of through a water closet.

The greatest care has always been taken in the Si-wel-clo to make every unit of the outfit as fine and trouble-free as possible. 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.

Send for a supply of Improved Si-wel-clo Folders, printed up with your name and address. Sell these better closets to your community.

THE TRENTON POTTERIES COMPANY

TRENTON, NEW JERSEY, U. S. A.

National Showroom, New York City Branch Offices
101 Park Ave., Entrance on 41st St. Boston, Philadelphia, Chicago
Export Office, 115 Broad St., New York City

Our Guarantee:
The world. The Te-poo, which you have paid.

We make but one grade of ware—the best that can be produced—and sell it at reasonable prices. We sell no seconds or culls. Our ware is guaranteed to be equal in quality and durability to any sanitary ware made in trade mark is found on all goods manufactured by us and is your guarantee that you have received that for
SUGGESTED ARRANGEMENT
OF A HYDROTHERAPEUTIC DEPARTMENT

Today, most hospital officials know Hydrotherapy’s great benefits to nervous ailments. Athletic clubs are also increasing their revenue by the use of Hydrotherapeutic treatments.

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

Above is shown a carefully thought-out plan for a Hospital or Sanitarium Hydrotherapeutic department. This Douche Room has been so arranged that one attendant controls every fixture and can observe all patients from his central station.

Other plans may be worked out for varying needs and conditions.

Almost from the first, Clow has been a supporter of Hydrotherapy... actually having designed a number of the well-known fixtures of today. Clow Hydrotherapeutic fixtures are used in Canada, South America, and other countries in addition to the United States.

For over half a century *Clow* has meant the best in Plumbing.

JAMES B. CLOW & SONS, 201-299 NORTH TALMAN AVE., CHICAGO
Sales offices in principal cities

CLOW

PREFERRED FOR EXACTING PLUMBING SINCE 1878
A trade mark bespeaks the quality of a product. Those who recognize the marks of these CRODON licensees will instinctively associate with them, the best there is in the industries they represent. Such is the prestige of a name.

CRODON identifies quality Chromium Plate . . . By “quality” is meant uniformly good... time-tested Chromium plate... consistently reliable in service!

CRODON has been put to the test by thousands of architects during the last few years. It is being written into an ever increasing number of specifications. Its formulae and laboratory service have been pre-empted by the country's most noteworthy manufacturers.

So to all Architects we submit CRODON and present our impressive list of licensees as its exponents and sponsors.

Our Service Department will gladly send a complete list of CRODON Licensees to those who request it.

CRODON
THE CHROME PLATE

CHROMIUM CORPORATION OF AMERICA
Licenses of
UNITED CHROMIUM INCORPORATED

Executive Offices: 51 East 42nd Street, New York City. Branch Offices and Plants: Chicago, San Francisco, Detroit, Cleveland, and Waterbury, Conn.
THE increasing number of specifications by architects and engineers for NATIONAL Copper-Steel Pipe in soil, waste, vent lines and rain leaders of large buildings, indicates the wide acceptance of this product as a means of securing greater resistance to atmospheric corrosion in these lines, or wherever pipe is exposed to alternate wet and dry conditions.

That the life of pipe in all such services can be greatly increased by using copper-steel is an established fact, based on tests and actual service records over many years. Therefore, copper-steel superiority for corrosion resistance is not a theory nor recent experiment, but a sound investment in the interest of prolonged life of pipe lines, less interruption to service in the building, and decreased costs of repairs or replacements.

NATIONAL Copper-Steel Pipe is the same high-grade steel pipe which architects and engineers have specified for many years, with the addition of a small percentage of pure copper, which thoroughly alloys with the highly refined steel, making it more resistant to atmospheric corrosion. To secure the benefit of the experience of pioneers in making this product, be sure to specify—

NATIONAL COPPER-STEEL PIPE
The Original Copper-Steel Pipe

NATIONAL TUBE COMPANY • Pittsburgh, Pa.
Subsidiary of United States Steel Corporation
THREE NEW KITCHEN COLORS BY KOHLER

ANNOUNCING AN IMPORTANT CONTRIBUTION TO THE PLANNING OF KITCHENS THAT HAVE NOT MERELY "COLOR"—BUT COLOR THAT IS PLEASING AND LIVABLE AS WELL

Kohler color experts, recognizing that kitchens and bathrooms present quite different decorative problems, have evolved three new colors solely for kitchen sinks—ADAPTABLE colors, specially created to meet the peculiar requirements of the kitchen. • They are BACKGROUND colors. They permit the sink—a large, permanent fixture—to take its place restfully and unobtrusively with the background of the room. • • • One of the new colors is Bisque, of a mellow, creamy quality, especially adapted to the room that needs a sunny note. For the more vivid scheme, there is Crystal Gray, its rich, soft tone adding the desired contrast. For a delightfully cool kitchen there is Silver Green. • These new tones merge quietly with color-trimmed ranges, cabinets, and refrigerators, and make possible the expression of the owner's individual taste in gay touches such as colored sauce pans and bright curtains.

• These colors in the new Kohler sink designs—wonders of convenience, with DUOSTRAINER drains, chromium-plated fittings, and FLINT-GLOSS acid-resisting enamel; even with provision in some for ELECTRIC DISHWASHING—now make attainable the ideal modern kitchen. • • • Special arrangements have been made to display latest sink models in the new colors at all Kohler Show Rooms. Believing that all architects will be genuinely interested, we cordially invite you to attend this presentation.

KOHLER CO., Founded 1873, KOHLER, WIS. * Shipping Point, Sheboygan, Wis. * Branches in Principal Cities

KOHLER OF KOHLER

Plumbing Fixtures

LOOK FOR THE KOHLER TRADE MARK ON EACH FIXTURE
There is no substitute for COHOES pipe.

Old fashioned puddled genuine wrought iron pipe.

It takes five years or more to prove the merits of a pipe installation. Cohoes Pipe has demonstrated in 75 years of every conceivable use that it resists corrosion and rust, and is leak proof.

Our handbook of "Pipe Facts" contains authoritative information of sizes, weights and uses. Send for it.

COHOES ROLLING MILL CO.
COHOES, NEW YORK

Branches: NEW YORK-CHICAGO-LOS ANGELES-SEATTLE-PORTLAND
BOSTON - CLEVELAND - DETROIT - NORFOLK - MINNEAPOLIS
The Invisible Patronage Attraction

IN stone, terra cotta or marble buildings, regardless of the rigidity of the structural steel or reinforced concrete frame, there are movements which occur that will create an overstressing of the facing material at various points. These movements may be caused by compression of the steel, vibration, wind action or unequalized expansion or contraction between the frame and the facing material due to temperature changes.

Where these movements occur—if there is not some elasticity in the face of the building—there will be some cracked facing blocks due to overstress.

The Cowing Joint, installed in place of one mortar joint at each story height, provides the needed elasticity. It gives exact and automatic compensation for all destructive stresses thrown on the facing material due to temperature changes.

It is neat... will not squeeze out... eliminates frequent tuck-pointing... it is everlasting.

Include Cowing Joint in the specifications. Estimates will be furnished promptly.

Cowing Pressure Relieving Joint Co.
160 N. Wells St. - Chicago, Ill.

"Oh, yes, Bob and I always stop at the Victoria. The food and service are perfect. But what appeals to us, after having knocked around the world so much, is that the rooms are always so warm and comfortable and we have never had that most annoying experience of no hot water, just when a bath is wanted.

"You know I am interested in the Hospital at home, so I asked Bob to find out how this hotel managed to give plenty of heat and hot water. The Manager said it was because all radiators are equipped with Sarco Radiator Traps and Inlet Valves, and hot water is regulated by a Sarco Temperature Regulator. So I'm going to see that our Hospital is equipped with Sarcos, as we've had so much trouble with heat and hot water."

Small items, you say—just-right room temperature and plenty of hot water. True, perhaps, but these are two of the many things which go to make satisfied guests and tenants.

And it is your attention to "little things" in the design and equipment of buildings that holds customers.

Sarco Radiator Traps, Temperature Regulators and Packless Inlet Valves are in hundreds of buildings. Let us give you the names of installations in your vicinity. Then ask the owners about the Sarco.

SARCO CO., INC.
183 Madison Ave., New York, N. Y.

SARCO (Canada) Limited, 1605 De Lorimier Ave., Montreal

Sarco Radiator Traps, Temperature Regulators and Packless Inlet Valves are in hundreds of buildings. Let us give you the names of installations in your vicinity. Then ask the owners about the Sarco.
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Showing the difference between protection offered by ordinary wood treatment (above) and penetrating Minwax (below).

No film could ever stand the savage treatment of daily wear... as does this TOUGH, PENETRATING GUM

Most floor finishes, whether for wood or masonry, depend on the formation of a film for their protective qualities. No film ever devised can stand the wear and tear to which most floors, especially maple, are normally subjected.

Minwax Finishes for maple floors do not depend on the formation of a film to protect the surface to which they are applied. When mopped on the surface, they penetrate deeply into the wood, toughening, densifying and sealing it so that it becomes practically waterproof and stainproof. When, and if, the floor so protected does show signs of wear, there is no surface film to become broken and expose the raw unfinished wood beneath. Therefore no rescraping is required—a quick wipe over with the same material restores the entire floor.

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SINCE 1879 - THE WORLD'S PIONEER MANUFACTURER OF LAUNDRY MACHINERY
THERE'S A NATIONAL HEATING SYSTEM FOR EVERY BUILDING NEED

NATIONAL LOW WATER LINE BOILER
Where Shallow Basements Won't Accommodate the Ordinary Boiler...

The National Low Water Line Boiler is extensively used in theatres, and other long buildings, where the provision of proper pitch on long pipe runs cuts down available head space. Standard also in tide-water countries, where flooding makes deep basements impractical.

This boiler utilizes a scheme of water circulation that brings the coldest water in contact with the coolest gases, the hottest water against the flames in the fire box. Numerous water legs speed heat transfer. For years an established favorite, this boiler has been improved and refined to a high pitch of perfection.

National Bonded Boilers are designed to perform efficiently with all leading types of fuel: coal, coke, oil and gas. They can be converted on the ground to meet the individual requirements of the fuel selected. Engineering design scientifically coordinates every part to produce economical combustion and thoroughly satisfactory heating.

National Heating Systems are Made-to-Measure; that means that the heating requirements of each room are scientifically determined. Then the boiler, the radiators, and the accessories required to establish a balanced system, proportioned in every respect to the need, are selected and installed by the National Heating Specialist.

A line to us will bring you complete and helpful information—immediately.

NATIONAL RADIATOR CORPORATION
Executive Offices: 55 West 42nd Street, New York, N.Y.
What Is Incineration?
The Incinerator
Plus The Service
Plus The Company

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.

It has won its position as the largest incinerator company in the world, through a product of genuine merit, backed by integrity and singleness of purpose.

KERNERATOR INCINERATION
Garbage and Waste Disposal for New and Existing Buildings

See our catalog in Sweet's

KERNER INCINERATOR CO.
715 East Water Street MILWAUKEE
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."
Uncontrolled heating is wasteful. No manual control can be economical—or healthful—because of the unavoidable wide temperature fluctuations.

The Thermotrol—which regulates room temperatures through regulation of individual radiators—will accomplish fuel economies that are almost unbelievable because it eliminates wasteful heating.

The Thermotrol is simple to install, accurate in its functioning, inexpensive to buy and maintain and it will save $\frac{1}{3}$ to $\frac{1}{2}$ of the fuel bill.

It pays for itself out of savings.

Ask us for complete information.

STERLING ENGINEERING CO.
1645 Holton Street
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Representatives in principal cities

**KITCHEN ENGINEERING**

Our service covers planning and designing to secure working economies. Likewise the furnishing of standard equipments, and special labor saving items for preparing and serving food. Over a half century in business. Finest of installations to our credit.

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It has a name by which to call it
It has a mark you can see!

It's as easy to specify pine as it is to write in electrical, plumbing, and refrigerating equipment. Write Pondosa Pine! The name stands for lumber that has been carefully seasoned, rigidly graded, and carefully milled...lumber that will remain beautiful years after specifications have been forgotten.

More than that, Pondosa Pine can be absolutely identified by the mark of the pine tree. The trade-mark is imprinted on the end grain of Pondosa, and designates it as a dependable lumber, ideally suited for any softwood purpose. Write in Pondosa Pine. It means good lumber. Address Dept. 75, Western Pine Manufacturers' Association, Portland, Ore.
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 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.
Boiler and radiation costs reduced by using GYPSTEEL ROOF

WHEN the American Aeronautical Corporation first planned its hangar and manufacturing plant at Port Washington, L.I., a wood plank roof was to be used.

But when they figured out that a Gypsteel Pre-Cast Gypsum Roof would insulate against heat and cold much better and enable them to put in a smaller boiler and less radiation, the Gypsum Roof went on.

Less coal is needed, too.

Best of all, the Gypsteel Roof cost no more than the plank roof would have.

Not to mention the many other good things about a Gypsteel Roof. Easy and rapid installation. Light undersurface. Sound insulation. Smaller amount of steelwork often required. Elimination of form work.

If it's an airport you're thinking about (and what live community isn't) our guess is that you'll want Gypsteel Roofs to give you these substantial savings that Lockwood, Greene & Co. got at Port Washington.

Let us give you the full facts and figures.

GYPSTEEL

Laying a Gypsteel slab

Tying the reinforcement

Grouting the joints between slabs

General Offices: Linden, N. J.

STRUCTURAL GYPSUM CORPORATION

Sales Offices in Principal Cities
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. Box 20, 8/4 x 11 ins. Important data on a valuable material.

ASH HOISTS
Gillis & Geoghegan, Inc., 546 West Broadway, New York. G & G Telescopic Hoist catalog, 8/4 x 11 A. L. A. Standard Classification 301, 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., 546 West Broadway, New York. G & G Telescopic Hoist catalog, 8/4 x 11 A. L. A. Standard Classification 301, 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. 266 pp., size 7 1/2 x 10 1/2 ins., an attractive and interesting history of the history and use of brick in Italy from ancient to modern times, profusely illustrated with 69 line drawings, 200 halftones, and 23 colored plates, with a map of modern and XII century Italy. Bound in linen. Price now $2.00, postpaid (formerly $5.00). Half Morocco, $7.50.
Brickwork in Italy, 1928. Illustrated 266 page volume. 112 pp., 8/4 x 11 ins. Profusely illustrated. Deals with the planning of factories and employees’ housing in detail. Suggestions are given for interior arrangements, including restaurants and rest rooms. Price now $1.00 postpaid (formerly $2.00).

CEMENT
Kosmoptor, the Mortar for Cold Weather. Folder, 4 pp., 3/4 x 6 1/4 ins. Tells why Kosmoptor should be used in cold weather.
Louisville Cement Co., 315 Guthrie St., Louisville, Ky. Bitume, the Mortar for Perfect Mortar. Self-filling 30lb. Box, 8/4 x 11 ins. 16 pp. Illustrated. Contains complete technical descriptions. Describes entire line of tin-chad and corrugated fire doors, complete with automatic closers, track hangers and all the latest equipment—all approved and labeled by Underwriters Laboratories.

CHURCH EQUIPMENT

CONCRETE BUILDING MATERIALS
Concrete Steel Company, 42 Broadway, New York. Modern Concrete Reinforcement. Brochure, 22 pp., 8/4 x 11 ins. Illustrated.

CONCRETE COLORINGS

CONSTRUCTION, FIREPROOF

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., 8/4 x 11 ins. Illustrated. Deals with preventing cracks, spalls and breaks.

DAMPPROOFING

DOORS AND TRIM, METAL
The American Brass Company, Waterbury, Conn. Anaconda Architectural Bronze Extruded Shapes. Brochure, 180 pp., 8/4 x 11 ins., illustrating and describing more than 2,000 standard bronze shapes of cornices, jamb casings, moldings, etc.
The Knauf Company, Niles, Michigan. Detail sheet, 8/4 x 11 ins., featuring Heavy Welded Bronze Doors.
Richards-Wilcox Mfg. Co., Aurora, Ill. Fire-Doors and Hardware. Booklet, 8/4 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.

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

ELEVATORS—Continued
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. 4½ x 8½ ins., 70 pp. Illustrated. Descriptive pamphlets on hand power freight elevators, sidewalk elevators, automobile elevators, etc. Catalog and pamphlets, 8⅞ x 11 ins. Illustrated. Important data on different types of elevators.

ESCALATORS
Otis Elevator Company, 260 Eleventh Ave., New York, N. Y.
Escalators. Booklet, 12 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.

FLOOR HARDENERS (CHEMICAL)
Master Builders Co., Cleveland, Ohio.

Concrete Steel Company, 42 Broadway, New York.
Economical Fireproof Floors for Suburban Buildings. Folder, 4⅞ x 8½ 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.

FLOORING
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.

Standard Lumber Corporation, 610 Olive Street, St. Louis, Mo.

FLOORING
Armstrong Cork Co. (Linoleum Division), Lancaster, Pa.


Linoleum Layer's Handbook. 3½ x 6 ins., 36 pp. Instructions for laying linoleum layers and others interested in learning most satisfactory methods of laying and taking care of linoleum.


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., with reproductions in color of suitable patterns, also specifications and instructions for laying.

Blabon's Main Linoleum and Cork Carpet. Gives quality samples, 3 x 6 ins. of various types of floor coverings.
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 up to 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

Carter Blooming Ford Co., Keith & Perry Bidg, Kansas City, Mo.

File Folder, 200 pockets, 15 x 12 ins. For use in connection with A. I. A. System of filing. Contains detailed information on Bloomingford installation and construction. Also contains leaflet form for specification writer and drafting room. Literature embodied in folder includes a specification sheet covering the use of Bloomingford in a general industrial service and Supplementary Specification Sheet No. 1, which gives detailed specification and explanations of an application method for installing Bloomingford in gymnasiums, armories, drill rooms and similar locations where maximum realism is required.

Coffin 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.
Pyrobar Floor Tile. Folder, 8 1/4 x 11 ins. Illustrated. Data on rubber tile for flooring in interiors of different historic styles.

Cutler Mail Chute Model F. Booklet, 4 x 9 1/4 ins., 8 pp. Illustrated. Data on different kinds of mail-chute apparatus. Also contains 12 pp. of blank forms for mailing.

Cutler Mail Chute Company, Rockford, Ill.
Cutler Mail Chute Model F. Booklet, 4 x 9 1/4 ins., 8 pp. Illustrated.


Dunham, C. A.
Dunham Company, 450 East 42nd St., New York, N. Y.


Dunham Radiator Trap. Bulletin 4A. 8 x 11 ins. Illustrated. Details the use of heating apparatus of this kind. Also contains 12 pp. of blank forms for mailing.

Dunham, C. A.

Dunham Radiator Trap. Bulletin 4A. 8 x 11 ins. Illustrated. Details the use of heating apparatus of this kind. Also contains 12 pp. of blank forms for mailing.

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Each of these, and hundreds of others, are Carey-roofed!

Whenever you see a Carey Built-up Roof applied to a stately building or mammoth industrial plant, you know that the owner has made a wise investment in weather protection. And you know, too, that the architect or engineer has protected his good reputation by endorsing a roof that will reflect credit on his good judgment.

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.

Each Carey Built-up Roof is guaranty-bonded by a forty-million-dollar surety company, and backed by an organization that is national in its scope.

THE PHILIP CAREY COMPANY
Lockland, CINCINNATI, OHIO
HEATING EQUIPMENT—Continued

May Oil Burner Corp., Baltimore, Md.
Takes the Quest of the Question. Booklet, 16 pp., 6 x 9 ins.
McQuay Radiator Corporation, 35 East Wacker Drive, Chicago, Ill.
McQuay Bulletin 65. Booklet, 4 pp., 8 1/2 x 11 ins. Illustrated.
McQuay Metal Heater. Booklet, 8 pp., 8 1/2 x 11 ins. Illustrated.
Gives specifications and radiator capacities.
Moore-McDowell Co., Chicago.
Modine Copper Radiation. Booklet, 28 pp., 8 1/2 x 11 ins. Illustrated.
Deals with industrial, commercial and domestic heating.
A Few Short Years. Folder, 4 pp., 8 1/2 x 11 ins. Illustrated.
Dairy Plant Heating. Folder, 4 pp., 8 1/2 x 11 ins. Illustrated.
Nash Engineering Company, South Norwalk, Conn.
Bulletin 68. Booklet, 8 pp., 8 1/2 x 11 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., 10 1/2 x 14 ins. Illustrated. Describes in detail the Unit Type Motor Driven Jennings Condensation Pump.
Bulletin 52. Brochure, 6 pp., 10 1/2 x 14 ins. Illustrated in color. Devoted to Jennings Standard Centrifugal Pumps for house service, business, city water, pressure to supply top stories, for circulating warm water, etc.
National Radiator Corporation, Valparaiso, Ind.
Aero Radiator Beauty and Worth. Catalog 34. Booklet, 6 x 9 ins., 20 pp., describing and illustrating radiators and accessories.
Six Years of Service—How to Form a Great Corporation. Booklet, 28 pp., 8 1/2 x 11 ins. Illustrated. Valuable data on heating.
Prometheus Electric Corporation, 30 West 13th St., New York.
Electric Heating Radiators. Booklet, 34 pages. 8 1/2 x 11 ins. Illustrated. Specialties for heating, cooking, hospitals, organ lofts, etc.
Rome Brass Radiator Corporation, 1 East 42nd Street, New York.
Garbage and Waste Disposal for Apartment Buildings. Folder, 8 1/2 x 11 ins., 8 pp. Illustrated. Describes principle and design of Kernerator Comfort Incinerator for apartment 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 the necessary part of hospital service is taken care of with the Kernerator. Gives list of hospitals where it has been installed.
The Kernerator (Chimney-fed) Catalog. No. 17, 20 pp., 8 1/2 x 11 ins. Illustrated. Data on a valuable detail of equipment.

INCENTRATORS

Hosmer Incentrator Co., Milwaukee, Wis.
A. I. A. File, 12 pp., 8 1/2 x 11 ins., inside. Suggests for architects a practical method of installing heating equipment.
Specialized Home Comforts Service Plan Book. 40 pp., 8 1/2 x 11 ins., inside. Illustrated. A comprehensive study of the many advantages of incineration.
Blue Star Furnishing a Home. Booklet, 16 pp., 5 1/2 x 8 1/2 ins., inside. Illustrated. Explaining fully the Blue Star principles, covering heat, incineration, refrigeration, etc.
Joanm-Graver Incentrators. Folder, 4 pp., 8 1/2 x 11 ins. Illustrated.
Kernor Incinerator Co., 1200 West 35th St., Chicago, Ill. 735 W. Water St., Milwaukee, Wis.

INSULATION

The Insulation of Walls with Armstrong's Corkboard. Booklet. Illustrated. 7 1/2 x 10 1/2 ins., 32 pp. Discusses means of insulating roofs of manufacturing and commercial structures.
Insulation of Roofs to Prevent Condensation. Illustrated booklet, 7 1/2 x 10 1/2 ins., 30 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.
Structural Gypsum Corporation, Linden, N. J.
Deals with Sizes T and U Jennings Vacuum Heating Pump for 2500 and 5000 square feet equivalent direct radiation.
Deals with Sizes T and U Jennings Vacuum Heating Pump for 2500 and 5000 square feet equivalent direct radiation.

HOSPITAL EQUIPMENT

The Frisk Co., Inc., 369 Lexington Ave., New York City.
Catalog 436. 7 x 10 ins., 16 pp. A booklet illustrated with photographic drawings, showing the wide variety of equipment in hospitals, as operating table reflectors, linolite and multilite concentrators, ward reflectors, base lights, ward reflectors, giving sizes and dimensions, explaining their particular fitness for special uses.
Holpham Company, 32 Madison Avenue, New York.
Lightening Specific for Hospitals. Booklet, 30 pp., 8 1/2 x 11 ins. Illustrated.
The International Nickel Company, 67 Wall St., New York, N. Y.
Hospital Applications of Monel Metal. Bulletin, 16 pp. Illustrated. Gives types of equipment in which Monel Metal is used, reasons for its adoption, with sources of such equipment.
Pick-Barn Company, Inc., Albert, 1200 West 35th St., Chicago, and Cooper Square, New York.
Some Thoughts About Hospital Food Service Equipment. Booklet, 28 pp., 8 1/2 x 11 ins. Illustrated. Valuable data on an important subject.
Prometheus Electric Corporation, 30 West 13th St., New York.
Electric Heating Specialties. Booklet, 24 pages. 8 1/2 x 11 ins. Illustrated. Specialties for heat, cooking, hospitals, organ lofts, etc.

HOTEL EQUIPMENT

Pick-Barn Company, Inc., Albert, 1200 West 35th St., Chicago, and Cooper Square, New York.
Some Thoughts on Furnishing a Hotel. Booklet, 7 1/2 x 9 ins. Data on complete outfitting of hotels.

JOISTS

Bates Expanded Steel Truss Co., East Chicago, Ind.
Catalog No. 4. Booklet, 32 pp., 8 1/2 x 11 ins. Illustrated. Gives details of truss construction with loading tables and specifications.

REQUEST FOR CATALOGS

To get any of the catalogs described in this section, put the name of the catalog desired, the name of the manufacturer and send coupon to The Architectural Forum, 5 Fifth Ave., New York.

"The architects have led a movement for a great and beautiful national capital. Everyone may help through his Congressman." — Horace W. Peaslee.
SELECTED LIST OF MANUFACTURERS' PUBLICATIONS——Continued from page 136

JOISTS—Continued

KITCHEN EQUIPMENT


LABORATORY EQUIPMENT
Alberene Stone Co., 153 West 22nd Street, New York City. Booklet, 8½ x 11 ins., 26 pp. Stone for laboratory equipment, countertops, partitions, stair treads, etc.


LANTERNS
Todhunter, Arthur, 119 E. 57th St., New York, N. Y. Harwood Lath Lanterns. Booklet, 54 x 6 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

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


Steelsex Data Sheet No. 1. Folder, 8 pp., 8½ x 11 ins. Illustrated. Steelsex for floors on steel joists with flat top flanges.

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

Steelsex Data Sheet No. 3. Folder, 8½ x 11 ins. Illustrated. Steelsex for roofs on steel joists.

Steelsex for folders on wood joists.

North Western Expanded Metal Co., 1204 Old Colony Building, Chicago, Ill. Illustrated.

North Western Expanded Metal Products. Booklet, 8½ x 11 ins., 32 pp. Illustrated. Describes different products of this company, such as Kool-burn metal lath, 20th Century lath and lath channels, etc.

Longspan 1¼-inch Rib Lath. Folder. 8 pp., 8½ x 11 ins. Illustrated. Deals with a new type of V-Rib expanded metal.

A. L. Book. Round volume, 8½ x 11 ins. Contains actual samples of several materials and complete data regarding them.

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


LAUNDRY MACHINERY

LIGHTING EQUIPMENT


Smyser-Rayor Co., 1700 Walnut Street, Philadelphia, Pa. Catalog "J" on Exterior Lighting Fixtures. Illustrated, giving data on over 500 designs of standards, lanterns and brackets of bronze or cast iron.

Todhunter, Arthur, 119 E. 57th St., New York, N. Y. Lighting Fixtures, Lamps and Candelabras. 24 pp., 8½ x 11 ins. Illustrated. Fine assortment of Sconces, Chandeliers, Pendants, etc.


LUMBER

MAIL CHUTES

MANTELS


MARBLE
The Georgia Marble Company, Tate, Ga.; New York Office, 1228 Broadway. Why Georgia Marble Is Better. Booklet, 24 x 6 ins. Gives analysis, physical qualities, comparison of absorption with granite, opinions of authorities, etc. Convincing proof, 3½ 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


The International Nickel Company, 67 Wall St., New York. Monel Metal Primer. 8 folders, 4 pp., 8½ x 11 ins. Contains valuable data on use of monel in kitchens, laboratories, etc.

MILL WORK—See also Wood
Curtis Companies Service Bureau, Clinton, Iowa. "American" Living. Book, 9 x 12 ins., 240 pp. Illustrated. This is an Architects' Edition of the complete catalog of Curtis Woodwork, as signed by Trowbridge & Ackerman. Contains many color plates.

Better Built Homes. Vols. XV-XVIII, incl. Booklet, 9 x 12 ins., 45 pp. Illustrated. Designs for houses of five to eight rooms, respectively, in several authentic types, by Trowbridge & Ackerman, architects for the Curtis Companies.

Curtis Catalog and Stair Work. Booklet, 48 pp., 7½ x 10½ ins. Illustrated. Complete details of all items of Curtis woodwork, for the use of architects.

Curtis Cabinet and Stair Work. Booklet, 48 pp., 7½ x 10½ ins. Illustrated.


Curtis Interior Doors. Booklet, 7½ x 10½ 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.
an office right under the roof

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

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.

Armstrong's Corkboard Insulation insures ideal top-floor living and working conditions for many other office buildings, as well as for factories, apartments, and hotels. When used in adequate thickness, it makes the roof practically heatproof. For average conditions the proper thickness is one and one-half or two inches, and with Armstrong's Corkboard, these thicknesses are laid in a single layer, one operation, one labor cost.

Complete data on roof insulation will be supplied promptly on request. Armstrong Cork & Insulation Company, 900 Concord Street, Lancaster, Pennsylvania.
SELECTED LIST OF MANUFACTURERS' PUBLICATIONS — Continued from page 188

PARCEL DELIVERY DEVICES
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 11 ins., 12 pp. Full data regarding the important line of partitions, along with erection instructions for partitions of three different types.

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

Irving Hamlin, Evanston, Ill.

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

Improved Office Partition Company, 25 Grand St., Elmhurst, L. I., N. Y.

Rands-Weston Mill Co., Aurora, III.
Partitions. Various folders, 8½ x 11 ins., 15 pp. Illustrated. Describes complete line of track and hangers for all styles of sliding partitions, accordion and flush-door partitions.

U. S. Gypsum Co., Chicago, Ill.

PIPE
American Brass Company, Waterbury, Conn.

American Rolling Mill Company, Middleport, Ohio.

Clow & Sons, James B., 354 S. Franklin St., Chicago, Ill.
Catalog A. 5 x 10½ ins., 200 pp. Illustrated. Shows a full line of steam, gas and water works supplies.

Circle A Products Corporation, New Castle, Ind.
Hollow Steel Standard Partitions. Various folders, 8½ x 11 ins. Illustrated. Complete instructions with full data on different styles of steel partitions, together with details, elevations and specifications.


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Rands-Weston Mill Co., Aurora, III.
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U. S. Gypsum Co., Chicago, Ill.

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American Brass Company, Waterbury, Conn.

American Rolling Mill Company, Middleport, Ohio.

Clow & Sons, James B., 354 S. Franklin St., Chicago, Ill.
Catalog A. 5 x 10½ ins., 200 pp. Illustrated. Shows a full line of steam, gas and water works supplies.

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Fulton Sylphon Company maintains a national organization of thirty-nine sales agencies specially trained and strategically located, to render a prompt, helpful and always available service.

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Write to Department A
SELECTED LIST OF MANUFACTURERS' PUBLICATIONS — Continued from page 190

PLASTIC—Continued

Interior-Valley Mastodon. Catalogue, 24 pp., 9½ x 11½ ins. Illustrated. Describes origin of Keene's Cement and views of buildings in which it is used.

PLUMBING EQUIPMENT

Clow & Sons, James B., 524 S. Franklin St., Chicago, Ill. Catalog M. 9½ x 11 ins., 134 pp. Illustrated. Shows complete line of plumbing fixtures for Schools, Railroads and Industrial Plants.


Hospital. Brochure, 60 pp., 8½ x 11½ ins. Illustrated. Deals with fixtures for hospitals.


PNEUMATIC TUBE SYSTEMS


4. Sheet. Data. Sheet showing schematic diagrams for bank, factory and wholesale buildings, table of sizes, space requirements and preliminary layout steps. A. I. A. 35h22.

PUMPS


The Trane Co., La Crosse, Wis. Trane Small Centrifugal Pumps. Booklet, 3½ x 8 ins., 16 pp. Complete data on an important type of pump.

RADIO EQUIPMENT


RAMPs

Ramp Buildings Corporation, 21 East 40th St., New York, N. Y. Building Garages for Profitable Operation. Booklet, 8½ x 11 ins. Illustrated. Discusses the need for modern mid-city, parking garages, and describes the Bally Motoram 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.


REFRIGERATION


REINFORCED CONCRETE—See also Construction, Concrete

Longepore 14-inch Rib Lath. Folder, 4 pp., 5½ x 8½ ins. Illustrated. Deals with a new type of V-Rib expanded metal.


RESTAURANT EQUIPMENT


ROOFING


Federal Cement Tile Co., 608 S. Dearborn Street, Chicago. Catalog and Roof Standards. Booklet, 36 pp., 8½ x 11½ ins. Illustrated. Describes roof coverings and describes many types of tiles, including complete data, weights and dimensions, specifications and detail drawings. Also includes valuable 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, 56 pp., 8½ x 11½ ins. Illustrated. Contains views of theaters designed by some of the country's leading architects.


Ludowici-Celadon Company, 104 So. Michigan Ave., Chicago, Ill. "Ancient" Tapered Mission Tile. Leaflet, 8½ x 11½ ins. 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. (1–2). Relative Effectiveness of Various Types of Roofing Construction in Preventing Condensation of the Under Surface Roof and the health and comfort of the people living there. Bulletin, 4 pp., 8½ x 11½ ins. Important data on the subject.

Gypsteel Pre-cast Fireproof Roofs. Booklet, 48 pp., 8½ x 11½ ins. Illustrated. Information regarding a valuable type of roofing.


Sheetrock Pyrofill Roof Construction. Folder, 8½ x 11½ ins. Illustrated. Covers use of roof surface which is pored in place.

SCHOOL EQUIPMENT


SEWAGE DISPOSAL

Kewanee Private Utilities, 424 Franklin St., Kewanee, Ill. Specification Sheets. 7½ x 10½ ins. 40 pp. Illustrated. Detailed drawings and specifications covering water supply and sewage disposal systems.


LAMINATED Wood Airplane Struts...

YES!

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.

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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.

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Bristol  Chattanooga  Cleveland  Des Moines  Kansas City  Memphis  Nashville  New Orleans  Pittsburgh  San Francisco  Tampa  Ottawa
Sydney, Australia  Johannesburg  South Africa
SELECTED LIST OF MANUFACTURERS' PUBLICATIONS — Continued from page 192

STORE FRONTS—Continued

Modern Bronze Store Front Co., Chicago Heights, Ill.

Zour! Drawn Metals Company, Chicago Heights, Ill.
Zouri Safety Key-Set Store Front Construction. Catalog. 8% x 11 ins., 60 pp. Complete information with detailed sheets and installation instructions convenient for architects.

International Store Front Construction. Catalog. 8% x 11 ins., 70 pp. Contains complete information with detailed sheets and installation instructions convenient for architects' files.

Store Fronts by Zouri. Booklet, 32 pp., 9 x 12 ins. Illustrated.

TELEPHONE SERVICE ARRANGEMENTS

All Bell Telephone Companies. Apply nearest Business Office, or American Telephone and Telegraph Company, 165 Broadway, New York.

Planning Home Telephone Conveniences. Booklet, 52 pp., 8% x 11 inches. Illustrated.


TERRA COTTA

National Terra Cotta Society, 19 West 44th St., New York, N. Y.

Color in Architecture. Revised Edition. Permanently bound volume, 8% x 12% 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. 8% 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. 8% x 11 ins., 32 pp. Illustrating many banking buildings and terra cotta with an article on its use in bank design by Alfred C. Bosson, Architect.

TILE, HOLLOW


Natico Double Shell Load Bearing Tile Bulletin. 8% x 11 ins., 6 pp. Illustrated.

Natico Face Tile for the Up-to-Date. Farm Bulletin. 8% x 11 ins., 6 pp. Illustrated.

Naticooff Bulletin. 8% x 11 ins., 4 pp. Illustrated.

Natico Unbacker Tile Bulletin. 8% x 11 ins., 4 pp. Illustrated.

TILES

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

C. Pardee Works, 9 East 45th St., New York, N. Y. and Beroo, Natico, the Complete line of Structural Clay Tile. Booklet. 39 pp., 8% x 11 ins. Illustrated. A General Catalog.


Natico Double Shell Load Bearing Tile Bulletin. 8% x 11 ins., 6 pp. Illustrated.

Natico Face Tile for the Up-to-Date. Farm Bulletin. 8% x 11 ins., 6 pp. Illustrated.

Naticooff Bulletin. 8% x 11 ins., 4 pp. Illustrated.

Natico Unbacker Tile Bulletin. 8% x 11 ins., 4 pp. Illustrated.

UNITED STATES QUARRY TILE CO., Parkersburg, W. Va.

VALVES

Crane Co., 526 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, 81 White Street, New York.

The Valve Behind a Good Heating System. Booklet, 4% x 7% 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, 4% x 7% ins., 16 pp. Illustrated. Description of Jenkins Model Globe, Angle Check and Gate Valves commonly used in home plumbing, and Iron Body Valves used for large plumbing installations.

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This is one of the newest type hotel laundries in the East...

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.

THE AMERICAN LAUNDRY MACHINERY COMPANY
Norwood Station, CINCINNATI, OHIO
SELECTED LIST OF MANUFACTURERS’

VENETIAN BLINDS

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

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Hope & Sons, Henry, 103 Park Ave., New York, N. Y.

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VENETIAN BLINDS
This office is equipped with every modern essential for executive supervision —

Including double track telephone facilities

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FOR THE EXECUTIVE

Adequate telephone facilities for the business executive must include means for making and receiving both outside and inside calls. Both services are important, and each must be rendered in such a way that it will not be hampered by the other.

When specifying telephone equipment for business and industrial projects, remember that Strowger P-A-X is the ideal automatic interior telephone system.

Installed as an isolated system, Strowger P-A-X offers these advantages to your client:
- Keeps the rented telephone free at all times for outside calls.
- Reduces the number of unauthorized personal calls.
- Reduces telephone rentals.
- Enables the operator to give proper attention to personal service for executives.
- Provides a double-track means of communication, permitting callers over the city lines to wait while information is secured over the P-A-X.

Other advantages of Strowger P-A-X, as applied to any project involving the specifying of interior telephones, will be gladly explained without obligation and without cost to your client.
If you wish to give clients the “last word” in modern pantry design, specify the Prometheus Electric Plate Warmer.

The Prometheus keeps things hot at a minimum cost as it is thoroughly insulated. Doors are of double construction, filled with asbestos. Space between the walls is thoroughly insulated. That also keeps the exterior cool.

Has a three-heat switch. Cannot overheat. A thermostatic cut-off can be furnished to disconnect current automatically if left on accidentally. Pilot light shows whether current is on or off.

Has a beautiful finish. Trim is heavily chromium plated and polished. Doors are vitreous porcelain when white finish is desired. Will not crack or turn yellow. Shelves are removable for cleaning.

Heating elements last indefinitely, but if accidentally damaged, they can be easily and inexpensively replaced. Built in many models.

Approved by National Board of Fire Underwriters.

Write for catalog, or mail the convenient coupon.

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Truscon Integral Door Frame and Trim are of high quality throughout and adapted to the finest buildings. They are fireproof and permanent, eliminating unsightly shrinkage cracks in casings and plaster.

Furnished in standard sizes for single doors from 2'-0" to 4'-0" wide, and for double doors 4'-0" to 8'-0" wide, both in heights from 6'-6" to 7'-6". Made with or without transom bar as integral part of frame. Can also be used for light frames, corridor lights, access doors and various other openings.

Write for full information, literature and quotations

TRUSCON STEEL COMPANY
YOUNGSTOWN, OHIO
Steel Door Division
Truscon Steel Company of Canada, Limited, Walkerville, Ontario
Sales and Engineering Offices in all Principal Cities
NO WELDS IN STRESS—one piece of steel—expanded—without rivets, bolts or welds in shear or tension—these are the features responsible for the rapid gain in Bates-Truss Joist popularity.

A simple I-beam section is expanded into a lattice truss web. The expansion increases the depth of the beam—the truss materially increases its strength. The points of contact of the lacing and flange members are simply unsheared portions of the original plain web. By this process, all defective beams are automatically eliminated.

Contractors, engineers, builders should all know about the Bates Expanded Steel Truss. We have prepared a book giving complete information. A copy will be mailed to you upon request.
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Illustration shows the simple and sturdy method of supporting a Venturafin Unit Heater from the ceiling, with ordinary ½-inch hanger pipes. Venturafin Units can also be supported on a wall or column, or can be used as a floor stand unit with a recirculating box.

The Truth About the Heating Business

Years ago, the problem in industry was to produce goods-selling was only a matter of getting satisfactory production.

Factories were small and heating problems few and far between.

Today, factories have grown in size; industries have increased in scope; there is a heating problem.

Many manufacturers have produced equipment to solve this problem, but no manufacturer has spent the time and money that American Blower has put forth to make the Venturafin method of heating answer not one, but every heating problem of industry.

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Rather than tell you the complete story of Venturafin in words, we would much prefer to send you our Red Data File, which contains nothing but facts-facts that make it possible for you to select the proper heating equipment for your clients-facts that are in no way concerned with claims or counter-claims. This convenient file also contains prices which enable you to estimate costs ahead of time.

Won't you let us send you one of these Red Data Files? The coupon will bring it.

AMERICAN BLOWER CORPORATION, DETROIT, MICH. CANADIAN SIROCCO CO., LIMITED, WINDSOR, ONT. BRANCH OFFICES IN ALL PRINCIPAL CITIES

American Blower
Modern architecture not only achieves imposing beauty, but lends to design a further significance—a tangible interpretation of the ideals of the builders. The architects have imbued the mammoth structure pictured above with an impression of permanence and stability—a true reflection of the character of the institution which will occupy these spacious quarters.

The impression created by the design is substantiated in the actual construction of this magnificent department store. The framework embodies the latest improvements in steel construction, and employs the most modern sections—Carnegie Beams.

In every type of construction—industrial buildings, bridges, subways, schools, apartments, hotels, stores and great towering skyscrapers. Carnegie Beams are imparting to structural steel a new efficiency. Their parallel flanges simplify fabrication and erection. The distribution of metal gives maximum strength in proportion to weight. Constant-depth columns, unique with Carnegie Beams, present opportunities for standardization, both in design and erection.

A handbook, “Carnegie Beam Sections” will be sent at your request.

Carnegie Steel Company
Subsidiary of United States Steel Corporation
Pittsburgh, Pa.
SANITARIUMS REQUIRE THE PROTECTION OF UNITED METAL ELEVATOR ENCLOSURES

While the fire-protection of United Elevator Enclosures is desirable in all heavily occupied buildings, it is imperative in sanitariums, hospitals and similar institutions.

The latest of a long list of such United installations is the Molly Stark Sanitarium for the treatment of tuberculosis, at Canton, Ohio. All passenger elevator openings are safeguarded against the spread of fire by permanent, handsome United Enclosures of the latest type.

Here again United engineering service functioned smoothly to relieve architect and contractor of all unnecessary detail.

THE UNITED METAL PRODUCTS CO.
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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-skeletoned 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. The strength and durability of wood 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. "Rot in wood is caused by fungi, or parasitical organisms, which makes possible the building of strong, lasting structures. The wide-spread use of such columns has resulted in great savings. The use of treated wood is rapidly gaining acceptance in all parts of the world, and has been associated with a great many industrial chemicals, and is 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. Decay, fungus or mold has a low residual to breakage and failure. 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 states of the United States and countries of the south. In addition to rotted wood, another destroyer prevalent in many regions is the termite, or white ant, which eats into wood, similarly weakening the wood. 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. 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 that 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 post 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 most familiar of which has always been zinc chloride. 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 cooperation 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."

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

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

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. The new 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 work of two widely known sculptors—James Earley Fraser and Henry Hering,—and portray scenes from the early history of Chicago. The group on the east pylons at the south end, depicting the settlement of Chicago by the early pioneers, long before the days of the covered wagon. Above the group there hovers the symbolic figure of America rolling back 'the veil' of the unknown country for these sturdy pioneers. The group on the west pylons 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 west pylons at the east end, the rich Gothic memorial of the first Lincoln Monument, and the 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 richly carved Astor Memorial; the entablature figures on Bush House, London; the entrance step pedestal groups of the Parliament Build­ings in Canada; the 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; the use of limestone in the Civil War court houses, and many other memorials and fountains.
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HOFFMAN CONTROLLED HEAT
anyone that any product which bears its name represents the organization has been preeminently the pioneer and leader, and from its wealth of research and experience can assure of electric heating is almost without end. In its field this successfully to the rigid specifications of the United States army contains a list of well known architects who have specified final word in electrical heating and that the spirit of its tion has grown into an institution producing the latest typePrometheus specialties for installation in their buildings.

In the field of sterilization, the Prometheus Electric Corporation, namesake of the Greek god, also seeks mighty and unselfish man through the modern application of heat,—electricity. For over 25 years this company, composed of expert engineers, has put electrical heat to prac­tice. Following 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—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 rapid 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 preeminently 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.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS, ASAMENDED, OF AUGUST 24, 1912, OF THE ARCHITECTURAL FORUM. Published Monthly at New York, N. Y., for October 1, 1929. 

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.

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INDEX TO ADVERTISING ANNOUNCEMENTS

Part 1—Architectural Design

Acme Brick Company 4
Adamston Brick Company 48
American Brass Company 9
American Brass Company, The 147
American Seating Company 52
American Walnut Manufacturers Association 44
Armstrong Cork Company 19, 67
Atley Company 96
Baggés, Inc. 54
Bakelite Corporation 96
Barnes Company, EK. 142
Best Bros, Keene's Cement Co. 69
Blank & Company, Frederic 210
Brazo Manufacturing Co. 12, 13
Carney Company, The 81
Casement Hardware Co., The 96
Casualt Roomo Company, Inc. 133
Circle A Products Corporation 26
Cleneesos Co., The 38
Clinton Metallic Paint Co. 72
Columbia Mills, Inc. 26, 30, 31, 226
Corbin, P. & F 16
Covey Corp., H. W. 58
Curtis Companies & Price Bureau, The 38
Detroit Iron Door Co. 78
Dietzgen Furniture Co. 47
Detroit Steel Products Co. 47
Dixie Lumber & Coal Co. 68
Du Bois Fence and Garden Co., Inc. 70
Eagle-Picher Lead Company, The 3
Federal Cement Tile Company 6
Fiske Iron Works, J. W. 103
Foremost Insulation Company, The 95
Georgia Marble Company, The 107
Hamlin, Irving 64
Hanley Company 64
Hartmann Sanders Co. 73
Hartshorne Co., Stewart 160
Hausmer Co., The E. P. 23
Hein Roofing Tile Co., The 2
Hess Warming & Ventilating Co. 22
Higgins & Co., Class M. 20
Hologic Co., Inc. 91
Home Company, R. M. 130
Hopk & Sons, Inc. Henry 25
Indiana Limestone Company 5
Jacobsen Mastic & Ornament Company 58
Jackson & Company 50
Johnson & Furnishing Company 133
Kawnoon Co., The 93
Kennedy Mfg. Company 43
Kemp Costalgin 49
King Construction Company 66
Kitterman-Griffin Co., Inc. 30
Klein & Co., Inc. 40, 37
Libby Owens Sheet Glass Co., The 105
Ludlow-Celadon Company 24
Lungton's Sons,5 Brothers 66
Lutton Company, Inc., Wm. H. 66
Macbeth Evans Glass Co. 89
Modern Bronze Store Front Co. 87
Murphy Varnish Company 87
National Lead Company 64
National Terra Cotta Company 99
Newcomb Mfg. Co., J. F. 56
New Pore Works, The C. 7
Pease & Eilliman, Inc 72
Peoria Paint Co. 18
Penn Hardware Company 18
Pratt & Lambert, Inc. 83
Rambusch 56
Ramp Building Corporation 11
Ritter Lumber Company, The W. M. 95
Robison & Co., Inc., H. A. 64
Ruddell Lumber & Veneer Company 71
Russell & Erwin Mfg. Co. 198
Sargent & Company 34
Shanks Manufacturing Co., Inc. 98
Shefter Sales Company, The 168
Sherwin-Williams Co., The Fourth Cover
Shriners, W. J. 65
Sterling Bronze Company, Inc. 51
Stone & Webster Engineering Corporation 17
Thorp & Co., Inc., J. H. 46
Todhunter, Inc. 66
Vanderbilt & Burke Mfg. Co. 12
Tyler Company, The Second Cover
U. S. Gutta Percha Co. 85
United States Gypsum Company 61, Third Cover
United States Rubber Company 59
Wheeler, Osgood Company 77
"White", Door Bed Company, The 101
Wickwire Spencer Steel Co. 22
Wilson Corrugated Paper Company, The 108
Zeniththerm Company, Inc. 62
Zour Drawn Metals Company 13

Part 2—Architectural Engineering and Business

Aerohin Corporation 231
Alabama Steel Company 120
Allene Stone Company 120
Aller & Blymire Co., Inc. 200
American Blower Corporation 147
American Institute of Steel Construction, Inc. 144
American Lumber & Machine Co., The 18
American Radiator Company 129, 210, 218
American Telephone & Telegraph Co. 123
A. W. & Co. 66
Armstrong Cork & Insulation Company 189
Automatic Electric, Inc. 197
Barrett Company, The 177
Barlow Expanded Steel Truss Co. 199
Berger Mfg. Company, The 203
Birch, F. N. & Co. 178
Brownell Company, The 210
Brunswick-Balke-Collender Co., The 193
Carey Company, The Phillip 185
Carmer Steel Company 201
Central Alloy Steel Corp. 204
Chromium Corporation of America 134
Close & Sons, James B. 153
Cochs Rolling Mill Co. 157
Concrete Engineering Co. 209
Concrete Steel Co. 206
Cowling Pressure Relieving Joint Co. 158
Cutler Mail Chute Co., The 162
Dixie Crucible Company, Joseph 137
Domestic Steel Co. 212
Douglas Co., The John 150
Dunkel & Company 166
Duriron Company, The 164
Electric Storage Battery Company, The 119
Electro, Inc., of Missouri 213
Ezell Mfg. Co., The 176
Fitzgibbons Boiler Company 220
Frigidaire Corporation 141
Fullerton Stylkene Corporation 191
General Refrigeration Company 162
Reggie-Simplex Boiler Co. 142
Hoffman Specialty Company, Inc. 225
Home Insulator Co. 171
Hullbore, Incorporated, Harvey 124
Imperial Brass Mfg. Co., The 162
International Heating and Ventilating Exposition 214
International Nickel Company, The 162
Jannete Mfg. Co. 212
Jenkin Bros. 187
John-Manning Corporation 136
Kilman Steel Company 285
Kerner Insulator Co. 176
Kewanee Boiler Corporation 216
Kimowan Private Utilities Co. 160
Kimmer Mfg. Co. 282
Kohler Co. 156
Kosmos Portland Cement Company 164
Louvain Mfg. Co. 212
Lawrence Bros., Toon. 148
May (Ft) Furnace Corporation 217
McQuay Radiator Corporation 218
Menasha Printing Company 268
Minwax Company, Inc. 166
Modern Manufacturing Company 223
Mueller Co. 149
Mush Engineering Co., The 137, 118, 183
National Electric Products Corporation Fourth Cover
National Fireproofing Company 109
National Lumber Manufacturers Association 247
National Radiator Co. 207
National Tube Company 135
Nelson Corporation, The 127
North Western Expanded Metal Co. 113
Oris Elevator Company 132
Peerless Unit Ventilation Co., Inc. 212
Ralph H. Anderson Electric Corp. 212
Raymond Concrete Pile Co. 111
Reading Iron Company 161
Republic Iron & Steel Co. 169
Richards Wilson Mfg. Co. Second Cover
Rome Brass Radiator Corporation 229
Sacco, Inc. 158
Sedgwick Machine Works 164
Serve Sales, Inc. 172
Sorbonne Sons, Inc., L. 237
Spokehouse Company 221
Spencer Heater Company 221
Standard Conveyor Company 176
Steel Frame House Company 179
Sterling Engineering Company 178
Stringer Bros., Inc. 167
Structural Clay Products Corporation 114
Structural Gypsum Corporation 180
Sturtevant Co., B. F. 219
Titsville Iron Works Co., The 222
Toch Brothers 124
Trapez, Co., The 215
Trenton Potteries Company, The 150
Troy Laundry Machinery Co., Inc. 174
Truscon Steel Company, The 130, 196
United Chromium, Incorporated 154
United Metal Products Co., The 202
United States Rubber Company 263
U. S. Mineral Wool Co. 160
Van Range Co., The John 122
Yilih Manufacturing Co., The 18
VonONDON HARDWARE Co. 139
Weidemiller Bros. 168
Western Pine Manufacturer's Association 178
Westinghouse Electric and Manufacturing Company 230
Weyerhaeuser Forest Products Co. 131
York Ice Machinery Corporation 116
Youngstown Sheet & Tube Co., The 121
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The Architectural Forum

November, 1929

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