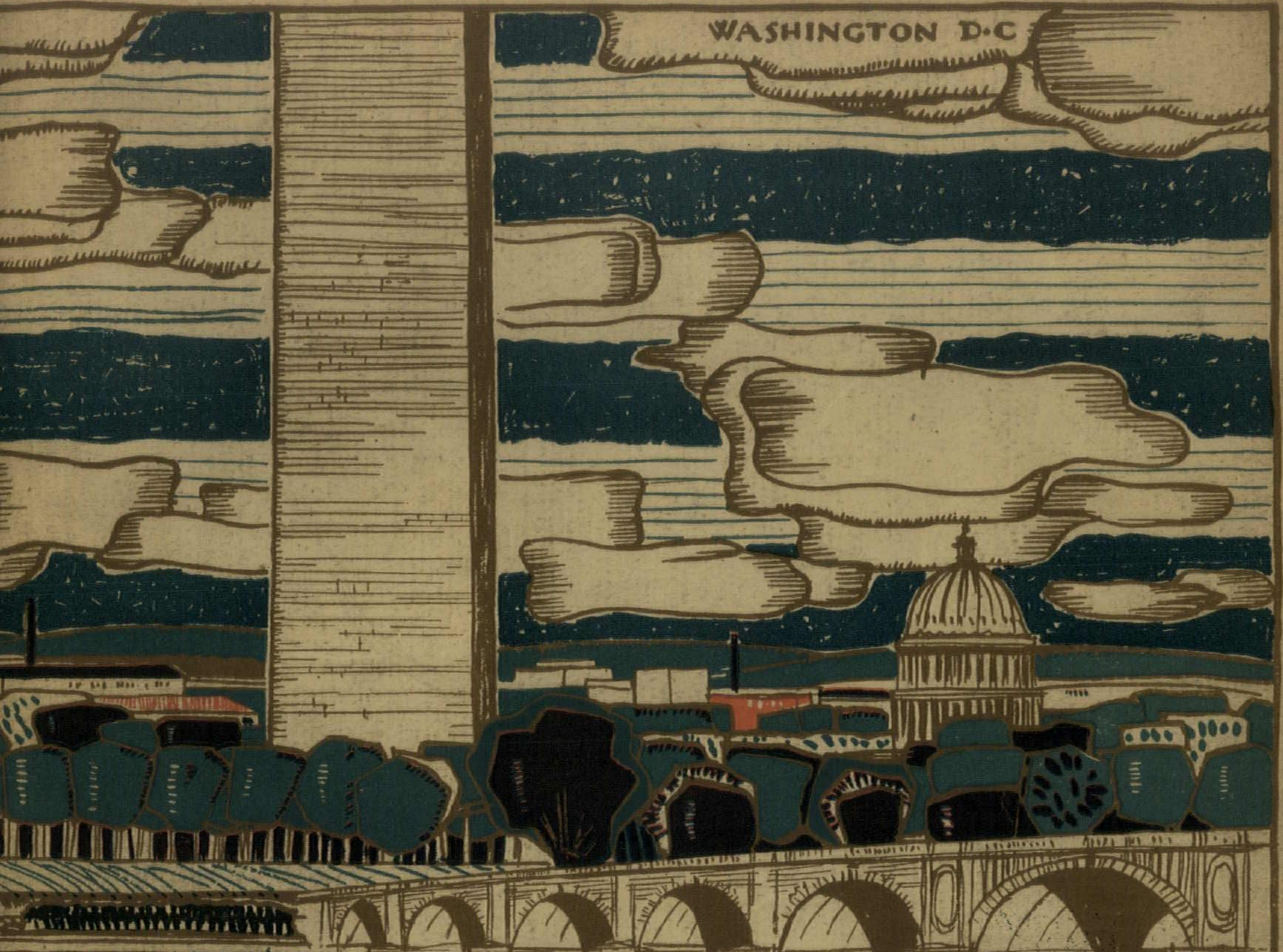


TAP ROOMS

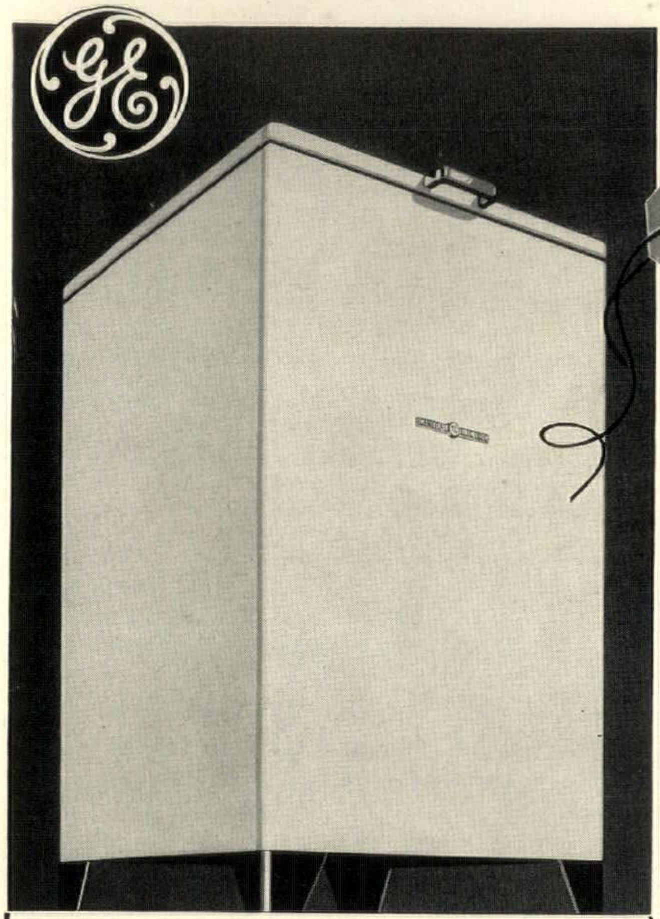
JULY 1934 • RECREATION ROOMS • HEATING, COOLING AND AIR CONDITIONING

AMERICAN ARCHITECT

The Interpreter Advances Progress

The art and science of building is, like all Gaul, divided into three parts. One is the planning and design of buildings; another concerns their financing and proper construction; the third involves the use and maintenance of buildings by those for whom they were constructed. Technically, architects may deal with only one of these three parts. But even the technical success of architectural practice depends upon a thorough understanding of the basic effect that site, financing and specific uses have on every problem of planning and design. Such things, being out of the architect's direct province, require interpretation in his own terms. This is a job for a professional journal; and the policy of American Architect is dedicated to it. The basis for this policy of interpretation is an understanding of the building industry in all its many phases coupled with the ability to translate those phases into the language of the architect. In every issue of American Architect are interpretations of vital issues and events that are tending to link the architectural profession closer and closer with the other factors of the construction industry. The interpreter advances progress. To advance architecture American Architect is interpreting—for every member of the profession—the progress of important questions of the building hour. » » »

GENERAL ELECTRIC ANNOUNCES A REVOLUTIONARY NEW REFRIGERATOR



for $77.50 plus freight

and a fully automatic RANGE at.. $72 plus freight

HOLDS ALL THIS FOOD!

2 qts. milk
2½ pts. cream
1 doz. eggs
1 lb. butter
2 pkgs. cheese
2 cans fruit juice
1 bottle catsup
1 bottle cherries
2 lbs. bacon
5 lbs. roast
1 head lettuce
1 big cucumber
2 lbs. tomatoes
1 bunch celery
2 grape fruit
2 lemons
½ doz. oranges
1 jar salad dressing
1 lb. lard
2 left-over containers
1 qt. water bottle
2 quick freezing trays
(20 ice cubes—
2 lbs. of ice)

BOTH FOR THE PRICE OF ONE!

Designed for either separate installation or as one combined unit. Now both electric refrigeration and electric cookery are available at the price previously paid for one—

$142.50 (plus freight).

A TRIUMPH of General Electric research and engineering! An amazing new refrigerator at lowest cost in all G-E history! Daring in conception, revolutionary in design, the new General Electric "Liftop" refrigerator is as epoch-making as the first General Electric Monitor Top!

Lowest Operating Cost in the World

The new G-E "Liftop" refrigerator has the lowest operating cost of any electric refrigerator in the world, with ample food storage capacity for the average family. Freezes ice faster—20 cubes (2 lbs.) at a time. It is powered with the famous G-E sealed-in-steel mechanism—the same principle as in the world famed Monitor Top—and requires no attention, not even oiling. All-steel cabinet, baked Glyptal enamel exterior, and stainless steel freezing shelf that cannot chip or rust. 5 years' protection on sealed-in-steel mechanism available at $7 additional.

The New "Companion" Electric Range

The new automatic G-E "Companion" range is most compact, yet has ample capacity for a family of eight. Unique design and construction give almost unbelievable speed and low cost in operation. Three surface units, and spacious oven that readily accommodates 15 lb. turkey. Automatic temperature control. Finished top and front with stainless porcelain.

At their startling low prices and incomparable low operating costs, the new G-E "Liftop" refrigerator and "Companion" range are ideally suited for apartment house efficiency suites, the small house with restricted floor space, the home with reduced income, the summer cottage, roadside stand and for many other purposes. Architects, builders, building owners and managers are invited to write or wire for complete information and detailed specifications. Address General Electric Company, Specialty Appliance Sales Department, Section AA7, Nela Park, Cleveland, Ohio.

PRESENTING THE NEW OTIS

PERSONAL-SERVICE ELEVATOR

A SPECIALLY designed Otis elevator for private residences with a maximum rise of three floors. Particularly adapted to installation in existing residences where space is limited.

Distinctive features—Requires no penthouse for lifting machinery. Elevator is supported by a steel frame mounted on the basement floor, which relieves the building structure of unnecessary weight and the building owner from considerable alteration expense.

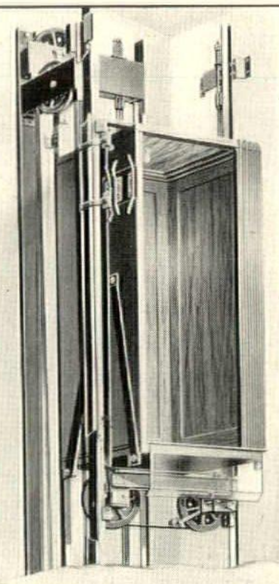
Mechanical details—Elevator platform is of the underslung type of construction which eliminates the need of supporting the platform from the crosshead. Also eliminates the need of overhead sheaves that are ordinarily placed at a considerable elevation above the top landing.

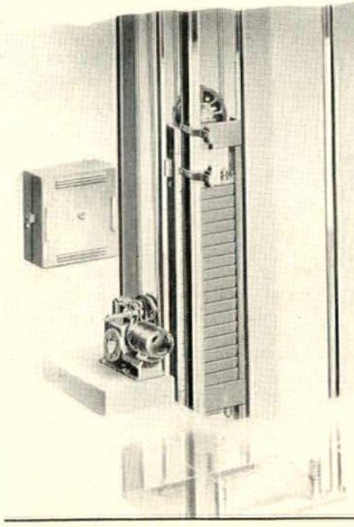
Single automatic push-button control operated from any standard A.C. house circuit. Capacity, 650 pounds (about four persons) at a speed of 35 feet per minute. Maximum size of platform, 3 feet, 2 inches wide by 3 feet, 8½ inches deep.

The machine is of the single-wrap traction type with ball-bearing worm shaft, roller-bearing drive shaft, steel worm, and bronze gear. Powered with a sturdily constructed Otis one-horsepower motor.

The car frame is steel with underslung construction and special roll safety. Regular steel rails are provided. Hoist-way doors are of the single-swing flush type with door locks and contacts. And the car itself can be of either wood or metal and may be had in a variety of Otis designs. Or if desired, it can be furnished plain to be decorated to the individual taste of architect or building owner.

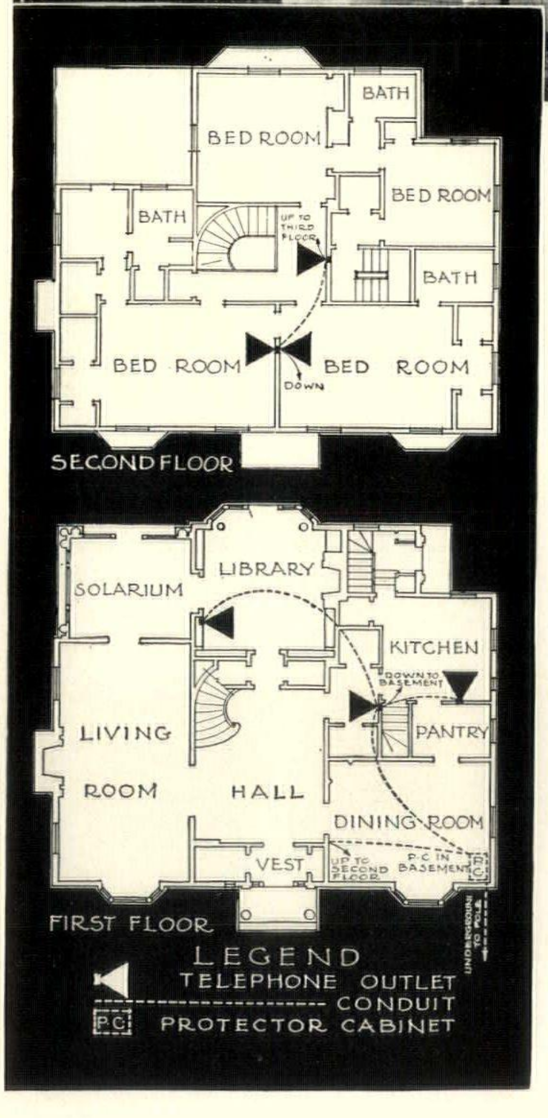
The new Personal-Service Elevator is in every way an Otis elevator. It is sturdy and dependable and with proper care will give years of trouble-free service. Its virtue lies in simplicity of construction, adaptability to installation in existing buildings, and moderate price—for it can be purchased for the price of a good motor car. . . . Otis Elevator Company—offices in all principal cities.





American Architect, published bi-monthly by International Publications, Inc., 57th Street at 8th Avenue, New York, N. Y. Yearly subscription, $1.50. Entered as second class matter April 5th, 1926, at the Post Office, at New York, N. Y., under the act of March 3rd, 1879. Issue 2624, dated July, 1934.

TELEPHONE CONDUIT PROVIDES FOR *TOMORROW'S* NEEDS AS WELL AS TODAY'S



Built-in conduit and seven convenient outlets, including one in the third-floor maid's room, provide for telephone convenience in this well planned residence in Hackensack, New Jersey.
ARTHUR E. DORE, Architect, *Hackensack, New Jersey.*

BUILT-IN telephone conduit and outlets make new or remodeled residences more livable — prevent unsightly exposed wiring — protect against most types of service interruptions.

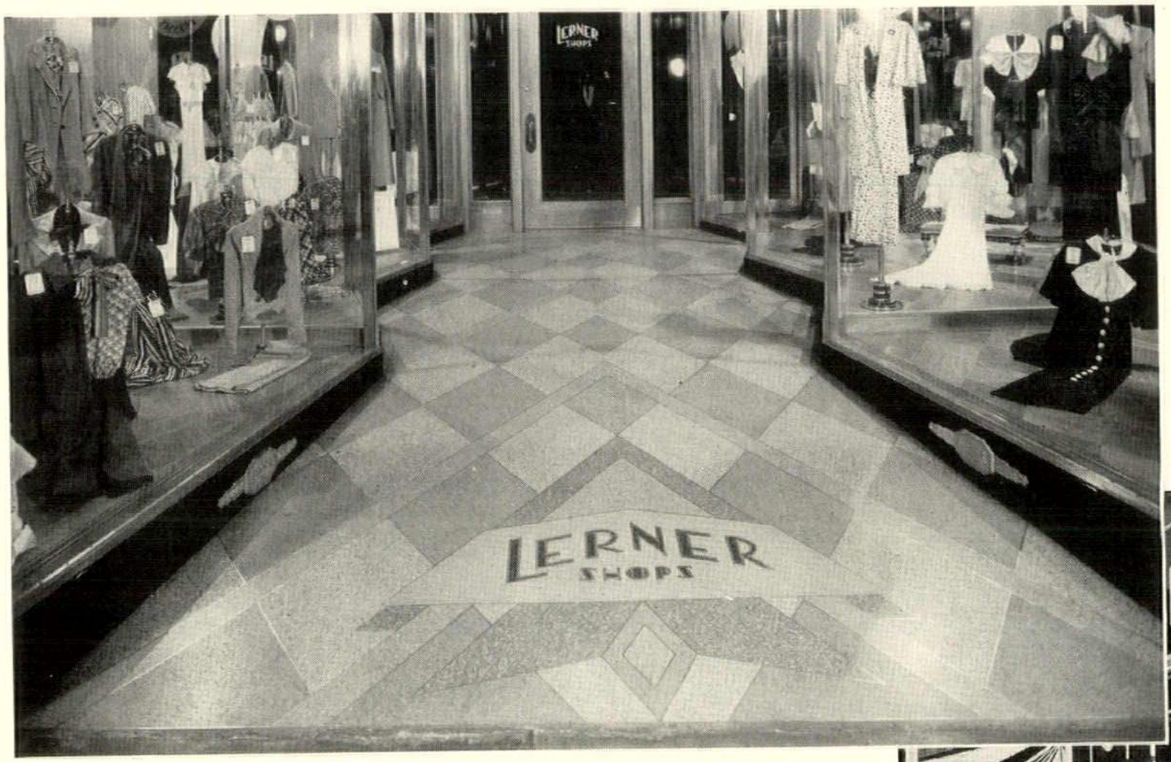
But their convenience is more than immediate. By careful planning, *extra* outlets can be located at strategic points throughout the house to provide for *future* requirements. Then as children grow up and households expand, the telephone arrangements can be easily extended or revised without the annoyance of messy alterations.

Extra outlets cost little during construction, add nothing to the monthly telephone bill until used, and assure flexible service. They are indicative of a foresight on your part that clients invariably appreciate.

Engineers from your local telephone company will be glad to co-operate in planning conduit layouts for any of your projects. There is no charge. Just call the Business Office and ask for "Architects' and Builders' Service."

REMEMBER TELEPHONE CONDUIT AND OUTLETS IN PLANS FOR NEW AND REMODELED HOMES

WHEN YOU MODERNIZE *Make the Walkways Safe!*



Four colors of terrazzo—all made non-slip by suitable colors of Alundum Aggregate—were used in this Lerner Store entrance in San Francisco. Installation by M. H. Gnecco & Company, San Francisco.

Use Terrazzo Made Non-slip with Alundum Aggregate

TODAY the store front must be attractive—and it is no less important that the vestibule floor be safe for hurrying shoppers. Economy of construction is a factor, too. Terrazzo plus Alundum Aggregate answers all three requirements.

Terrazzo lends itself to attractive, colorful designs. Terrazzo is economical. And terrazzo containing Alundum Aggregate in the proper proportion is permanently non-slip—in wet weather as well as dry.

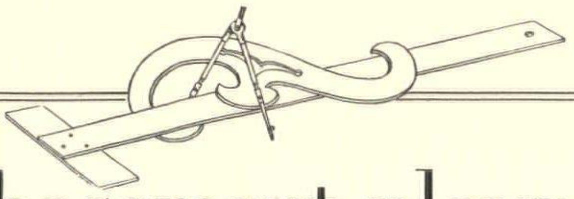
Catalog C gives full information about Alundum Aggregate for terrazzo—including complete specifications. Have you a copy in your file?

NORTON COMPANY, WORCESTER, MASS.
New York, Chicago, Detroit, Cleveland, London, Paris

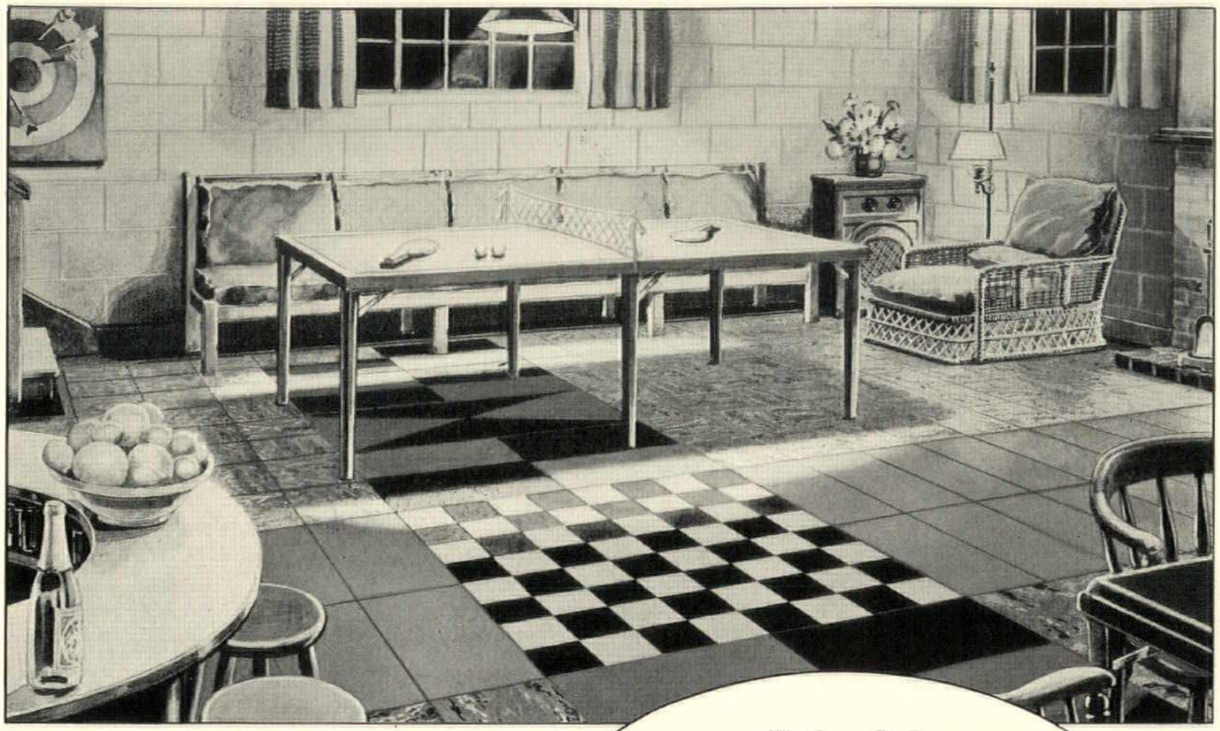
NORTON FLOORS
Alundum Tiles, Treads & Aggregates

T-376

NORTON PRODUCTS—Grinding Machines; Lapping Machines «» Grinding Wheels; Abrasives for Polishing; India Oilstones, Pulpstones «» Laboratory Ware, Refractories; Porous Plates «» Non-slip Tiles and Aggregates



For gay basement playrooms . . .



Colorful
Accotile Floors
withstand dampness . . . offer
unlimited design
possibilities

HERE'S the ideal floor for installation over concrete in direct contact with the ground! Armstrong's Accotile Floors (asphalt type) withstand dampness. They're durable, too. In spite of hard usage, they retain their beauty and require a minimum of care.

Accotile offers a wealth of artistic designs and color combinations. There are fourteen plain colors and eight marbles with which to create enduringly beautiful floors in original designs for basement playrooms and recreation rooms.

The current issue of Sweet's shows the colors offered in Accotile and gives other data for architects. For the complete story get our booklet "Armstrong's Accotile Floors." Armstrong Cork Co., Floor Division, 1201 State St., Lancaster, Pa.

Armstrong's **ACCOTILE FLOORS**

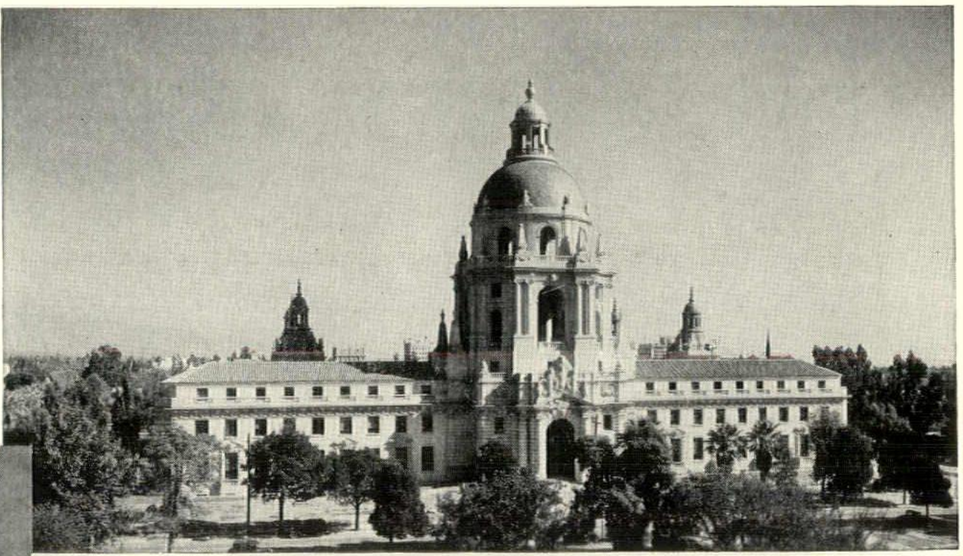
for every type of room

LINOLEUM ~ LINOTILE ~ CORK TILE ~ RUBBER TILE ~ LINOWALL

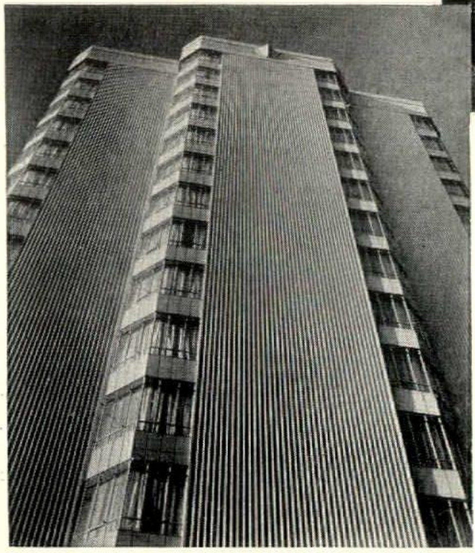
What a Break

THIS WOULD HAVE BEEN FOR BRUNELLESCHI!

● What would the Great Ones of the age of stone have done with modern concrete? What might have been the course of architecture had the Brunelleschis, the Michelangelos, the Mansarts, or the Wrens been able to work with modern concrete . . . with a material that liberates design rather than restricts it?



★ *The City Hall at Pasadena, California—an instance of the way in which concrete lends itself to the execution of traditional styles. Architects: Bakewell & Brown. Contractors: Orndorff Construction Co.*



★ *No other material is so ideally suited to modern design. Here is a facade, executed entirely in monolithic concrete, on the Edmond Meany Hotel in Seattle, Washington. Architect: R. C. Reamer. Contractors: Teufel & Carlson.*

It is an interesting conjecture . . . particularly as we advance further and further into the Age of Concrete. In Europe, today, and in America many designers are throwing off the shackles of old materials to work in concrete: a material capable of the widest latitude in the composition of masses . . . of infinite variety in surface textures . . . and of color.

Here, for instance, are notable examples of concrete's adaptability to varied architectural classes: one, the traditional Spanish . . . the other, the modern.

PORTLAND CEMENT ASSOCIATION

ROOM 267 • 33 WEST GRAND AVENUE • CHICAGO, ILLINOIS

AMERICAN ARCHITECT

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VOLUME CXLIV NUMBER 2624

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Washington, D. C. Cover Design by Ernest Born

AMERICAN ARCHITECT. Published bi-monthly by International Publications, Inc., 57th Street at Eighth Avenue, New York. Other offices, 919 N. Michigan Avenue, Chicago; General Motors Bldg., Detroit; 755 Boylston Street, Boston. William Randolph Hearst, President; Richard E. Berlin, Vice President; John Randolph Hearst, Vice President; Arthur S. Moore, Secretary.

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Single copies, 50 cents. Subscription: United States and Possessions, $1.50 per year; $3 for two years; $4.50 for three years; Canada, 50c extra; foreign countries, $1.00 extra. Entered as second-class matter, April 5, 1926, at Post Office, New York, under Act of March 3, 1879.

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The Architect's Part in the National Housing Program

BY BENJAMIN F. BETTS, A.I.A.

THROUGH the National Housing Act the Government will stimulate needed remodeling and modernization of existing houses and the construction of new houses. To encourage private money to enter this field, the Government will guarantee a portion of the loans. The Reconditioning Division of the Home Owners Loan plans a similar reconditioning program. Action of this kind as a means of revitalizing the building industry and thus stimulating general business has been advocated by AMERICAN ARCHITECT since September, 1933.

To the architectural profession this building program presents an unusual opportunity to demonstrate the economic and practical value of its services. These values cannot be demonstrated unless the profession is allowed to participate in the program and unless it stands willing to do so if given the opportunity.

The first step toward participation requires the correct presentation of the value of architectural service to the Government officials in charge of the program; to private lending agencies; and to the public who will apply for loans. Nationally, this would appear to be a function of the American Institute of Architects. Locally, it must be accomplished through Institute Chapters and other architectural organizations or individuals.

The second step implies willingness on the part of architects to make inspections and give advice on the basis of a consulting fee. The profession must adjust its business methods to meet the situation and it must be prepared to provide a service of a type warranted by the nature of the work and commensurate with the public's ability to pay.

Two types of service will undoubtedly be required. In certain cases a report and opinion as to the value, need and soundness of the proposed work will suffice. In others the service normally furnished by architects will be needed.

Sound building will be, as always, essential to protect money invested in this building program. Any use of public funds will make this especially important. All work should, therefore, be executed under the direction of qualified experts skilled in good planning, local building values and sound building. These experts are architects.

News reports emanating from Washington state that money will be paid to contractors on behalf of home owners but no mention is made of the architect as a part of this program.

Let the Government publicly acknowledge the fundamental value of architectural service and insist, at least, upon an architect's report accompanying every mortgage application.

The National Housing Act

By Miles L. Colean, A.I.A.

Special Consultant on Housing, National Emergency Council

THE National Housing Act, in its broad implications of effect upon the home credit structure and upon trends in building and neighborhood development, should have a more profound bearing upon the future of the architectural profession than any piece of legislation that might be named. If the objects of the Act are to any reasonable extent achieved, an increase in building activity in both alteration and new residential work should be evident fairly rapidly. Beyond this lie the possibilities of a mortgage system maintained in its liquidity, and more sensitive to the needs of the market than it has been possible to attain in the past. Booms may be averted, but a steady flow of activity in economically healthy communities should be possible.

THE ACT, as passed, is divided into five parts. The first sets up the Federal Housing Administration for the purpose of exercising the principal functions of the Act. This part also provides for the insurance of private loans made "for the purpose of financing alterations, repairs, and improvements to real property." All types of buildings are, therefore, included in the program; and the scope of the character of improvements may be safely left to the architect who through several years of enforced inactivity has watched the ravages of depreciation upon the country's buildings. The maximum loan so insured is $2,000, and all loans will be required to be repaid on an amortized basis. Rates of amortization interest, etc. will be determined by the Administration.

The second part of the Act, in many ways the most important and far-reaching, provides for the insurance of mortgages made by private agencies upon both new and existing one-to-four family dwellings. No single loan may exceed $16,000, or exceed 80 per cent of the appraised property value. Loans must be amortized over a period of not more than twenty years with interest generally set not to exceed five per cent. The Administration is empowered to set up such regulations and controls as it may see fit in order to secure the best application of the provisions of the Act. In other words, the Administration can make its own definitions of economic soundness.

Besides insurance upon the types of structure above named, the Administration may also insure mortgages or mortgage bonds issued by private agencies or governmental authorities upon low cost housing projects. Broad powers are conferred in the naming of the terms upon which insurance will be granted and in defining the character of the financing which will be insured, or of the building or buildings which will be eligible. A statement of policy from the Administration is thus necessary before it may be said what general classes of project will be apt to receive the most favorable consideration. This provision should, however, make possible the financing of limited dividend projects where the necessary rents can be justified, and should make easier the fostering by state and municipal authorities of housing for the lower income groups without entire dependence upon the Federal Government.

The third part of the Act establishes, under the jurisdiction of the Housing Administrator, National Mortgage Associations, which are private institutions of large capital created for the purpose of buying mortgages of the type described. The function of these associations is thus a rediscount function, aimed to maintain the liquidity of the primary lending agencies.

The fourth part provides for the insurance of savings accounts in Savings and Loan Associations of a character similar to that now prevailing for accounts in Savings Banks.

AMENDMENTS TO EXISTING LEGISLATION are contained in the last section of the Act. Among them are the broadening of the lending powers of the Home Loan Bank where insured mortgages are involved, the extension of credit for reconditioning to farmers through the Farm Credit Administration, the empowering of member banks of the Federal Reserve System to make mortgages under the provisions of the new act and to make construction loans where a mortgage commitment has been given by an acceptable agency.

It is in the functions of the Administration in regard to the issuance of insurance upon personal credit for modernization purposes and upon mortgages that architects are most interested. Special emphasis must be placed upon the point that under this Act no money is lent by the government. The Administration merely insures loans made, under certain restrictions, by private agencies, and, fur-

Promises To . . . .

PRODUCE NEW BUILDING ACTIVITY
IMPROVE OUR MORTGAGE SYSTEM
INCREASE OPPORTUNITIES OF ARCHITECTS

thermore the Administration does not deal directly with the public but only with those private lending institutions whose loans it insures. In this it is different from the other governmental agencies in the housing field. The Home Owners' Loan Corporation, for instance, makes direct loans to that class of the public whose mortgages are in distress or to such distressed home owners whose houses need repair; while the Emergency Housing Corporation of the Public Works Administration makes direct loans and grants for slum rehabilitation projects, designed particularly for the class of family which can not pay an economic rent.

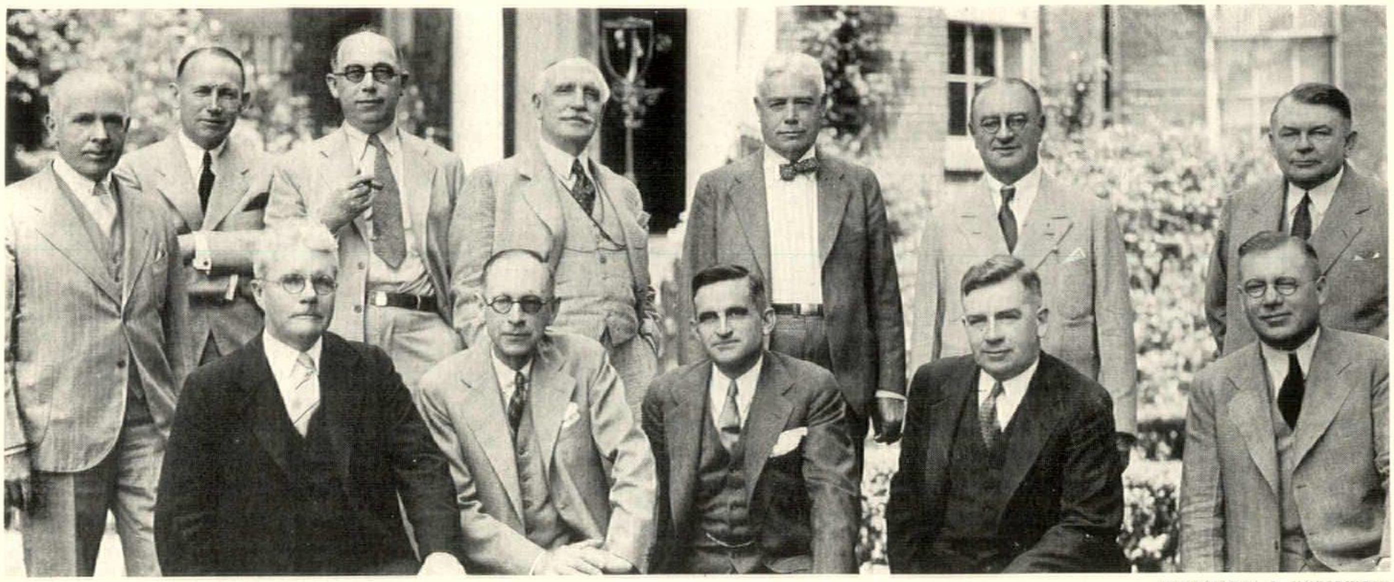
The Administration as set up under the Act is concerned with solvent owners and with self-sustaining projects, and with these it is concerned only through the medium of loan insurance and the control which it may exert through that medium. This indirect relation to the actual construction it intends to foster implies that such control as the Administration may exert upon the character of the work done is an indirect one. This does not mean that the control, though indirect, need be lax, for the Administration, operating as it must, with public funds, is clearly under a strict obligation to see that the risks it assumes are reasonable risks amply covered by its premiums. It means something more than this. It implies that for the satisfactory functioning of this new agency and for the broadest effectiveness of the new low cost financing, communities in all parts of the country must cooperate in working out standards of design and construction particularly suitable to their own conditions, in accepting a type of zoning that is more than the wishful thinking of the speculator, and in encouraging stable and integrated neighborhood and community development.

In this the Administration may do much, but the communities themselves can do more. No control, no direction set in Washington can be effective if it is not felt to be the general desire of the community to which it is applied, so that, in the final analysis, the social benefit to be derived from the Act depends upon the alertness of informed opinion within each town and city. It is, without question, the architects as a group, who are best fitted to persuade their communities of the importance of land planning as against speculative subdivision, of orderly development, of good design and good building. Communities which do respond to such opinion and which can evidence careful planning, healthy neighborhood developments, sound construction, and good architecture will obviously be among the best insurance risks; and it is reasonable to expect that in such communities insurance will be most freely and cheaply granted, with the result of easier credit and increased building activity.

BY ACTING AS A GROUP, therefore, to improve local standards, architects stand to profit as individual practitioners. From the provisions of the Act dealing with the insurance of modernization credit, the first effects upon building activity should be produced. The amount of deferred maintenance during the depression period has reached amazing proportions, and a means of establishing credit should produce a large volume of work from this source. Architects may complain that the limit of insured loans for alterations and repair does not permit them profitably to engage in this program. The answer is that they can if they will realistically face the problems presented, organize their work as much as possible by neighborhoods, work efficiently, and gauge their fees to the character of the service performed. It must also be remembered that the limit to the amount of a loan is not a limit to the size of the job where the owner has other sources of funds, as may frequently be the case.

To refrain from active participation will, moreover, tend to confirm an opinion, unfortunately neither limited in its acceptance nor so far very effectively combated by the profession, of the superfluity of architectural service except upon work of elaborate and expensive character. On the other hand, to assume leadership in it both as individuals and as professional groups is to seize an opportunity of impressing upon the public the value and importance of the architect's advice. Here, as in the program as a whole, the architect is well fitted to balance the cost of a proposed improvement against the value which will accrue from it to the owner's property, to see that work proposed is of a beneficial and economic character, and, while discouraging the expenditure of funds in neighborhoods which are deteriorated or threatened with rapid deterioration and upon buildings which have become social and

(*Continued on page* 140)



UNDERWOOD & UNDERWOOD

Newly elected officers and directors of the A. I. A. Top row, left to right: H. G. Ripley; E. C. Kemper, executive secretary; M. H. Furbringer, second vice president; C. D. Maginnis, first vice president; E. J. Russell, president; F. C. Baldwin, secretary; E. Bergstrom, treasurer. Bottom row: W. T. Warren, G. J. DeGelleke, D. J. Witmer, H. E. Hewitt, R. H. Cameron

The Sixty-Sixth Convention of The American Institute of Architects

WASHINGTON, D. C.—MAY 16, 17, 18

THREE outstanding accomplishments marked the sessions of the sixty-sixth annual convention of The American Institute of Architects held in Washington, D. C., May 16, 17 and 18. Of most general interest to architects—in or out of the Institute—probably is the fact that the Architects' Small House Service Bureau—endorsement of which by the Institute has long been a subject of heated controversy—was divorced from any affiliation with the Institute. Of equally important significance was the attitude of the convention regarding an increase in membership. The conviction of both officers and members is that sound growth of architectural organization lies in the ability and willingness of the Institute to expand its ranks to include architectural societies already in existence and operating independently as local groups.

Third in significance—at least so far as it reflected the sense of architectural thought—was a discussion of the public works situation involving the architects' part in governmental expenditures. The convention officially did little to help the problem beyond approving the report of the Public Works Committee as read by its Chairman, Louis La-Beaume, and passing a resolution protesting against intrusion of Government's agencies into the field of architectural practice.

The actual accomplishments of the convention were polite, mild-mannered and general in nature. Throughout the ranks of delegates, however, was a strongly militant attitude toward many of the questions that were so pacifically settled. The matter of the Architects' Small House Service Bureau, for example, did not even draw forth a discussion much less any debate. William Stanley Parker, long one of the Bureau's staunchest proponents, personally offered the resolution removing the Institute's endorsement of the Bureau, on December 31st, 1934.

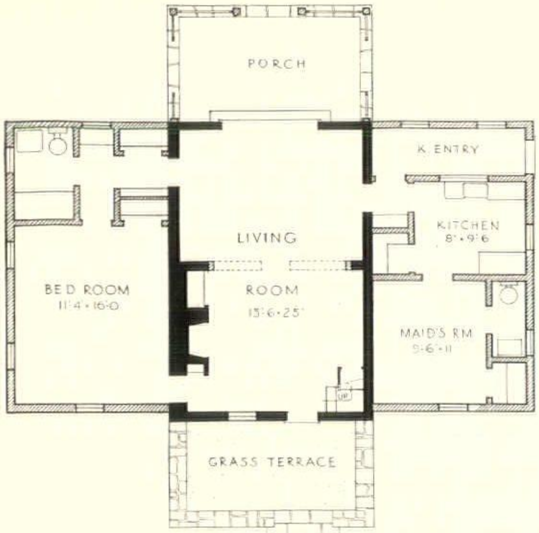
Handclapping was desultory; cheers were entirely absent. Disappointment of delegates who had anticipated a "fight" on many important questions was apparent; and even from high official circles the opinion was expressed that the convention had missed an opportunity to take a forceful stand on important national

(*Continued on page* 136)

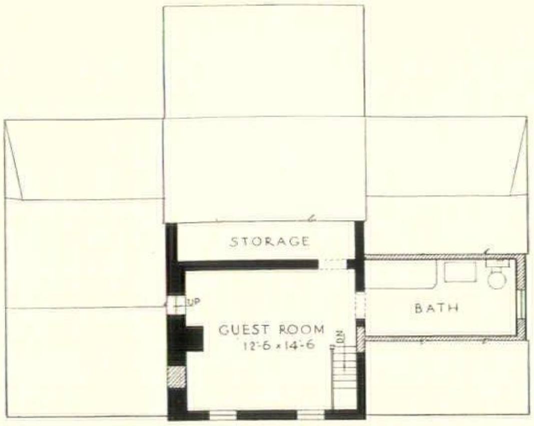
Reclaimed by Remodeling

HORACE W. PEASLEE, ARCHITECT

Skillful remodeling can reclaim almost any sort of dilapidation and develop for owners a high degree of value and satisfaction. The cabin of Mr. George Odell, near Washington, D. C., was reclaimed for approximately $3,000. The center portion was an old log cabin, covered with siding. Siding was removed, the logs painted and new frame wings added. Reclaimed materials were used where possible

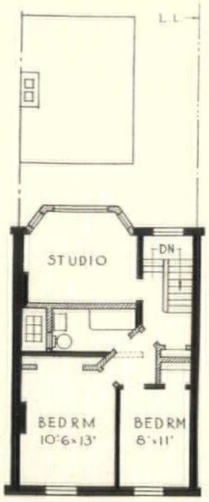


FIRST FLOOR

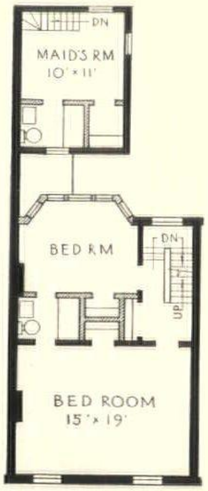


ATTIC

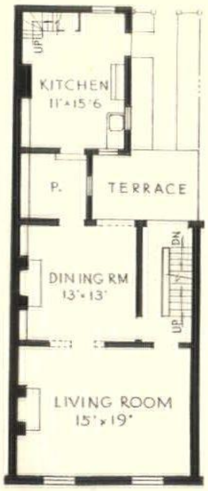
CABIN OF GEORGE ODELL
ON GREAT FALLS ROAD,
WASHINGTON, D. C.
HORACE PEASLEE, ARCHITECT



THIRD FLOOR



SECOND FLOOR



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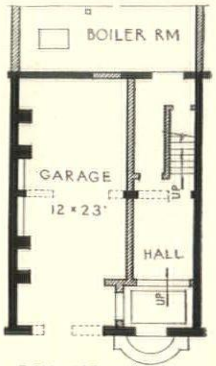
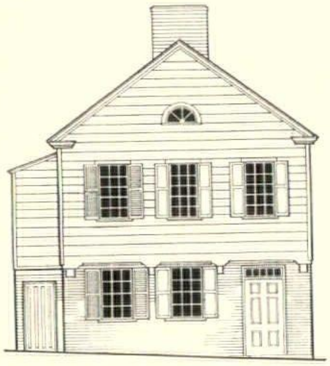
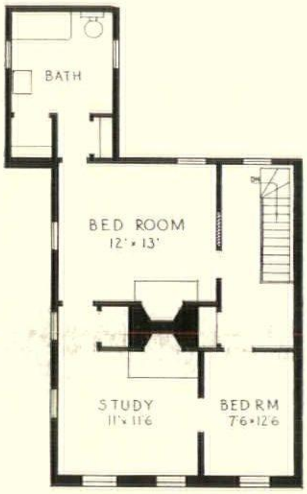


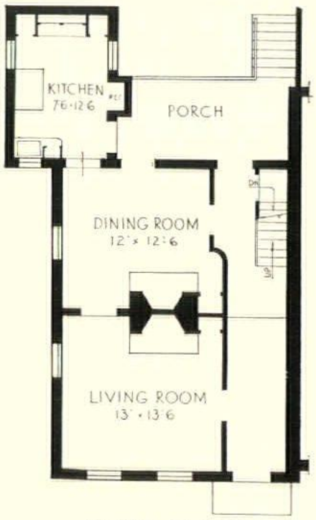
GROUND FLOOR

Two center houses reclaimed from a tenement-like row in Georgetown, D. C. Right-hand one, (plans above) for Charles Bittinger, cost approximately $10,000; has new gas furnace and plumbing; exterior, warm gray walls, pale lavender trim. Left-hand one, for Mme. von Ascheberg, cost approximately $8,500. Exterior, dull buff walls, gray-green trim. Plans similar to above

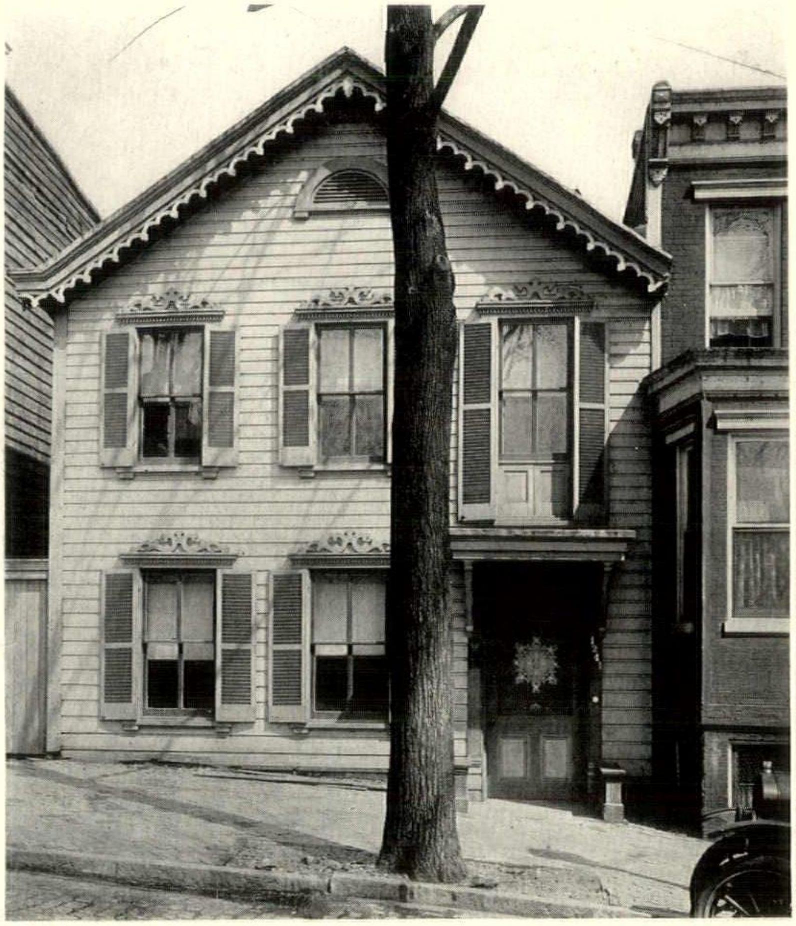




SECOND FLOOR

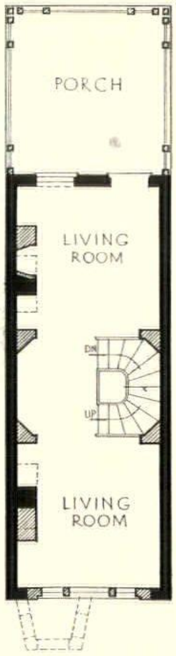


FIRST FLOOR



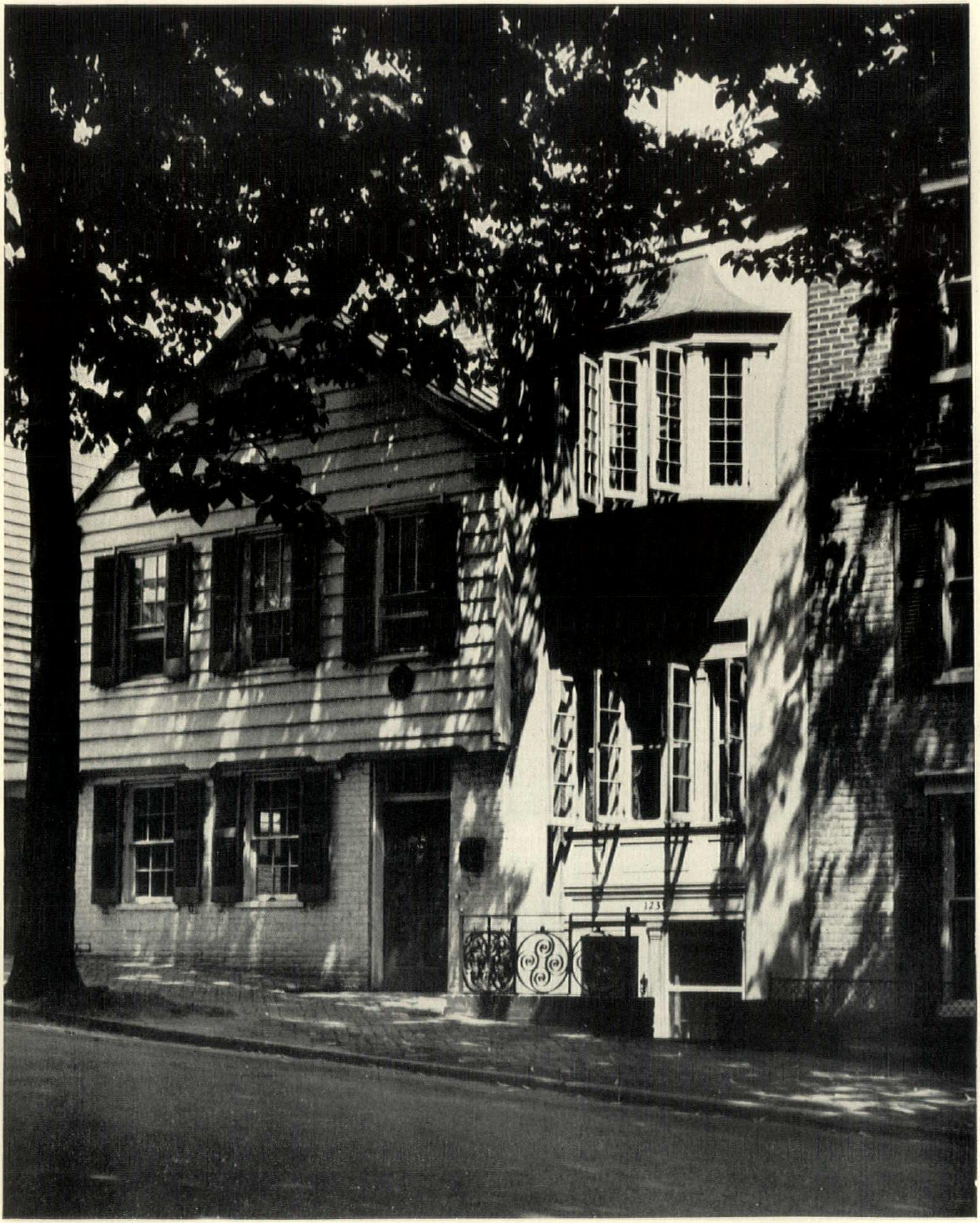
Alterations in Georgetown, D. C. The house on the left, for Antoinette Funk, was not changed structurally, but merely refinished by exposing brick walls and by changing cornice and window details. It is now painted oyster white. Reclamation of the house on the right, for George Dubois, cost approximately $7,000. Exterior is finished with gray stucco and white trim. Hafched lines indicate changes in plan

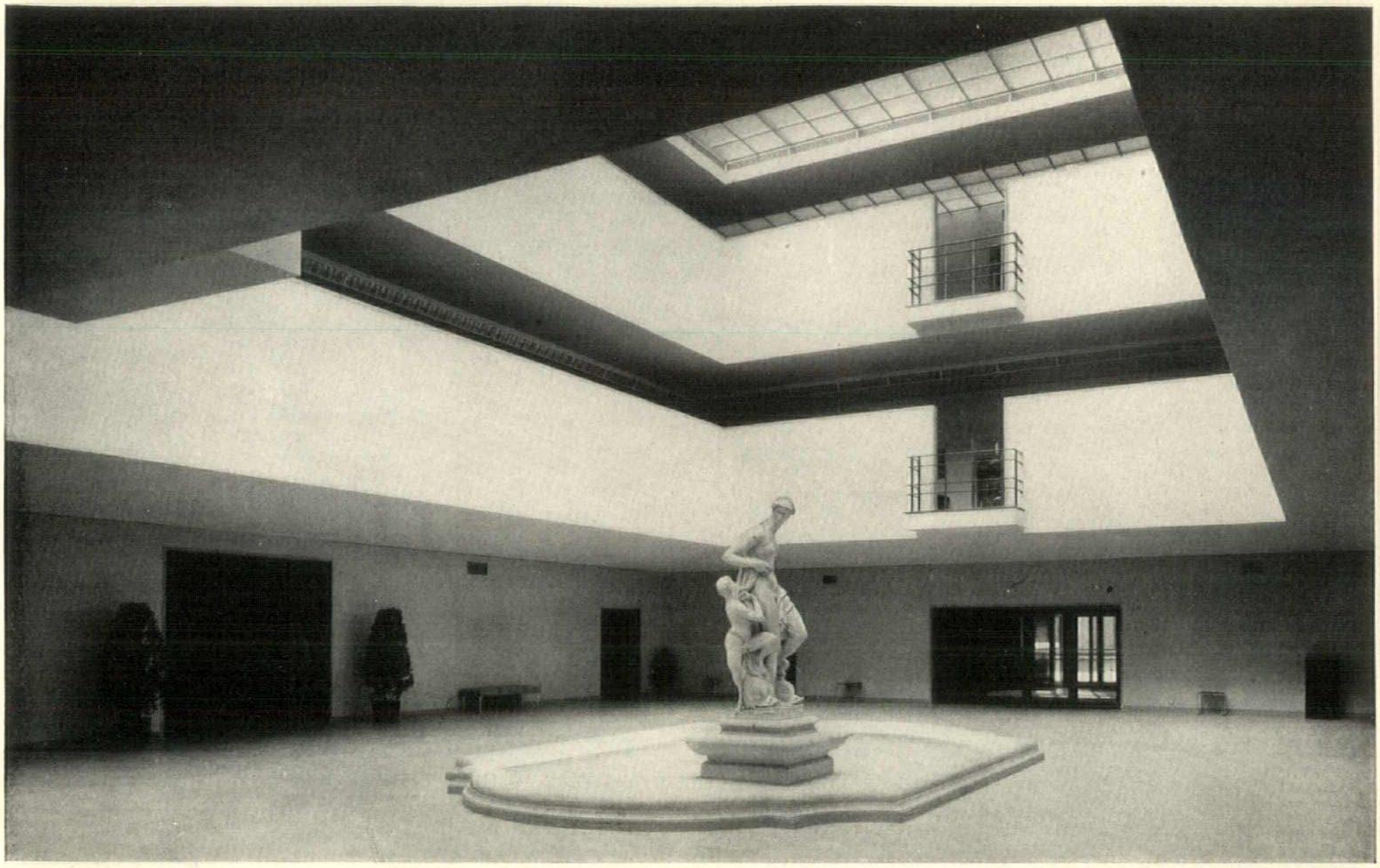
GROUND FLOOR



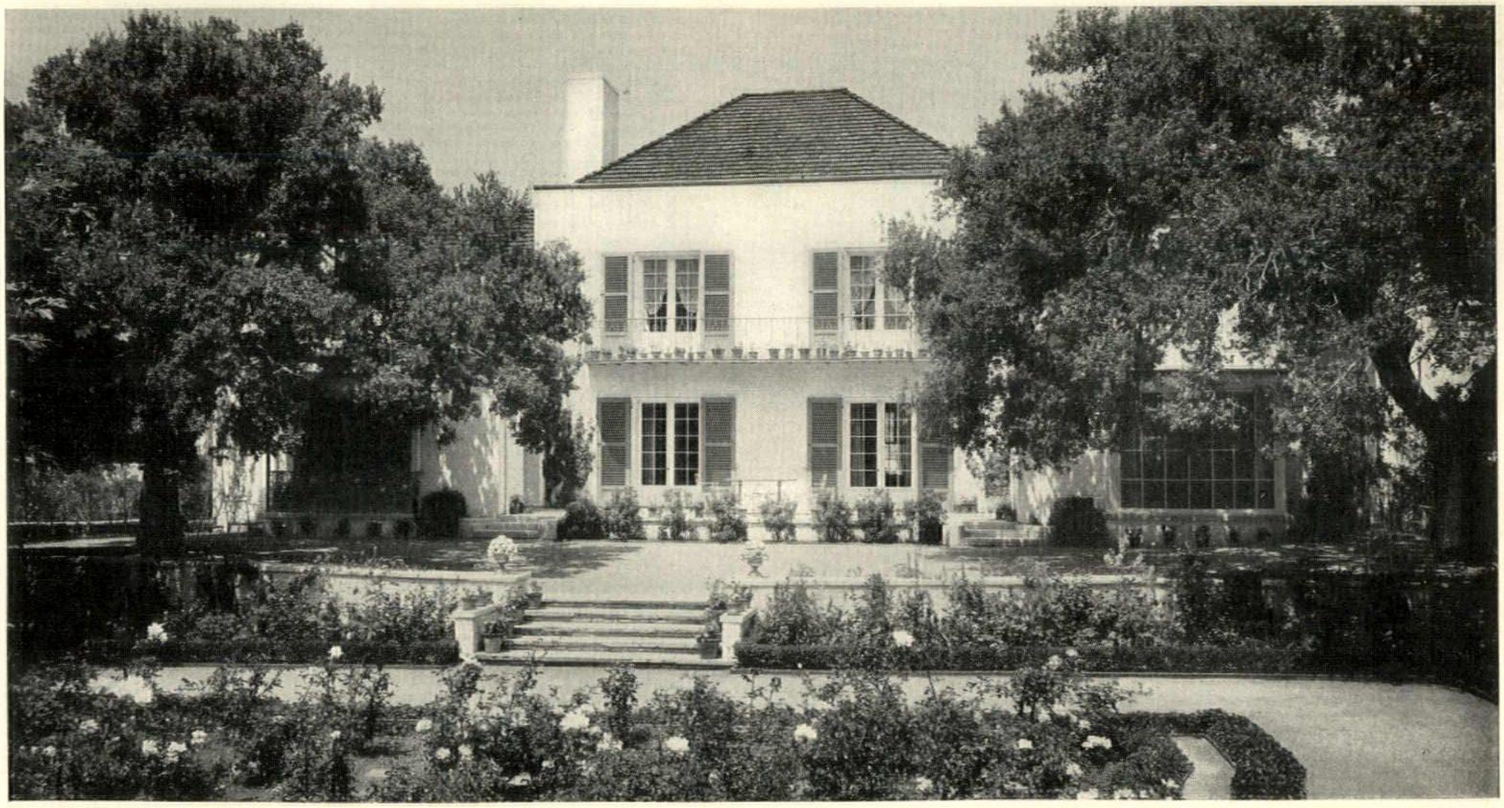
FIRST FLOOR

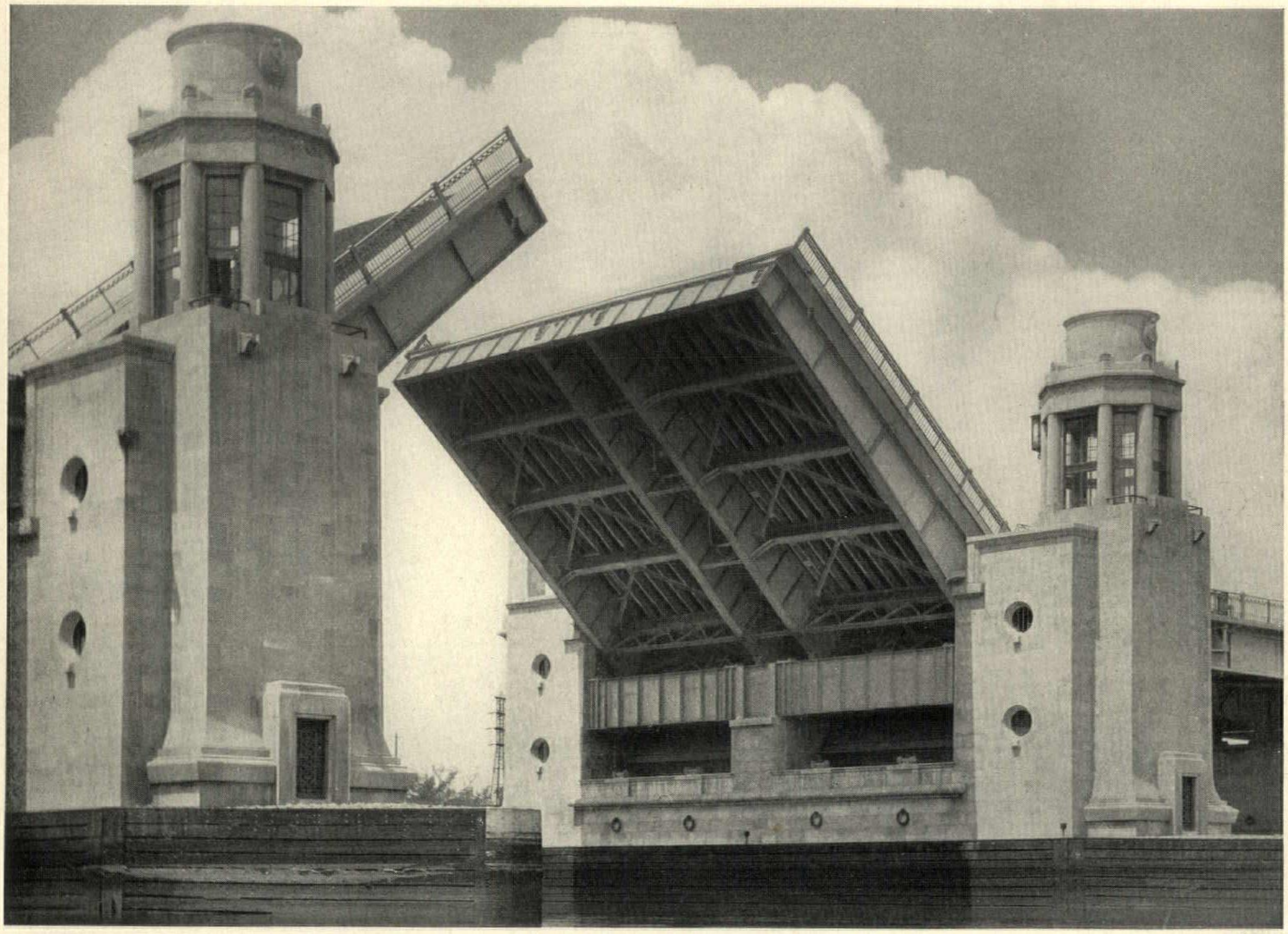
SECOND FLOOR





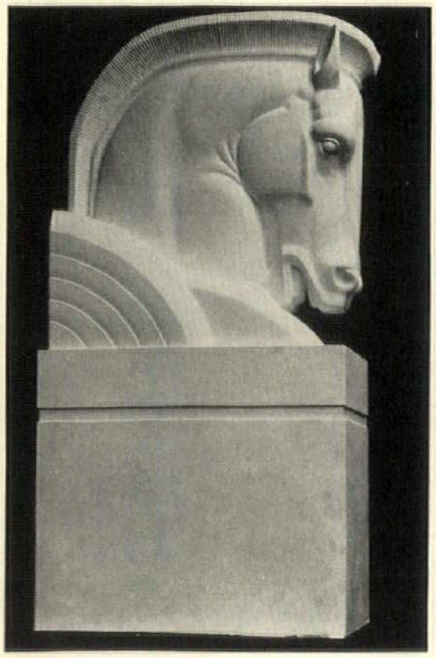
HAIGHT

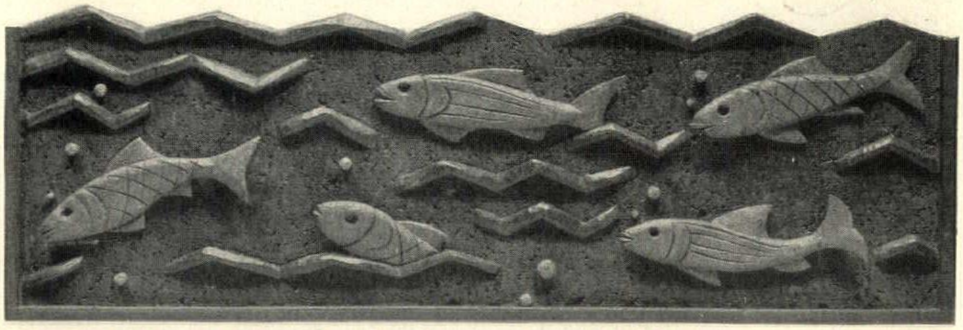




RITTASE

DEWITT WARD





Shown at the 49th Annual Exhibition of The Architectural League of New York

On facing page: above, Main Court of the Avery Memorial, Hartford, Conn.; Morris & O'Connor, architects; below, house of Mrs. Richard B. Fudger, Beverly Hills, Calif.; Roland E. Coate, architect. This page: top, University Avenue Bridge, Philadelphia, Pa.; Paul P. Cret, architect; left, design for gate post; J. Kiselewski, sculptor; above, cork over-bar panel carved by T. Weidhaas

Cass Gilbert,
Architect

1859-1934

BY CHARLES MOORE

Chairman, The Commission of Fine Arts

CASS GILBERT died on the eve of giving to a waiting public two structures of the highest rank—the United States Supreme Court Building in Washington and the building for the Federal Courts in New York City. Death robs his ears of popular acclaim. This is spoken of as a catastrophe. On reflection one recognizes that already the artist has enjoyed the satisfaction of creation. He has had his opportunity. He has exercised a life-time of study and experience. He has looked upon his last work (the epitome of everything he has done before) ; and it was good. Good—not perfect.

In the Roman Pantheon is inscribed this epitaph to the reputed architect of the Villa Medici: "Flaminius Vacca, who in the works he executed never satisfied himself." To the architect the completed edifice is an autobiography wherein are recorded, first, the struggle to create in his own mind an ideal of function expressed in terms of beauty, then his wrestling to coordinate all those warring elements, both human and material, concerned with the realization of that ideal. Only the artist knows and intensely feels his dependence on the cooperation of those who have striven with him loyally, understandingly, with heart and brain and hand, to carry out his conception.

Herein lies the real satisfaction of the artist. Public recognition is but an added joy. Often it comes slowly. It takes time and thought to understand and appreciate the whys and wherefores of decisions many and rejections innumerable. Critics may at pleasure build their evanescent castles in Spain. Artists must deal with materials fixed for all time in form and substance.

FROM impressive state capitols to vast warehouses, essentially utilitarian, Mr. Gilbert has worked, adorning everything he touched. In the epoch-making Woolworth Building he grasped firmly and solved adequately the New York problem of the skyscraper. Its sheer beauty transcends architectural style. Twenty years ago it was the tallest structure in the world. Today its height is exceeded by five buildings in New York City; but it still stands royally as the queen, surpassed in grace and dignity by none. Architecture has been likened to music. "The mounting chords of the Stabat Mater," said Mr. Gilbert to me, "kept sounding in my mind while I was piling up that building."

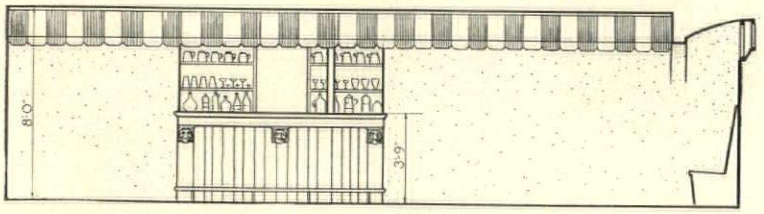
Decorative possibilities of colored linoleum for both floor and walls of recreation rooms as develped by the Decorator's Bureau of Congoleum-Nairn in the showroom of the A. H. Stiehl Furniture Co., New York. In the diagram: 1, dark, mottled green; 2, light tan jaspe; 3, dark tan; 4, light gray; 5, dark brown; 6, dark slate gray. The use of linoleum in sub-surface rooms is not recommended by manufacturers unless the original walls and floors are thoroughly waterproofed and then furred

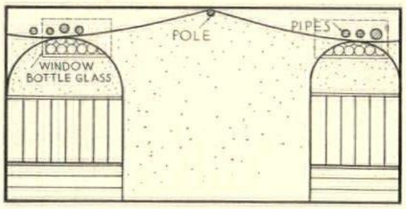
Basement Recreation Rooms

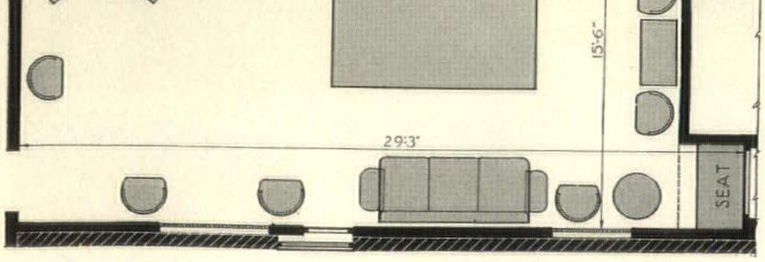
COSTAIN

BASEMENT LOUNGE, HOUSE OF W. F. WEBSTER, LARCHMONT, N. Y., C. C. MERRITT AND URBAIN G. TURCOT, ARCHITECTS

GOTTSCHO

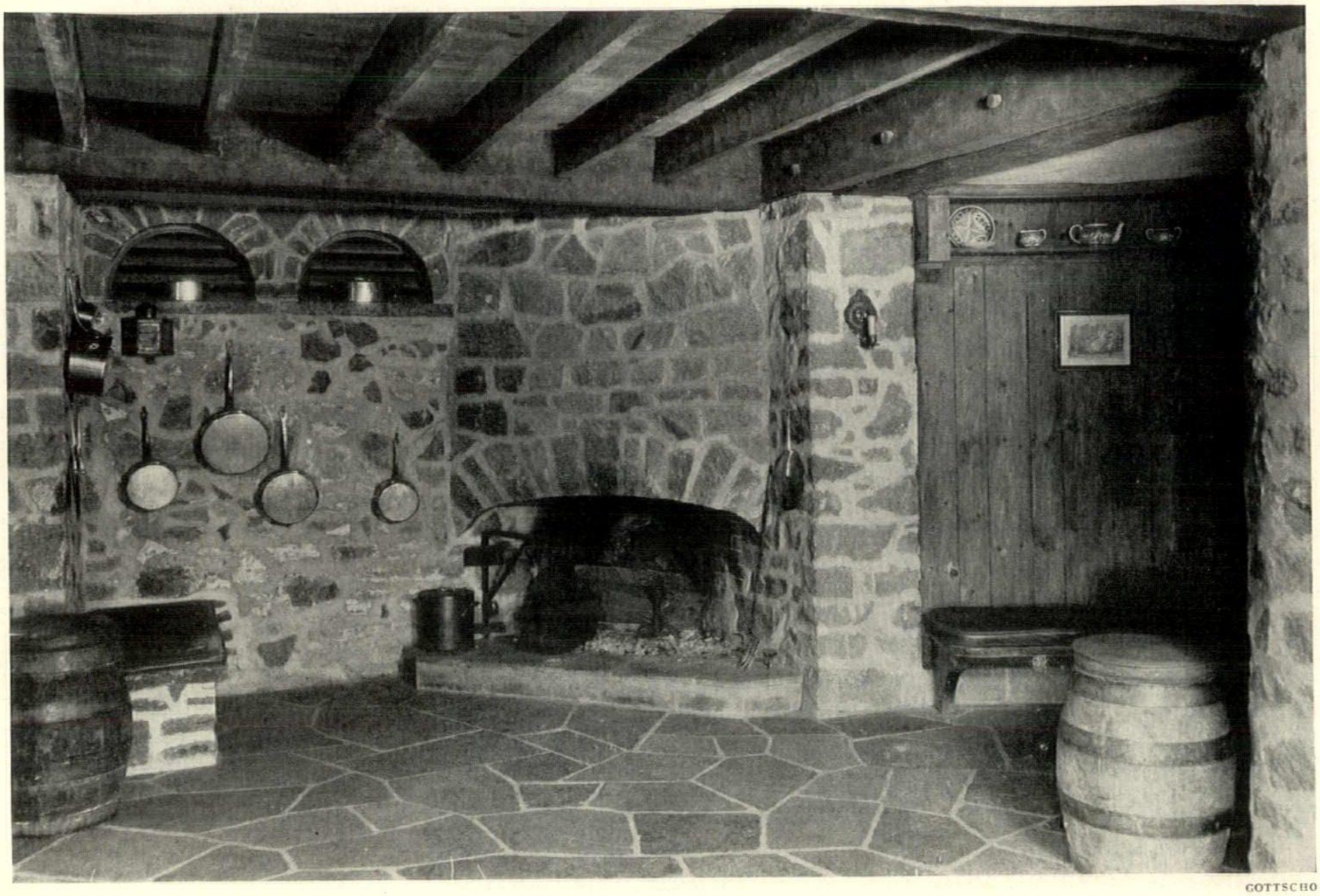






Ceiling: orange and blue striped canvas to conceal piping. Floor: black and red asphalt tiles. Walls: hand-patted plaster with occasional grotesque figures in flat modeling. Surface is slightly stained and waxed. Cellar windows concealed with leaded bull's-eye glass sash. Doors opposite bar open to utility control valves and panels. Bar is equipped with refrigerator

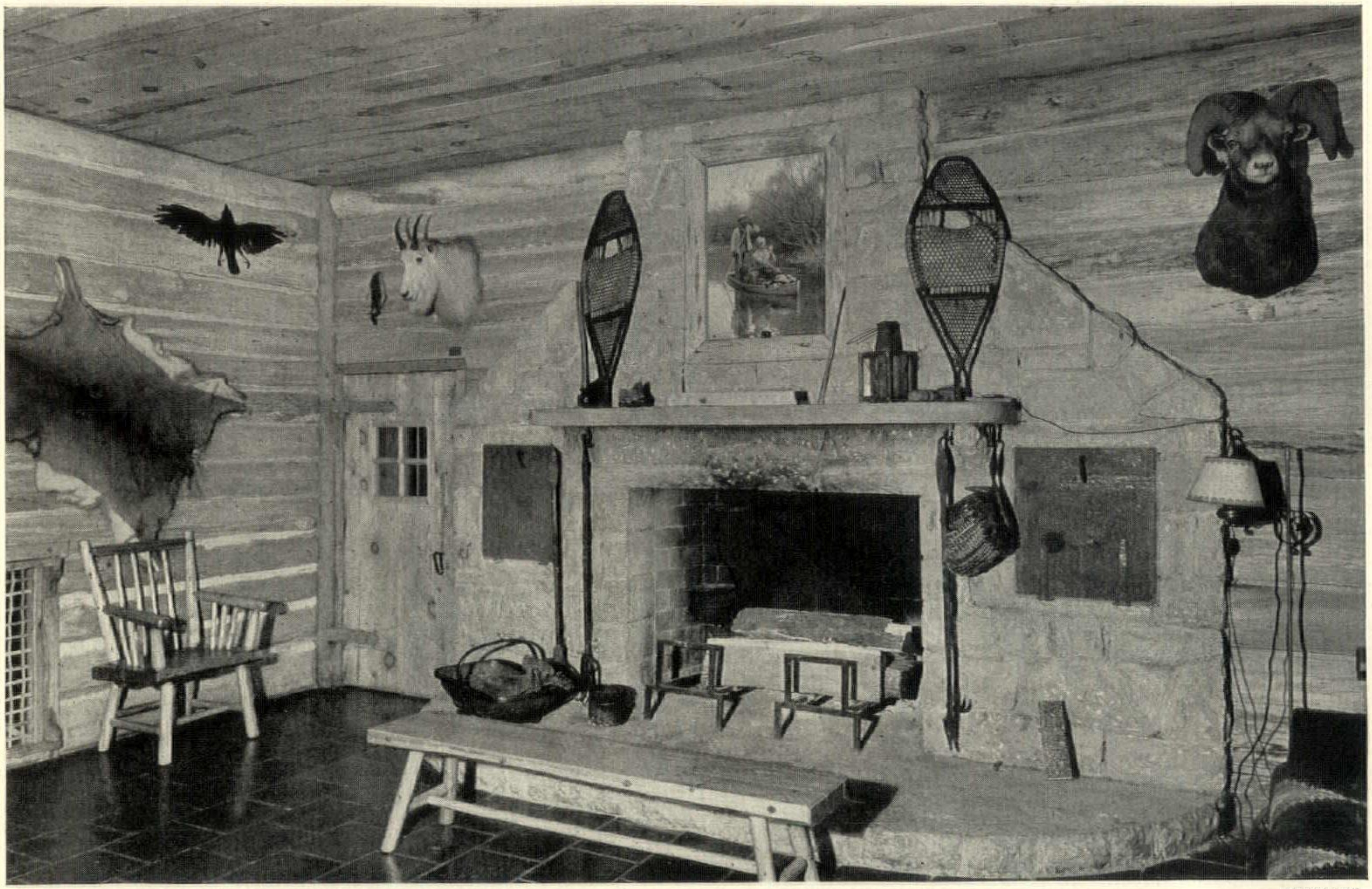
PLAY ROOM, HOUSE OF TRACY HIGGINS
SMITHTOWN, LONG ISLAND, NEW YORK
PEABODY, WILSON & BROWN, ARCHITECTS



GOTTSCHO

Floor: slate. Walls: original stone-work, plastered over rough spots. Ceiling: whitewashed planking between rough-hewn oak beams. Woodwork, including doors and trim: wire-brushed oak

TAPROOM,
HOUSE OF FRANCIS BLOSSOM
FAIRFIELD, CONNECTICUT
HENRY C. PELTON, ARCHITECT



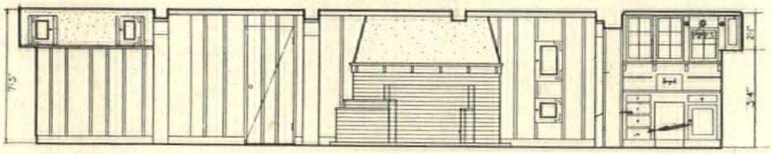
GOTTSCHO

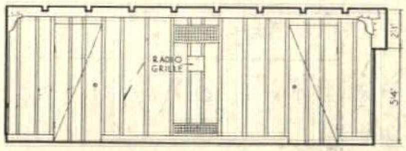
Floor: heather-brown tile, waxed. Walls and ceiling: hewn logs, waxed finish in natural color. Wall logs laid in white mortar. Fireplace: gray, rough-cut local stone. The room was finished by owner with local day labor

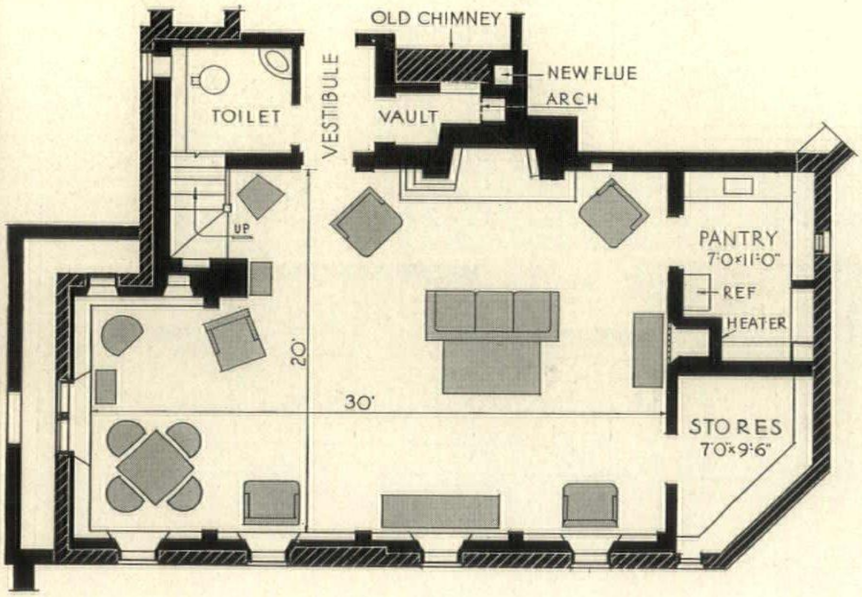
TROPHY ROOM,
HOUSE OF NELSON S. TALBOT
DAYTON, OHIO
PEABODY, WILSON & BROWN, ARCHTS.

PHOTOGRAPHS BY GOTTSCHO

BASEMENT LOUNGE, HOUSE OF DR. KINGSLEY ROBERTS, GREENWICH, CONNECTICUT, G. PIERS BROOKFIELD, ARCHITECT

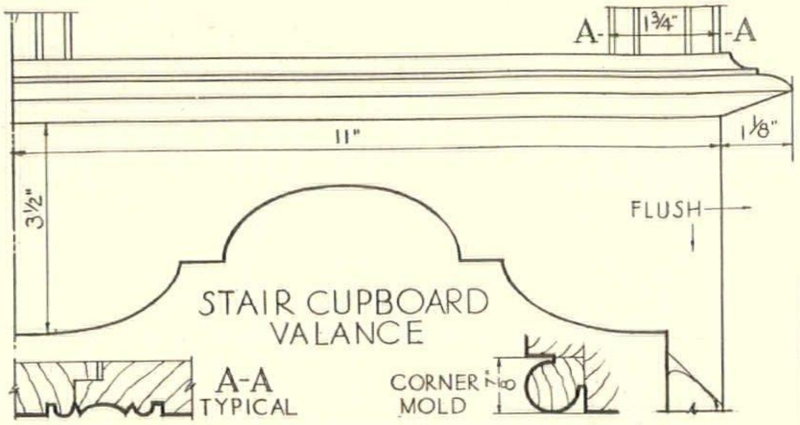


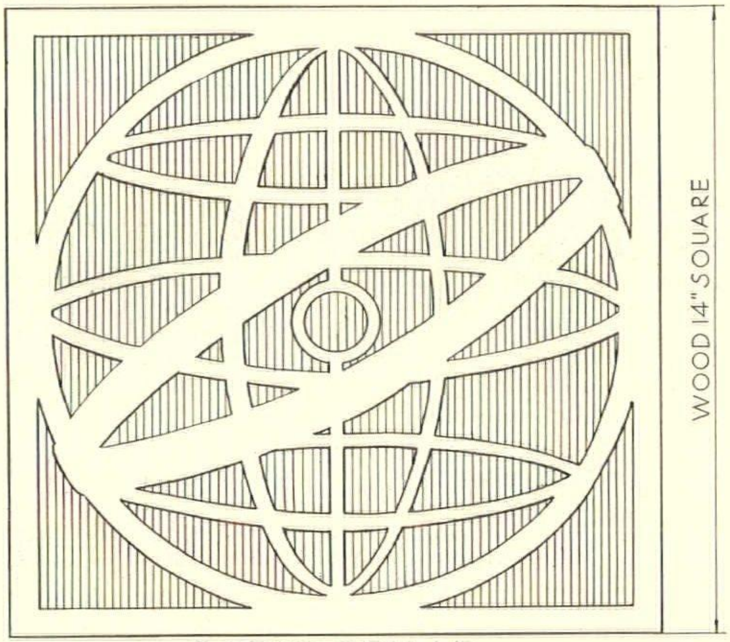


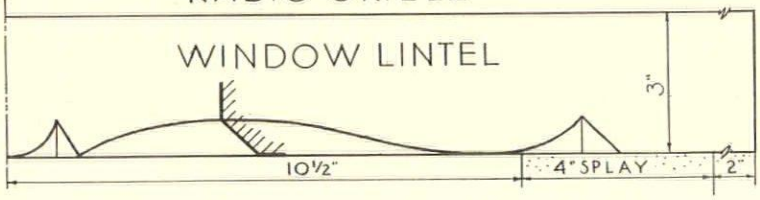


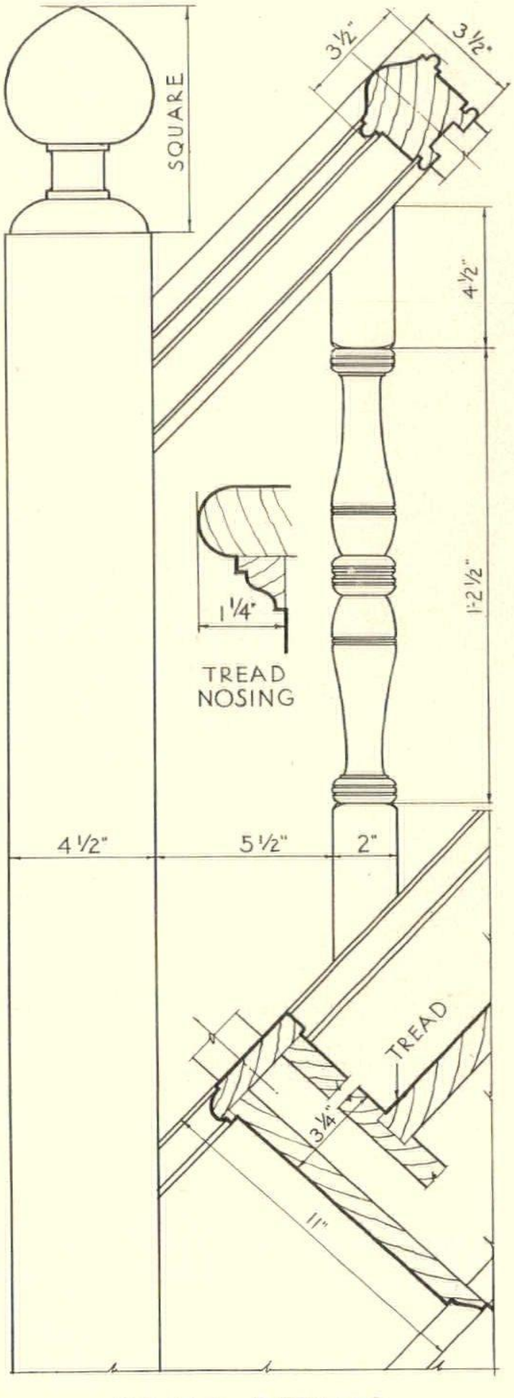
Space was formerly a boiler room. Necessary new work made most walls double thick, old work forming pine-paneled wainscot ledges under windows. Windows open underneath a porch; artificial light is indirectly reflected from boxed-in panels to simulate daylight. Room is heated, ventilated and air conditioned from unit near pantry. Floor: random variegated slate. Woodwork: clear pine, antiqued with solution of potassium permanganate and walnut crystals, then waxed. Plaster of walls and ceiling: slightly irregular, antiqued by smoke from turpentine soaked rags. Beams: oak, adzed on job. Fireplace ledges: quarry tile

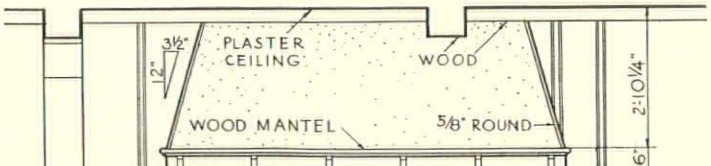
BASEMENT LOUNGE, HOUSE OF DR. KINGSLEY ROBERTS
GREENWICH, CONNECTICUT
G. PIERS BROOKFIELD, ARCHITECT

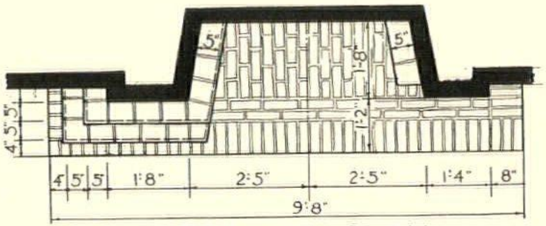

STAIR CUPBOARD VALANCE


RADIO GRILLE


WINDOW LINTEL


STAIR DETAILS


FIREPLACE


FIREPLACE PLAN

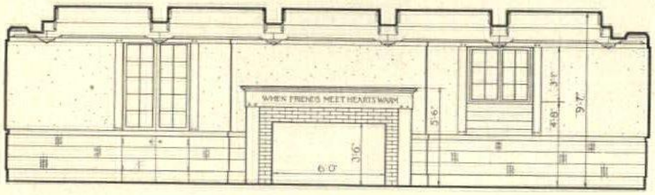
BASEMENT LOUNGE, HOUSE OF DR. KINGSLEY ROBERTS, GREENWICH, CONNECTICUT, G. PIERS BROOKFIELD, ARCHITECT

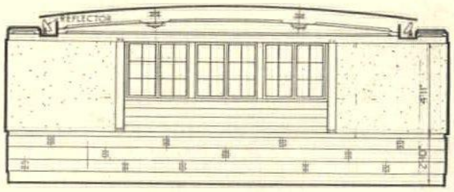
LINCOLN

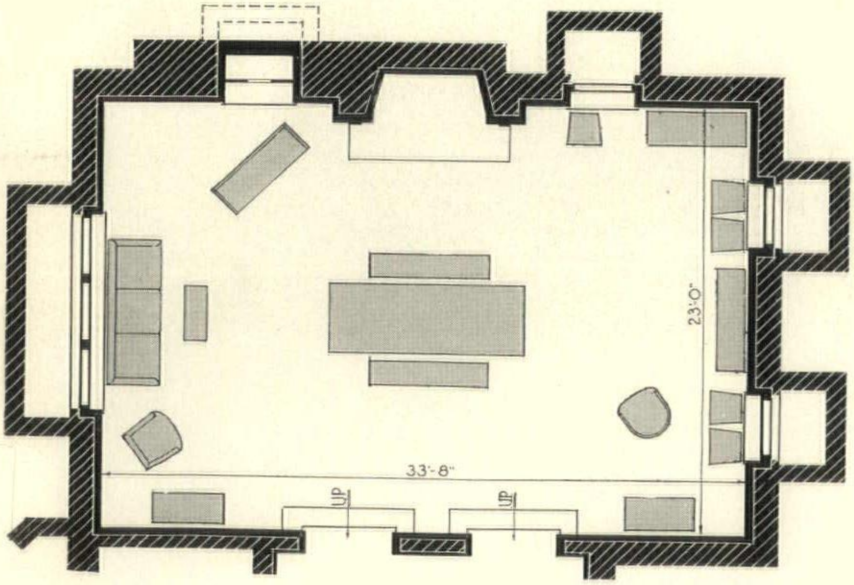
Floor: maple field with ebony border, waxed and polished. Ceiling: silver leaf. Walls: plaster. These are now covered with chalk murals, sprayed with fixatif. Pilasters and lighting fixtures: pink mirror. Fireplace mantel: polished black slate. Upholstery and draperies in shades of blue, brown and tan. Interior decorations and furnishings by Mrs. Devah Adams

BASEMENT LOUNGE, HOUSE OF FREDERICK B. RENTSCHLER, WEST HARTFORD, CONNECTICUT, CHESTER PATTERSON, ARCHITECT

GOTTSCHO



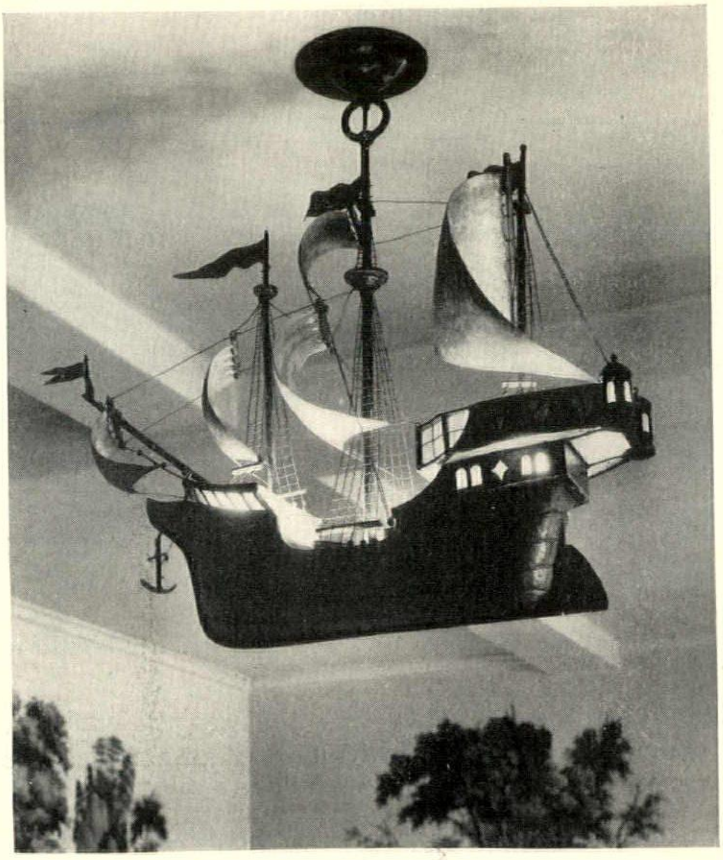




Floor: teak planks, waxed. Walls: painted plaster. Woodwork: pine, charred to produce an effect of mellow age. Beams are built-up to conceal pipes. Plaster ceiling is curved for the same purpose and also to reflect indirect lighting from cornice slots on long sides of the room. Fireplace will take logs four feet long which can be stored in a concealed closet near it. The closet also conceals a radio having a remote control. Double doors lead to a large hall used in conjunction with this room. Hall has a slate floor and pine paneled walls

SOCIAL ROOM, HOUSE OF HANNIBAL C. FORD
GREAT NECK, LONG ISLAND, NEW YORK
GEORGE W. CONABLE & LEON H. SMITH
ASSOCIATE ARCHITECTS

GOTTSCHO



Floor: oak plank, stained dark gray and waxed. Base, stair risers and door trim: gray-buff local sandstone, slightly sand-blasted. Dado: plaster, painted gray-buff. Ceiling: plaster, painted white. Windows (not shown) are recessed and trimmed with stone similar to entrance door. Room contains a fireplace of carved stone. Lighting fixture, right: iron and aluminum

RECREATION ROOM
HOUSE OF RICHARD C. GRANT,
DAYTON, OHIO
PEABODY, WILSON & BROWN, ARCHITECTS

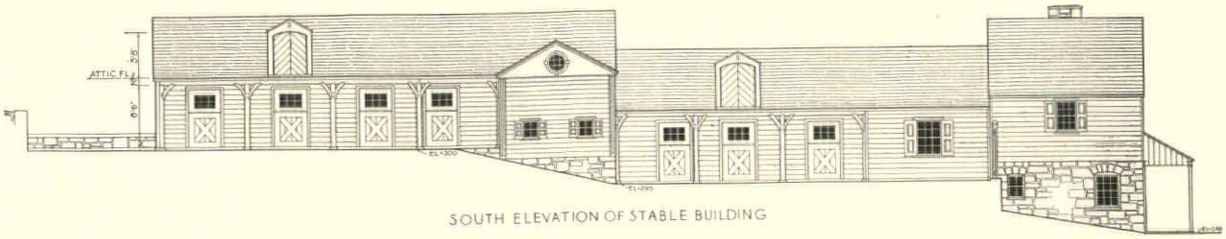
POLHEMUS AND COFFIN, ARCHITECTS

GARAGE AND STABLE GROUP

ESTATE OF JESSE ISIDOR STRAUS, MT. KISCO, NEW YORK

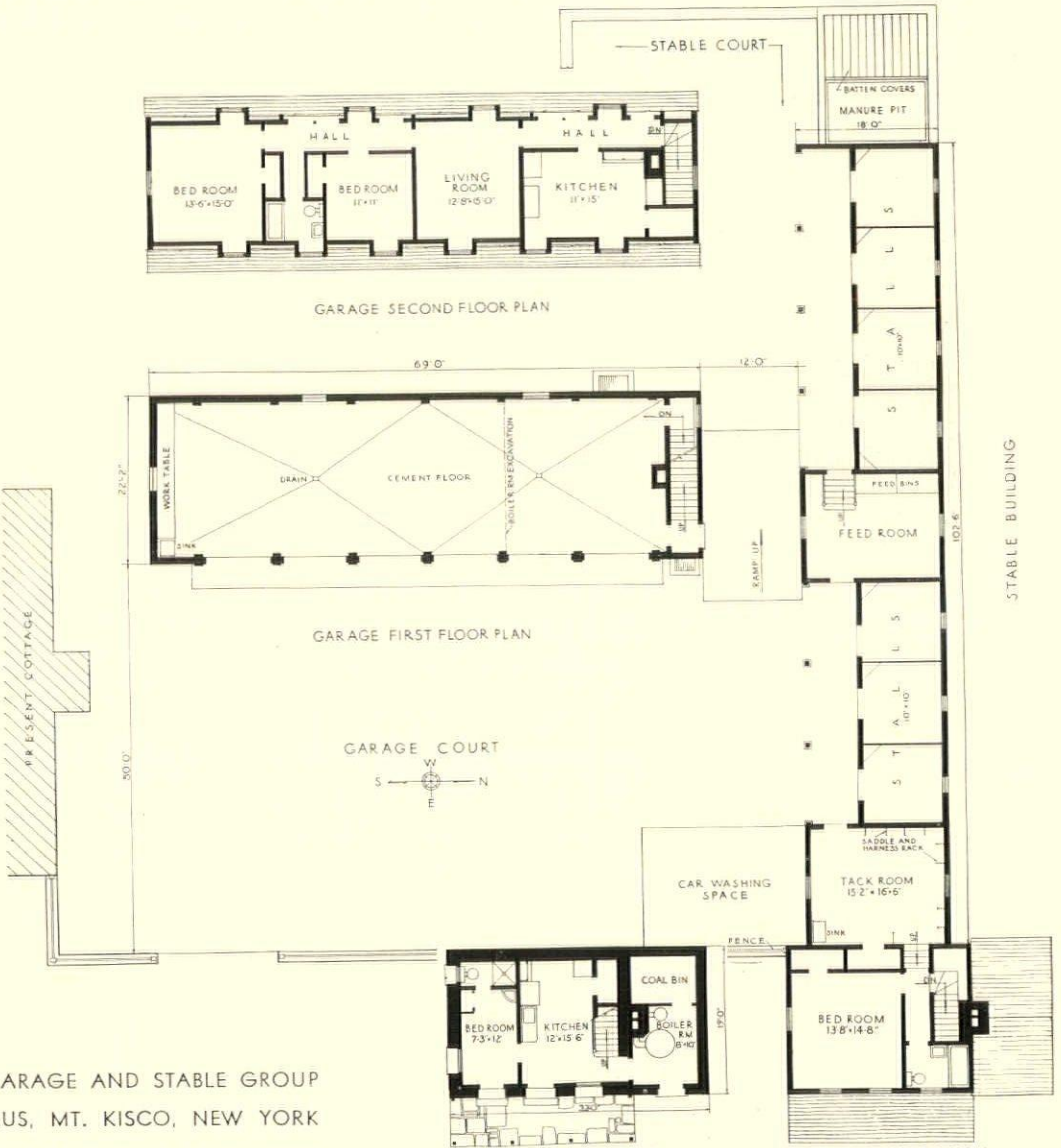
Photographs by Harold Haliday Costain

Construction, frame throughout except back of garage and first floor walls of groom's cottage which are whitewashed rubblestone. Exterior finish, shingle. Cost, in 1929, approximately $45,000



SOUTH ELEVATION OF STABLE BUILDING

EAST ELEVATION OF GARAGE AND GROOMS COTTAGE



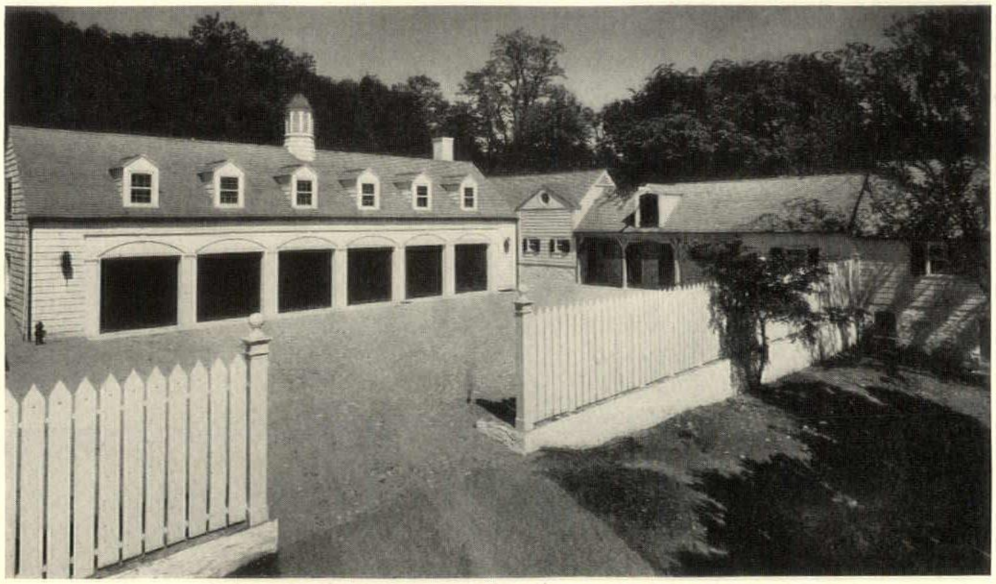
GARAGE SECOND FLOOR PLAN

GARAGE FIRST FLOOR PLAN

GROOMS COTTAGE FIRST FLOOR

GROOMS COTTAGE 2ND FLOOR

PLANS AND ELEVATIONS OF GARAGE AND STABLE GROUP
ESTATE OF JESSE ISIDOR STRAUS, MT. KISCO, NEW YORK
POLHEMUS AND COFFIN, ARCHITECTS



GARAGE AND STABLE GROUP
ESTATE OF JESSE ISIDOR STRAUS
MT. KISCO, NEW YORK
POLHEMUS AND COFFIN, ARCHITECTS

As It Looks

ARCHITECT: PROFESSIONAL OR BUSINESS MAN

MUCH argument ensues and much confusion exists over the question of whether the architect is a professional man or a business man. Everyone probably agrees that the practice of architecture is a profession. At the same time it is difficult to see how any one can carry on a practice and not be a good business man. Doctors and lawyers are professional men; and many of them are astute business men as well. And you may be sure that the successful architects are also good business men. The confusion apparently exists in the failure to distinguish between the professional-business man and the individual who commercializes architecture. Doctors, dentists and lawyers face competition similar to that of an architect. But these other professions are continually waging relentless campaigns to safeguard those who do maintain reasonable standards of practice.

ANOTHER STEP IN THE RIGHT DIRECTION

IN June of this year the New York Society of Architects instituted a program of awards to schools of architecture, by which special ability in building construction shown by students will be recognized. The Society states that the purpose of this special recognition is to stress the importance of proficiency in the utilitarian side of architecture and building construction. Architectural students and the public have too long been led to think that architects are solely concerned with beautiful buildings. It is about time to impress both with the fact that architects are no less important in the case of practical plans, specifications and the erection of buildings than they are in the matter of aesthetic building design.

ROBERT D. KOHN RESIGNS FROM PWA

NEWS of Robert D. Kohn's resignation as director of the PWA housing division comes as no surprise to those well informed on the housing situation and sensible to the PWA's policies on housing activities. For many months it has been apparent that the set-up of the housing division itself precluded any chance of practical success. The difficulties under which Mr. Kohn labored were inherent ones and resulted in inefficiencies for which Mr. Kohn can be held blameless. All who know his high personal integrity and keen administrative ability will deplore the way in which his resignation was announced. It was subordinated to news that administrative methods of the housing division were under investigation, thus carrying a clumsy implication of misconduct and indirectly reflecting upon the entire architectural profession of which Mr. Kohn is such an able representative. It is an unfortunate implication, to say the very least. A candid survey of Mr. Kohn's work and efforts of architects throughout the country to cooperate with the PWA would show that nothing could be further from the true state of affairs. The only just criticism of Mr. Kohn must be levelled at his poor judgment in not resigning sooner a position which embarrassed him from the administrative standpoint and jeopardized from the start the results of the undertaking.

BRING DOWN THE HIGH COST OF BUILDING

HIGH building costs will delay recovery of the building industry. It has been known for some time that the cost of building has been too great. Reduction of costs is a real problem for the industry to solve—if it can be solved. Low wages are not necessarily the answer. Increased efficiency in construction methods is not the whole answer. New construction methods may be the solution. It may prove better to develop methods using highly skilled labor at high wages than to attempt to reduce costs through a combination of low wages and construction short-cuts. There is a good argument for high wages. They mean more money in circulation, greater confidence in business and hence more building.

LET THE ARCHITECT WRITE THE PROGRAM!

SHOULD an architect accept his client's building program without question or should he make his own investigation and submit an independent, comprehensive scheme? As an expert in planning and construction, with special facilities and training to determine building requirements, it is logical that the architect should make his own investigation and write the program for the client. Most owners have long considered their building problem and have formulated a good conception of their needs. But,

To the Editors

with a limited knowledge of building, their program is usually incomplete. Often it is fundamentally wrong. Thus the program for the average building too often becomes a combination of an owner's idea of what he thinks he wants and an architect's more experienced recommendations. As a professional advisor it is plain that the architect should, in every case, make his own independent investigation of the client's building needs. If this results in a program identical with the client's, well and good. If the two are not the same, the client should be so informed and desirable adjustments should be made. This is clearly a duty of the architect and one of the best possible ways of developing a satisfied clientele.

ARCHITECTS LIKE IT ANYWAY

THE Journal of the Royal Institute of British Architects for June had this to say about AMERICAN ARCHITECT Reference Data on "Thermal Insulation of Buildings": "A useful section on Thermal Insulation which tails off into an advertisement of 'Reynolds Metallation'—a 'reference advertisement of Reynolds Metals Company which is good for an advertisement but must not be confused with the more valuable material in the article proper which contains among much else of interest a table showing the heat insulating capacities of a variety of forms of wall and roof construction."

Unfortunately the editor of the Journal did not know two pertinent facts: First, that this reference article, like all others in our series, was prepared without consideration of the advertisements published with it. The text was completed and then checked by leading technicians and authorities before the Reynolds Metals Company even became interested in advertising their product in the issue. The second fact is that this advertisement was designed to show that advertising can be as useful and reliable as the editorial content of a professional journal.

Instead of subordinating editorial ideas to advertising exigencies, we are trying to encourage advertisers to lift their story to the high standards that make the editorial content and layout of AMERICAN ARCHITECT successful. It is pleasant to report that several hundred architects have written to us praising the reference article and encouraging the further development of reliable reference advertising.

NEW BUILDING CODES ARE NEEDED

TODAY'S demand for lower construction costs in the face of rising costs of labor and building materials brings sharply into focus the need for building code revisions. Most building codes have been based upon the theory that a minimum standard of acceptable construction must be specified. In general the effect has been to encourage construction that was no better than the code required; to retard development of better and more economical construction methods; and often to place a severe cost penalty on building owners forced under code provisions to pay for excessive structural requirements. The fundamental purpose of the building code is to assure public safety. The desired objective is *performance* and not *specification.* Code revision to that end would encourage development of new, safe, economical construction methods. Equally desirable is the better unification of building code provisions. Codes of two adjacent communities in the State of New Jersey, show, for example, a 25 per cent difference in roof load requirements. One or the other must be excessive or inadequate. Architects in every community know whether or not local building codes are what they should be; and professionally they have a vital interest in them. It would be a constructive effort for groups of architects everywhere to study their local codes and secure such revisions as may be necessary to keep the codes abreast of scientific developments, thus permitting progressive construction economies.

A GOOD SALES POINT

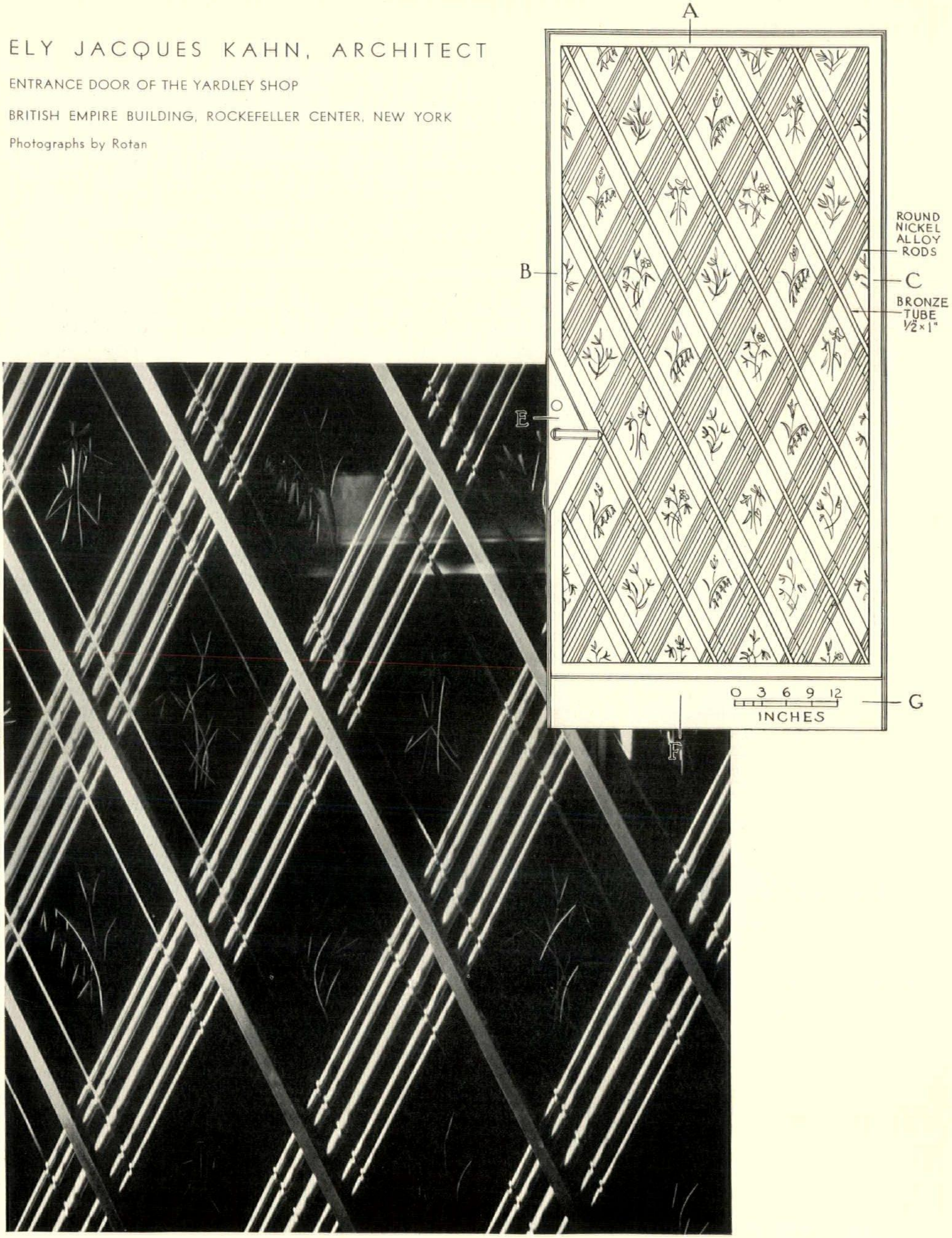
AFTER a building is completed the most important elements of the structure are concealed. The actual materials and workmanship that went into the building are records not available to the average person. Seller or buyer must too often depend largely upon surface indications to determine the value of the building. Size is no reliable criterion of worth. But—the wise owner who employed an architect has a valuable set of documents in the plans and specifications. With them he can demonstrate what is behind paint and plaster. If the architect supervised the construction, it should be sufficient assurance that specifications were followed and that workmanship was what it should have been. That is a good argument upon which to sell architectural service. It is a logical basis upon which to determine building value.

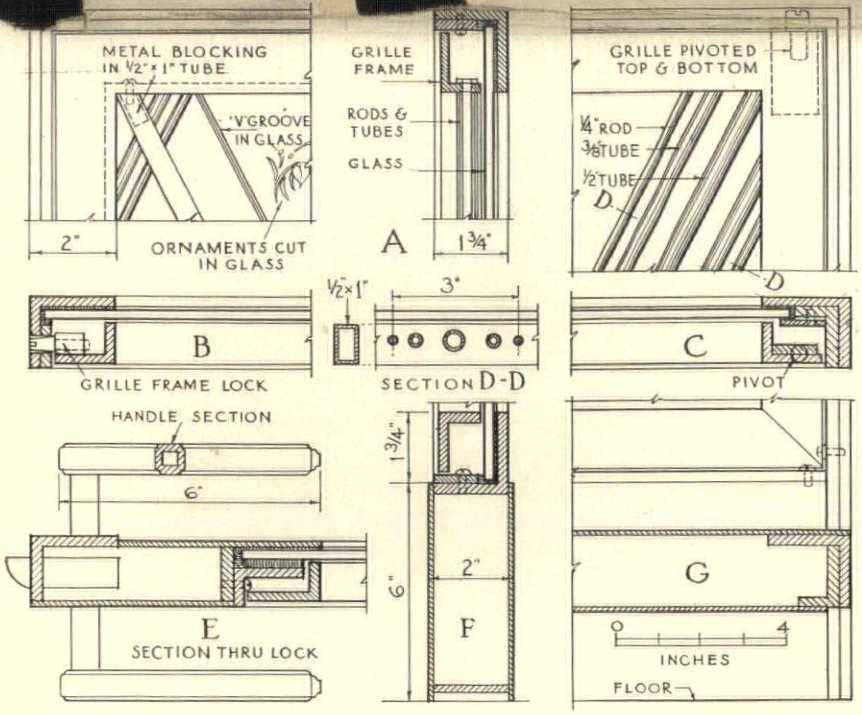
ELY JACQUES KAHN, ARCHITECT

ENTRANCE DOOR OF THE YARDLEY SHOP

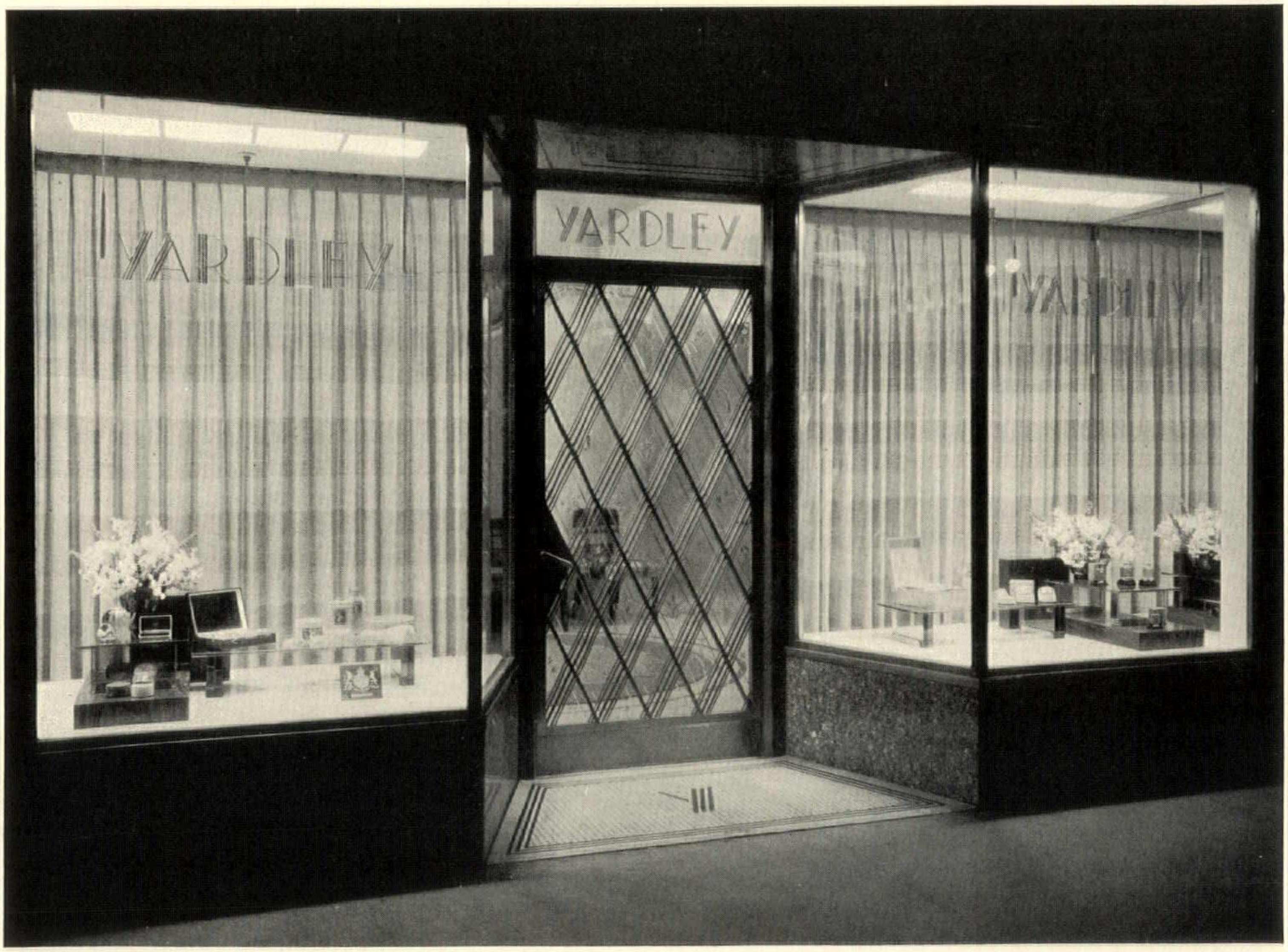
BRITISH EMPIRE BUILDING, ROCKEFELLER CENTER, NEW YORK

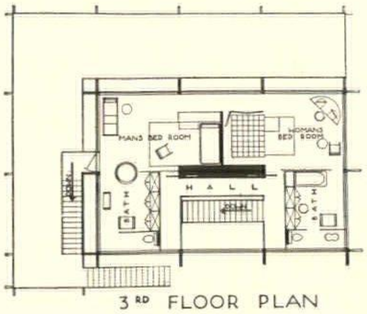
Photographs by Rotan



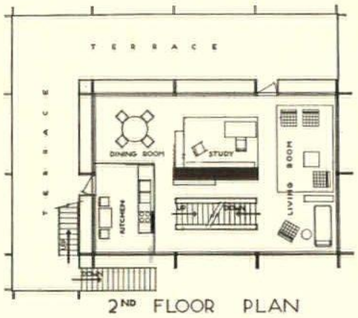


Door and show window frames: bronze. Show window floors: Botticino marble. Side walls of windows: mirror. Lighting is entirely from overhead, recessed panels. Entrance door was designed and executed by Kantack, Inc.





3RD FLOOR PLAN



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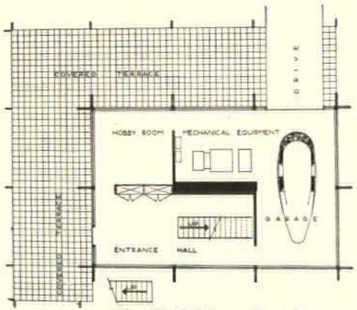
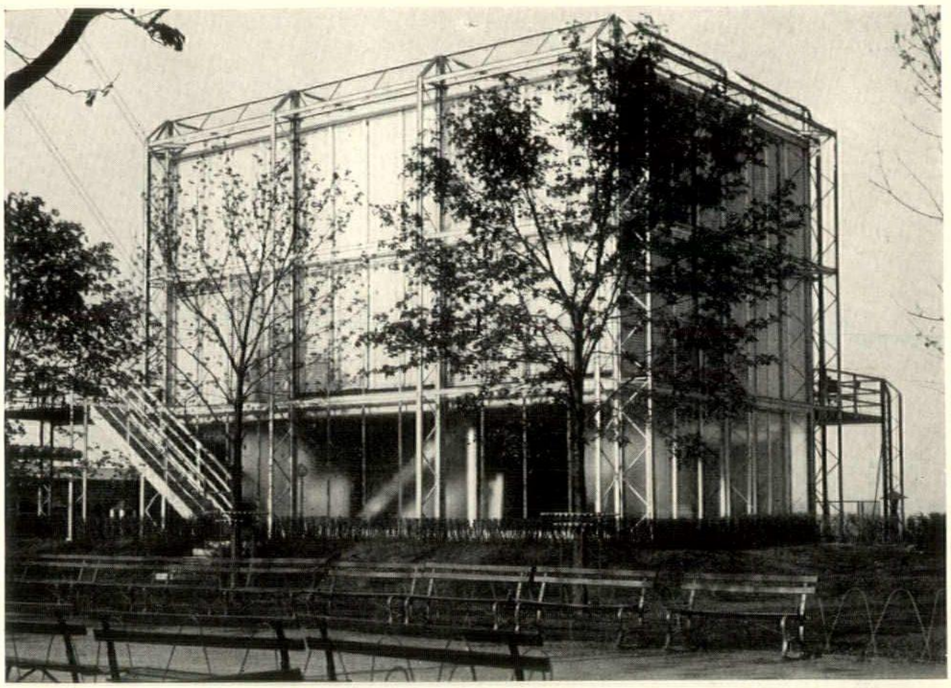
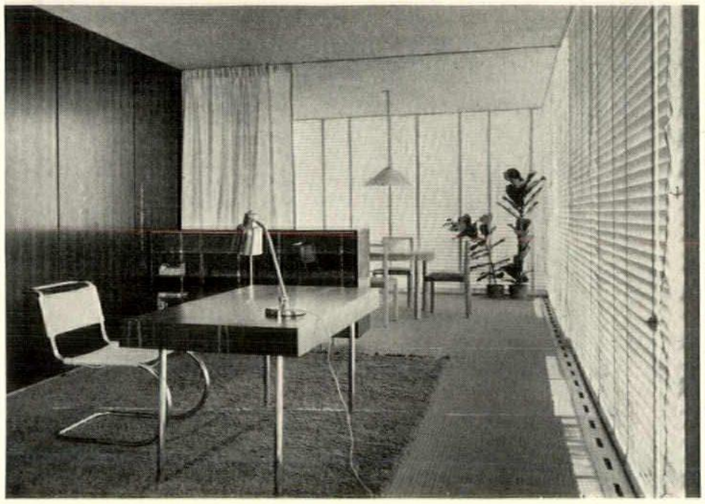


1ST FLOOR PLAN



Steel and plate glass are the most important structural materials used in this experimental building at A Century of Progress, called "Crystal House" and designed by George Fred Keck and Leland T. Atwood, architects. All framing is on the exterior; all walls are entirely of glass; trim is metal; floors, rubber tile; and closets are replaced by movable wardrobes. All rooms are air conditioned from a central shaft supplied by units on the first floor. Above: View of exterior. Right: Study - living room



Trends and Topics

• Fanfare accompanying passage of the National Housing Act served to obscure news that Congress also had appropriated an additional $200,000,000 for use in the reconditioning Division of the Home Owners' Loan Corporation. This brings to the impressive total of $400,000,000, a sum that HOLC officials will lend to house owners for repairs, remodeling and modernizing in sums ranging from $200 to $2,000. To architects this should be significant news, for of all the Federal Government's alphabetical brood, the HOLC has most quickly recognized the value of architectural service as insurance against poor construction work. The operating manual of the HOLC Reconditioning Division together with a supplementary memorandum lists the functions of State Architects Advisers and their assistants, of which there will probably be about 1,000, according to Pierre Blouke, Architect Adviser to the HOLC. Architects may be used to develop plans, specifications and consultation or merely in a supervisory capacity as required. In any case they will be retained on a fee basis. Fees for supervisory service are set at a minimum of 1 per cent of the reconditioning construction cost and in

Above, the Parthenon, showing the restoration of the columns in the North Peristyle.
On facing page, a corner of the Parthenon through the inner columns of the Propylæa

Builders in Search of a Civilization

BY CHARLES HARRIS WHITAKER

Photographs by the author

ONCE one has arrived on the summit of the Acropolis, the number and variety of questions may be endless. Pedants and lovers of hard-and-fast dates and tight fitting historical sequences will want to know how the Doric order came to Athens and why the refinements of curvature, the metope and triglyph, guttae and fluting. No importance attaches to the answers even though they could be found. They only matter to putterers. The Parthenon rests simply on the post and lintel; and all builders had known that method for at least five thousand years. The Athenian builders undoubtedly carried over some useless parts as echoes of wood forms that once expressed use. Builders of all ages changed their forms slowly and by the simple process of trial and error.

Looking through the inner columns of the Propylæa at the two temples ahead it is suddenly borne in upon one that all such questions are trivial; that history is inevitable only up to the tick of the clock; that the Present lasts no longer than that tick; that the Future is the one thing with which it is of any use to have concern. All the rest is Past and makes up history—the refuge of cowards. It takes courage to face the Future—that adventure that begins with each swing of the pendulum.

To the right, between the inner columns of the Propylæa, one sees the Parthenon. The noble austerity and majesty of the mass are accented by its position on the highest point of the Acropolis. From the moment one leaves Athens until one at last sets foot on the floor of the Portico, one climbs and looks upward. The builders of that day knew that the first principle of building is site.

The Parthenon is so many things that one is for the moment quite overcome. Some time will pass ere one sees it not only as the work of ten or more years, but also as the fruit of a century of patient trying and testing, during which generations of craftsmen in Asia Minor, Sicily, Italy and Greece sought to bring the temple to a form that entirely pleased them. At least we must so assume if we accept the usual historical version of the Parthenon as the greatest of all Greek buildings. It is so easy, however, in thus accepting to give credit to the men whose names have come down to us by the very imperfect historical method—Callicrates, Ictinus, Phidias, and Pericles—and so easy to forget, by the same historical process—twisted and distorted to suit the vanities of a profession or the theories of culture—the long procession of faithful building craftsmen. Year by year, century by century they played with form and grew to become ever more and more sensitive to the harmonies and proportions for which the very materials seemed to cry out.

Had it not been for this great host of stone-cutters —even though the bulk of their services were at the command of king and priest—there would have been no Parthenon. It sprang from no single mind. Rather was it the fruit of a slowly ripening experience over a century and more of trial and error. Year after year the builders studied the result of their labor, looked at it, lived with it and noted what pleased them and what did not.

Even as the pyramid builders of Memphis fitted limestone slab casings—with a precision that has never been surpassed—to give the appearance of a single stone to the symbolic sun-reflecting surface, so did the Athenian builders join their blocks and drums with infinite pains. They, too, wanted the Parthenon fabric to look like a monolith. Nothing else would befit the noble and gracious temple. Though no more than a mystical and momentary abode, it had to be a fitting dwelling place for immortals. The Company at Olympus was very much alive. It wanted no hermetical tombs in which to await a hereafter!

Even so, why all the refinements of curvature and entasis? They involved an incredible labor as one can easily see. Why? We shall never know. Were they merely to correct the illusions of perspective? Or may we believe that the builders wrought them because of their sheer love and knowledge of organic form? Had they looked through and beyond the material in which they worked—looked, as it were, inside of Nature herself, noted her process of growth and the form that never failed to serve the purpose to see the truth that she hid from the eye by the appearance she gave to the form? Might it be that the Athenian craftsmen could not be satisfied with a mere rectangular precision? That was never Nature's way.

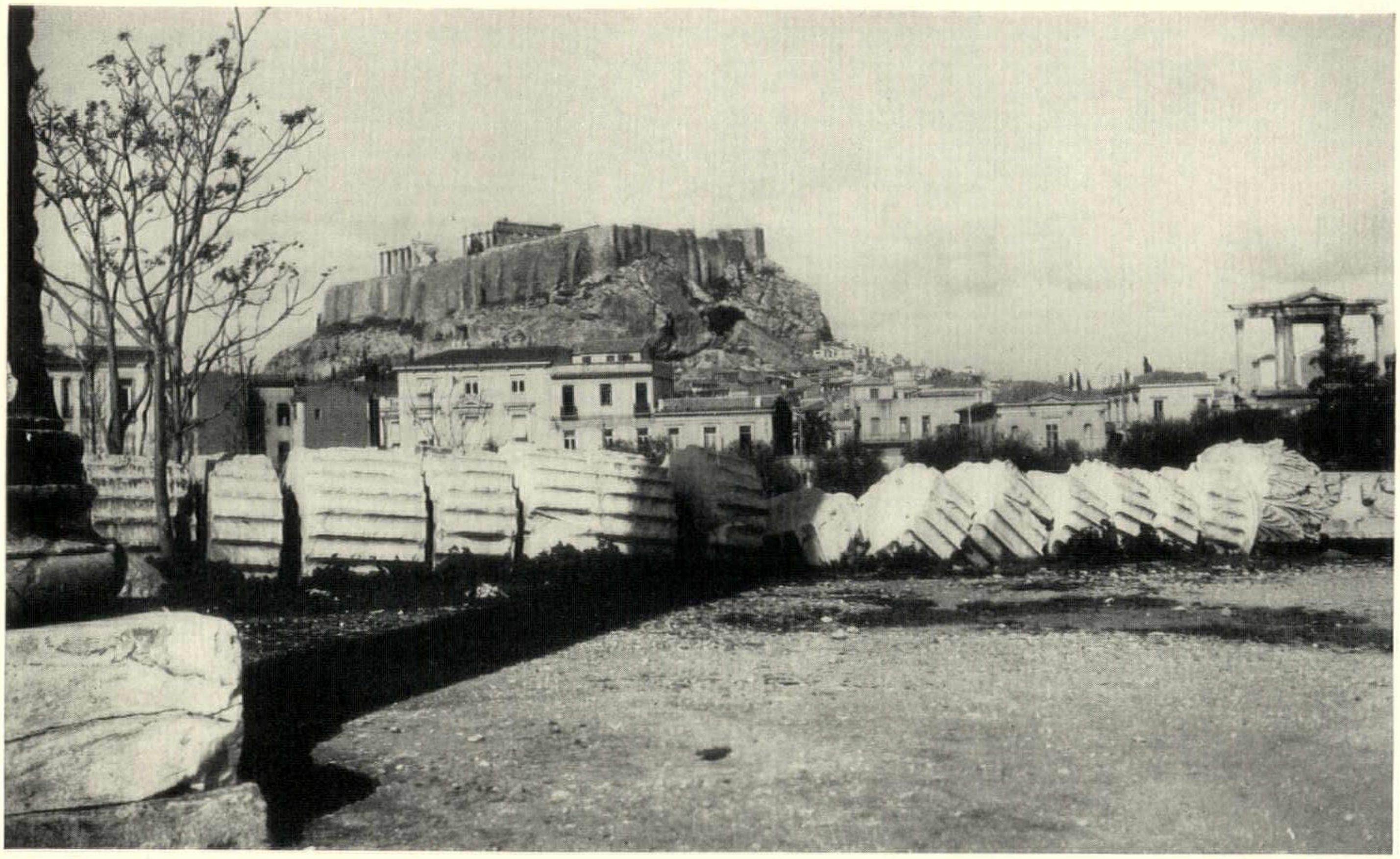
Standing by the ruins of the South Peristyle, where fragments of wall and columns lie as they fell under the Venetian bombardment, it would be easy to come to such a conclusion. Here, if one is sensitive to presences, one may feel the spiritual attendance of a great army of craftsmen. The thought of them is the larger part of the comfort and serenity that flow from ruins. In these, where sun, wind and rain have long bathed and cleansed, those fixed ideas that the building was meant to proclaim and impress are gone. The command, once set forth in symbols that spoke their meaning more clearly than do our shufflling words and symbolic trickeries of today, has disappeared. The marble has regained its purity!

One is no longer asked to believe in the gods or to quail before the unknown. The ruins set one free to mingle with the builders and to hear the clink of hammers and the sounds of voices. Here craftsmen once worked. They were making a building of two rooms, two porticos and a four-sided peristyle. The dominating element was the lintel. It governed the spanning of all spaces and openings. The form grew naturally into a rectangle in which, after years and years of experiments, the final relationship of the parts was being worked out.

The real way to approach a building problem has never changed from that day to this. We have simply messed and muddled the building process by accepting, as the determining factor, a series of monetary operations and considerations that have no more to do with building, or with the natural process of emerging from barbarism into civilization, than the moon has to do with green cheese.

EVERY now and then, the craftsman's way of looking at the building process seems to break through the tough hide of illusions in which man loves to encase himself. Thus the spirit of "modern architecture"—referring to the principle of organic structure and not to the idea that architects have developed a new high-pressure salesmanship—is merely the attempted rebirth of the instinct for workmanship. That was what animated the builders of the Parthenon and all other builders before and after it, up to the time of the Renaissance when the creative builder was pushed out of the picture. Today we call this attempted rebirth "modern," because it satisfies our ego. In reality, it is as though the Goddess of Building were once again pointing out the way—not to the waste and folly of the historical style process, but to the principle on which style rests which is the organic growth of form.

Louis Sullivan, in the 70's, with his magic and challenging formula "form follows function" gave dramatic utterance to the law of all growth and stated the ancient craftsman's common-sense approach to a problem of building. It was the same truth that Schinkel jotted down in his diary in 1824.

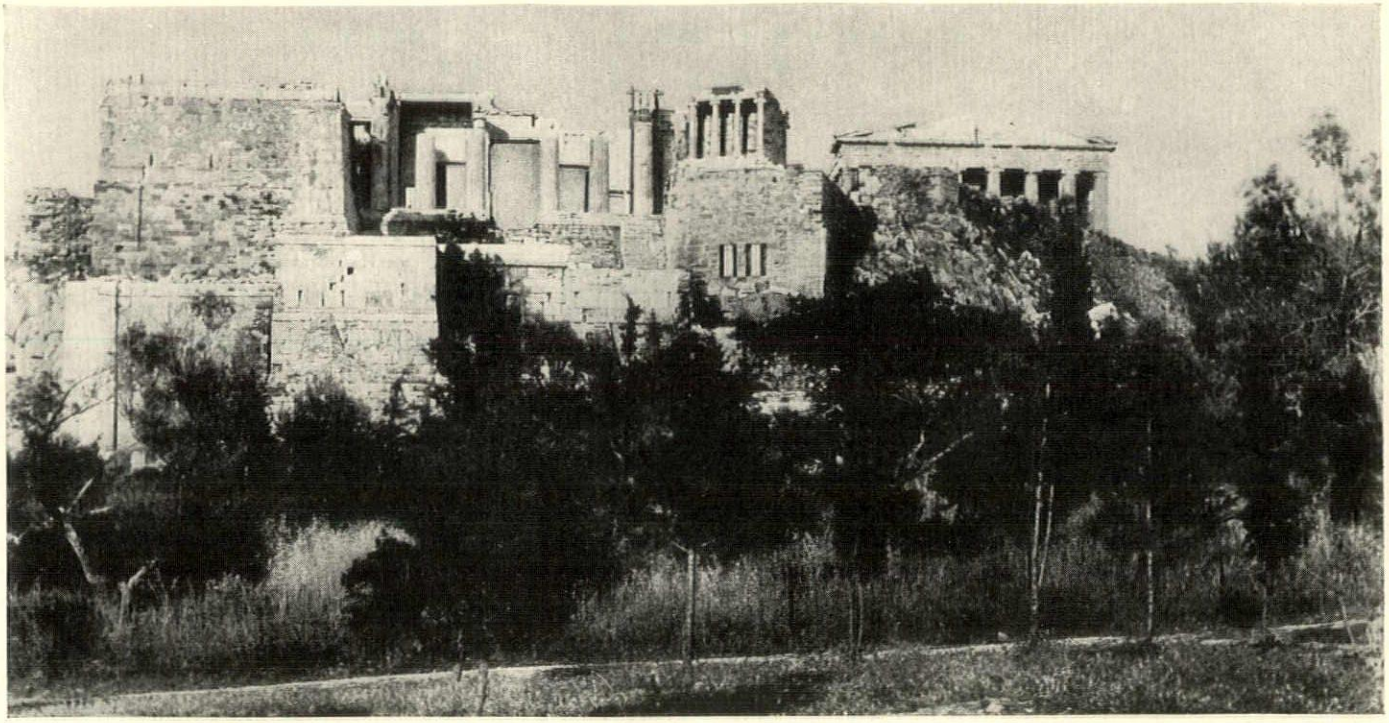


The fallen column is part of the ruins of the Temple of Jupiter. In the distance above it is the Acropolis; and at the extreme right is the Arch of Hadrian

The great German classic architect, after seeing the new industrial buildings in Manchester, cried out, "Every age has left a record of its style of building. Why shouldn't we try to find one for ourselves? Emphasize structure by its articulation; use materials frankly; no useless parts; all clear and natural."

It was the engineer who began to unmask the snobbery and pretense of architecture as an historical process. Crystal Palace, Brooklyn Bridge and Eiffel Tower announced the rebirth of the law of organic order in structure, just as Schinkel worked it out in his design for a new department store in 1827. The engineer, however, had come into possession of new materials. The whole theory of loads, strains and stresses became completely transformed. Careless of form as an aesthetic factor the engineer began to find a fine form by his unconscious obedience to the law of organic growth. Every technician, feverishly exploring the new field of machine industry, was likewise obeying the law more and more in the search for efficiency. When he accepted efficiency as a technical end he came to a form. It was only when efficiency was measured in monetary returns that form became a mixture of novelty and dullness.

In reality there is nothing, from a needle to a battleship, that does not find its right form—suited to use and purpose—by following the law of organic growth. Buildings cannot be made in the same way because we have mixed structural technique with a maudlin aesthetic emotionalism. Now that the jumble has proved so costly, so wasteful, so loaded with debt and disorder, so mercilessly perverted by our antique pecuniary processes, it may be possible, in the not too far distant future, to return to the law by which the Parthenon—and every other good building—came into existence. Not one of the fictions we have devised for monetary purposes has the slightest relation to a normal building process or to the law of organic growth. These fictions merely represent our stupid way of contriving debt and disorder; and although they are not likely to be changed over night, there can be no "modern architecture" in any genuine sense until the art of building becomes subordinated to the law of organic growth. This means something far more than the



" . . . The ruins set one free to mingle with the builders and to hear the clink of hammers and the sounds of voices. Here craftsmen once worked." Above, the Acropolis from the West, showing the Propylæa, Temple of Nike Apteros and the West front of the Parthenon. On the facing page, the North Peristyle of the Parthenon from the Naos, showing the reconstruction of the columns. At the extreme left are the columns of the Propylæa

satisfaction of one's needs and purposes or the vanities of a profession or a society. It means the social finding and adhering to those collective needs and purposes that are in tune with the law of organic growth; for in no other possible way can society grow in the direction of civilization and thus offer the builders a basis for the marvellous architecture that has yet to be built—an architecture that will grow as naturally, as sanely and as beautifully as the flower comes to bloom by following the law that was contained in the seed.

Whether the Athenian builders knew this law no one can tell us. Did they see that it governed all growth and movement, from the dance of the atom to the orbit of the star whose light takes a million years to reach our speck of an earth? All we can say is that they followed the law so closely as to indicate that they were not mere accidentalists. Nor were they confused by having their instinct for workmanship led astray by a hoary tradition of historical styles. They were as modern in their approach to their problem as was Schinkel, Paxton, Roebling, Eiffel, Sullivan, or any one of the group of young architects in the United States and Northern Europe.

The law of organic growth as we observe it seems so vast as to be incomprehensible. Yet it is simply and naturally observed without question by every organism save man. No other organism builds so stupidly as does he. Every other organism allows the form of its building to grow out of the function. If this is offered as a proof of the stupidity of man, I, for one, would not challenge the assertion. Man is the one organism that loves to live in an unreal world and to teach his children by a process that is based wholly on unreality. The more he becomes what he calls civilized, the further he moves away from reality.

Building, in itself one of the realest of processes, has become the strangest of unrealities. So deeply has it become involved with the land debt and monetary measuring processes—not one of which has the remotest relation to the manner in which any honest craftsman sets about his work—that it plunges society not into order, but into disorder. Our method of making and arranging buildings defies every natural law. What wonder that the architect-spokesman for the new governmental Housing Department at Washington recently stated publicly that the majority of the people of the United States have no adequate house in which to live? What wonder that the Emergency Committee in New York discovered

and announced that some 2,000,000 people are living in fire-traps? Even by making a due allowance for rhetorical exaggeration, one may still ask—"What price architecture?"

If we have courage to look at the Spirit of Modern Architecture as a revelation or a Voice that would point out a truth, we shall have to remember that revelations do not argue. They reveal. They challenge. The Spirit of Modern Architecture tells us to abolish school methods that sent thousands of young men into a world about whose realities they knew nothing; sent them into it with the belief that architecture was for the service only of those who had the price; sent them out with no effort to tell them the truth about the means by which the builders were being driven to write one of the most disheartening records that ever came from a race.

To hope or to suppose that there is to be a revival of the "prosperity" or of the outlook and methods that produced the present building chaos of financial discord and disorder is merely to admit that we are incapable of laying a course that will lead to civilization. The spirit of modern architecture is the challenge to a complete revision of all the old ways—the challenge to think in new ways and with a new purpose.

ON the Acropolis the shadows lengthen. The roofs of Athens fade into the same soft veil that steals about Hymettos. All outlines are losing their edges; and the Western hills that enclose Phaleron and Salamis are silhouetted in a dying golden radiance. Above the Propylæa hangs a brilliant burnished cloud, as though Jove had sent a blessing for the end of the day. Amidst the silence and the deepening shadows one seems to stand where the waves of man's long groping break softly on the Athenian strand, like lingering lappings of a long unrest.

Over and over again the builders have been ready to make a home for a civilization that should endure and grow wise and gather a beauty such as men have never known. Over and over again there were beginnings, but never more than beginnings. The real work for the builders is still ahead of them, but only as the will to civilization can overcome the will to chaos.

Architecture, after all, is only the pen that traces and records the social basis and cultural development of a people as they flow by a given point in what they call Time. How strange it is that the very people who cause the record to be written are so little interested in looking at it or in reading the one indelible record that cannot ever be falsified.

THE CULMINATION OF CLASSIC BUILDING ART

New camera studies by Charles Harris Whitaker that present, from a fresh, unhackneyed point of view, three famous monuments of ancient Greece that have stood as masterpieces of perfect building for nearly twenty-five centuries. These pictures of the Erechtheion, the Choragic Monument of Lysicrates and the Parthenon are new and dramatic records of the Greek craftsmen's mastery of the Classic building art. On this page is the Erechtheion from the West

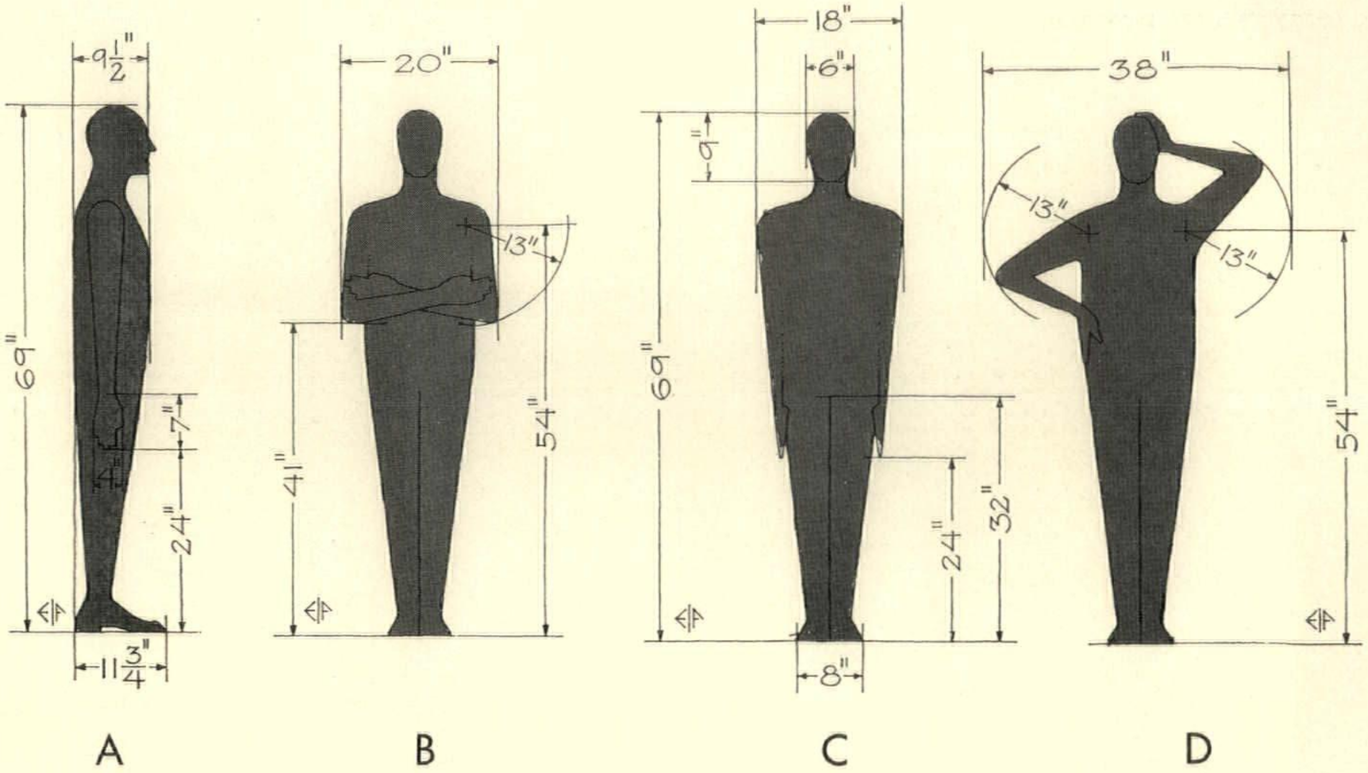
The Erechtheion (B. C. 420-393). Above, East Portico from within the ruins. On facing page, detail of the Caryatid Porch from the South-East

Above, the Erechtheion from the West through the columns of the Propylæa. On facing page, the Choragic Monument of Lysicrates (B. C. 335). Surrounding it is twentieth-century Athens; towering above are the ancient stones of the Acropolis


ΒΑΡΕΛΟΠΟΙΕΙΟΝ

The Parthenon, (B. C. 454-438), greatest of all Greek monuments. Above the South Peristyle. On facing page, Eastern façade through which passed the great processions

South Peristyle of the Parthenon looking West. At the right are the walls of the Naos



The Geometry of the Human Figure

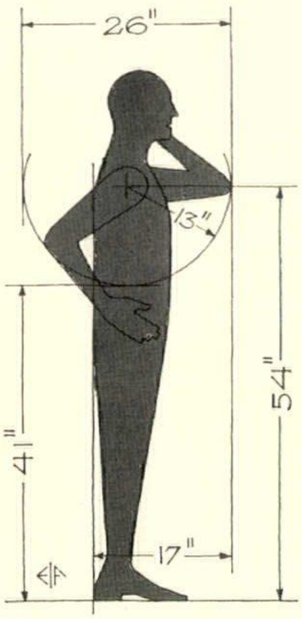
BY ERNEST IRVING FREESE

BUILDINGS are built for people. Yet in many of them this obvious fact seems to have been forgotten. In too many instances dimensions and clearances of all sorts are arbitrarily fixed with no attention to the detailed requirements of space in reference to the human inhabitants of the building. As a result furniture is often uncomfortable, spaces are cramped, built-in equipment is tiresome to use. These conditions need not be. One reason for them may lie in the lack of ready reference to accurate graphs of human dimensions.

To provide such a reference these charts were prepared. The conventionalized human figure represents the average in size and conformation; and the dimensions indicating limits of spatial needs in rest or action illustrate graphically a variety of basic clearances necessary to assure comfortable "head-room," "knee-room," "standing-room," "reaching distance," etc. These basic figure scales can be useful in determining minimum width and heights of passageways and compartments of various sorts. They will be found helpful in locating shelves and counters of built-in cabinets and are particularly to be consulted for proper clearances in the design of furniture, especially that type which is built as part of the structure itself.

About half of the diagrams constitute "working drawings" of the human figure and dimensional extremes that influence architectural planning and design. The remainder illustrate applications of the comfortable spatial needs to several commonly met furniture and fixture problems.

The Geometry of the Human Figure



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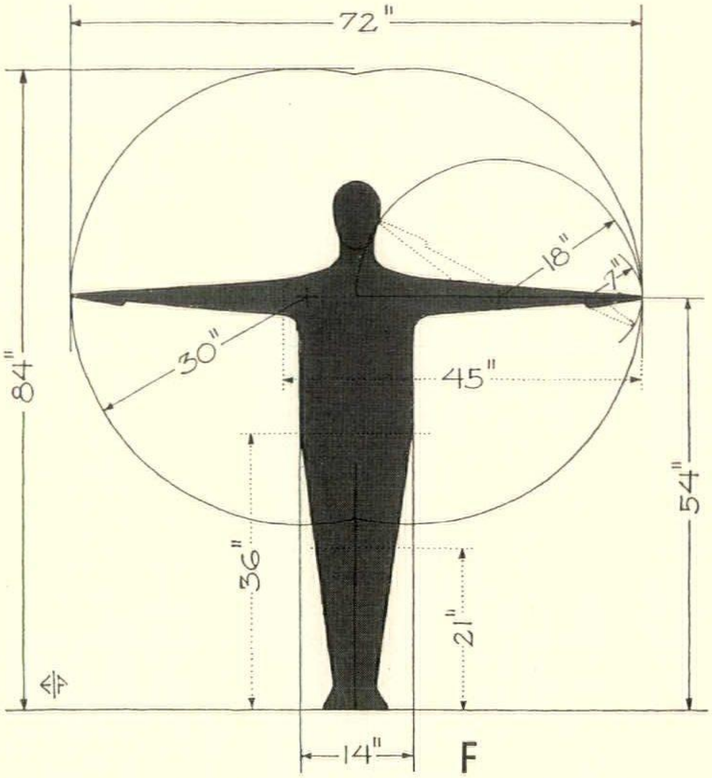
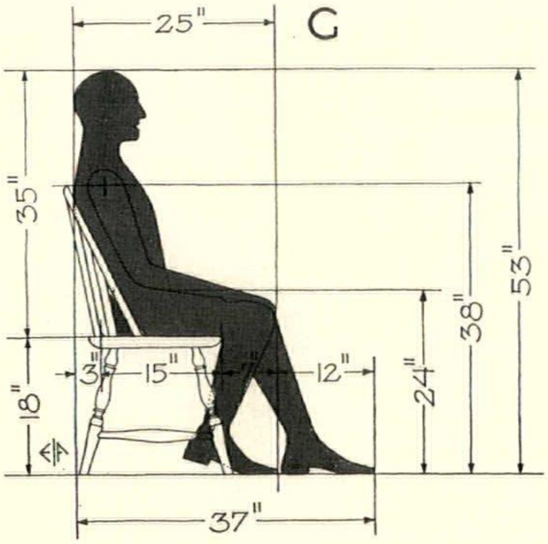
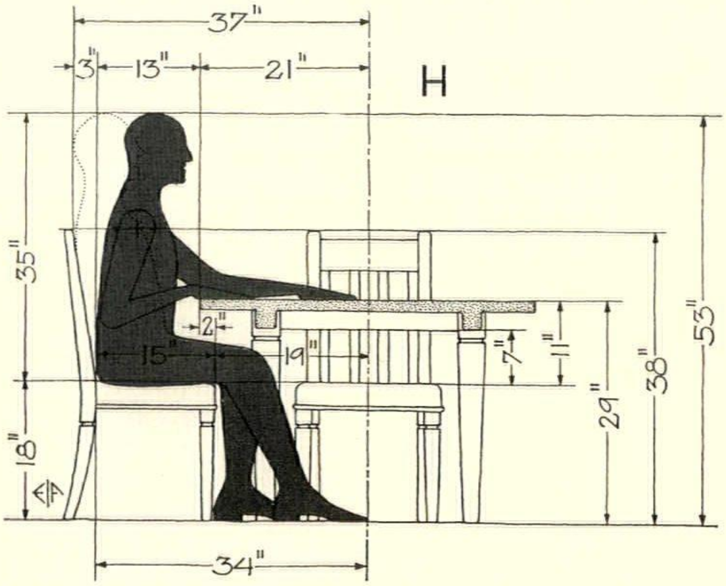
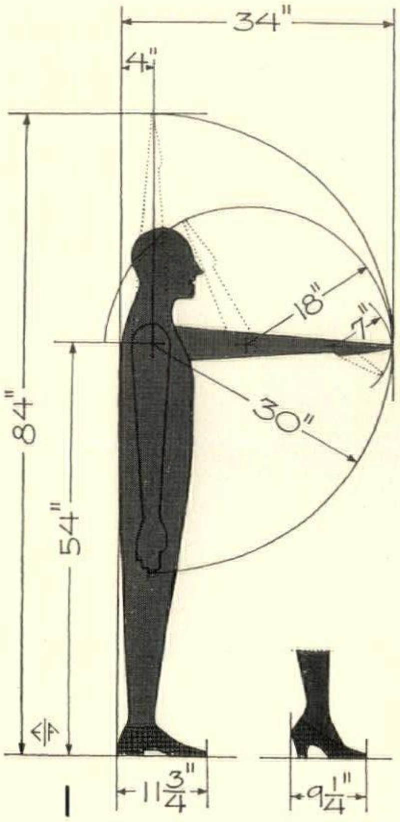


F

Diagrams A, B, C and D on the preceding page and **E, F, G, I, L and M** on these two pages establish basic limiting dimensions of the average human figure in all positions ordinarily to be considered in building design. They control minimum dimensions for passages, corridors, etc., doorways or other openings. **Diagrams G and H** indicate controlling dimensions for comfortable chairs and tables. Applications of clearances are shown in **Diagrams J, K, N and O. Diagram H** indicates that desirable footroom fixes 42 inches as the minimum desirable table width. For a chair height of 18 inches a table height of 29 inches should be a minimum to preserve a desirable clearance of 11 inches between table top and chair seat. Chairs—movable or stationary—should not be spaced closer than 27 inches center to center as shown in **Diagram N.** A center-to-center spacing of 30 inches is more desirable. **Diagram O** establishes correct dimensions for a lunch counter with footrail and movable stools



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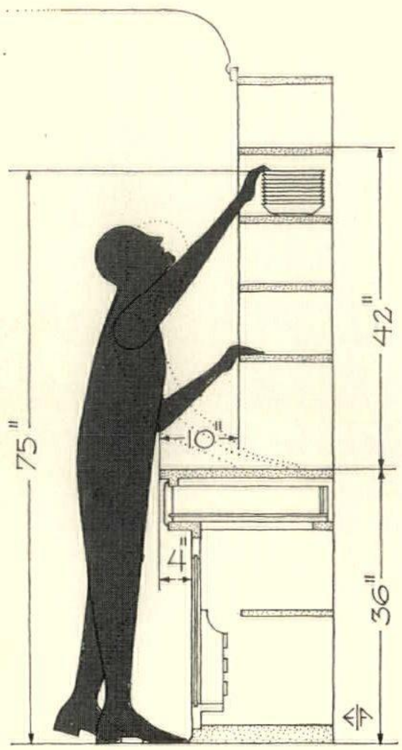
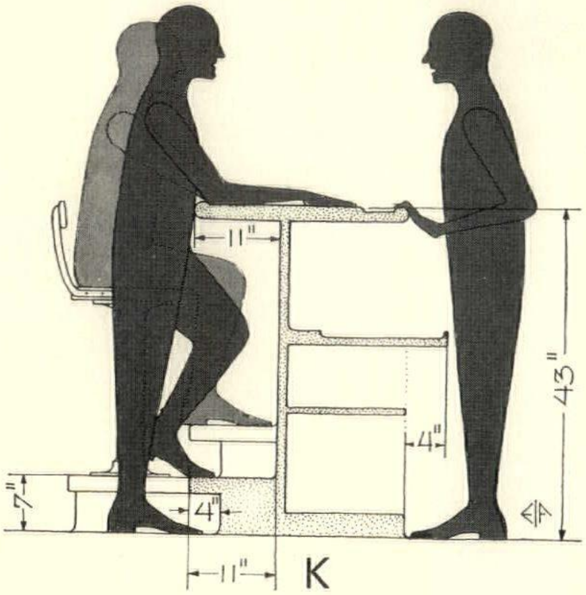
4"
84"
54"
18"
7"
30"
11 3/4"
9 1/4"

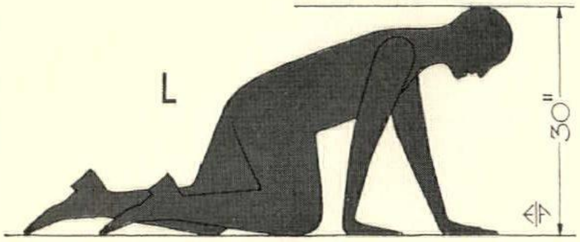
I


75"
42"
10"
4"
36"

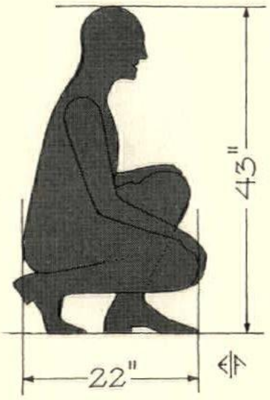
J


11"
43"
4"
7"
4"
11"

K


30"

L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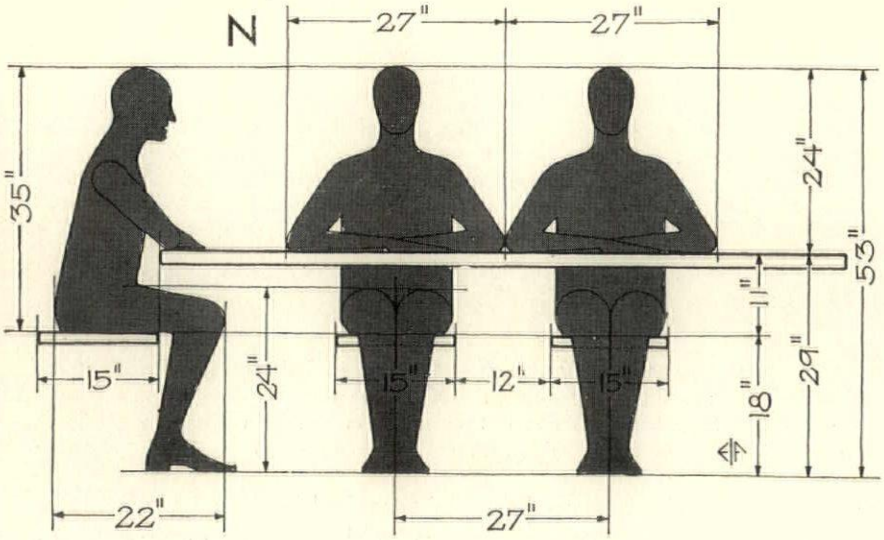
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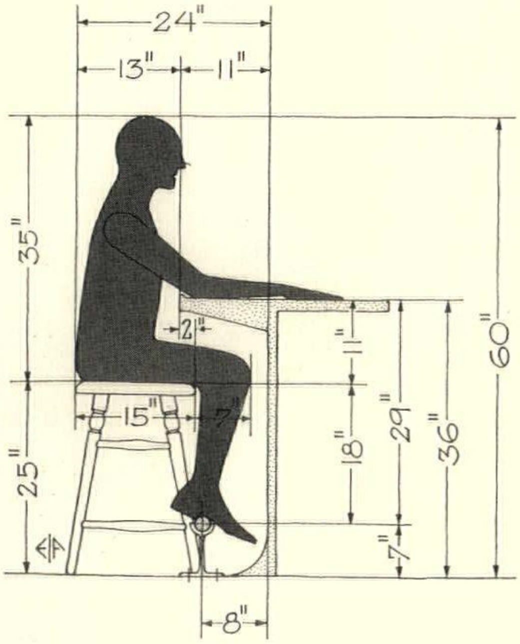
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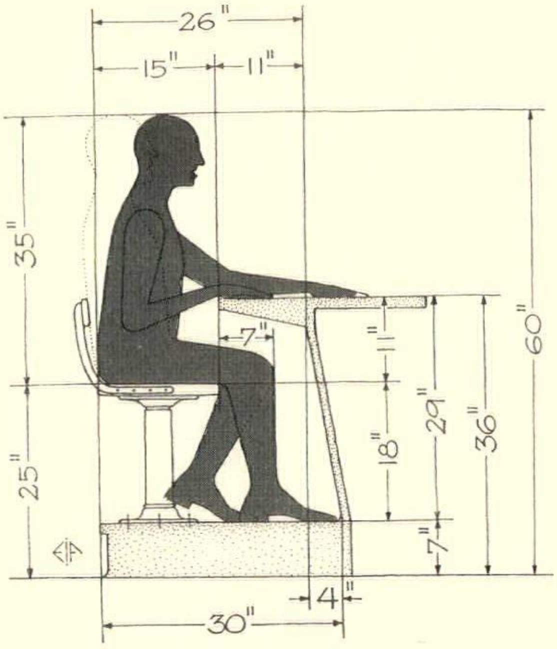
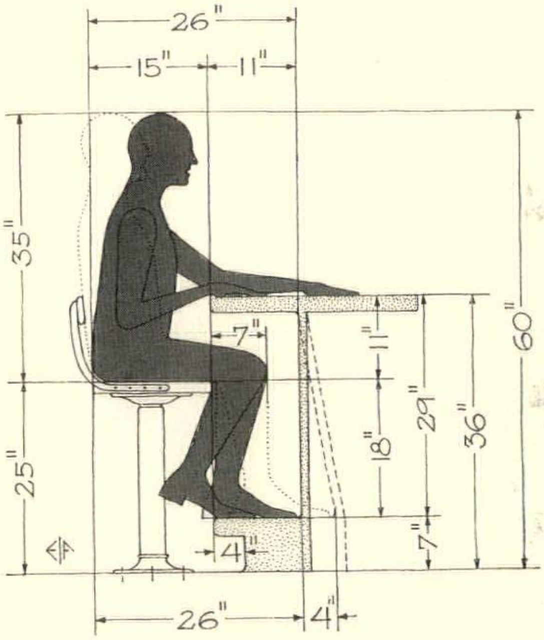
36"
25"
7"
8"

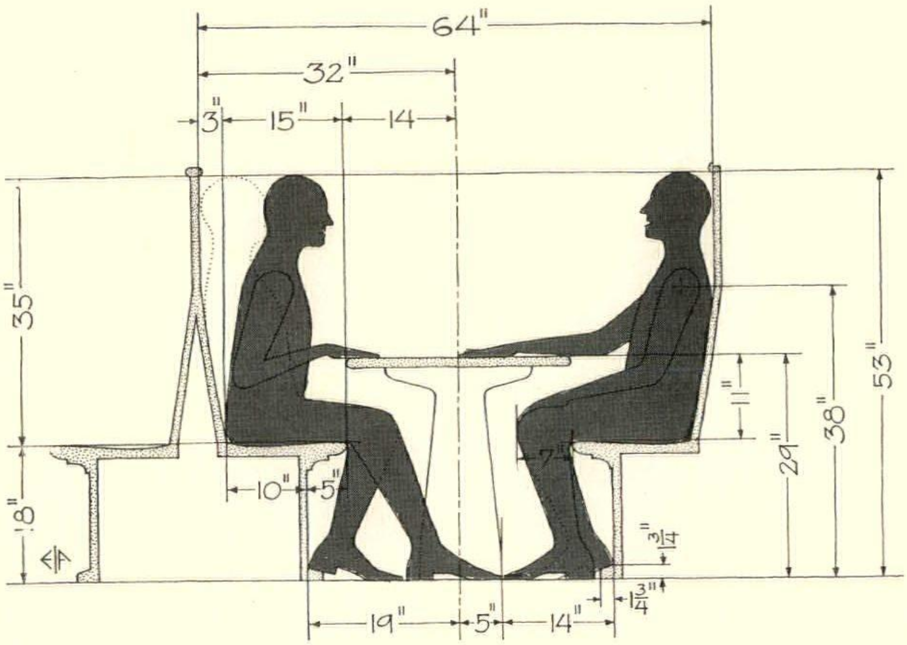
O



P



Q



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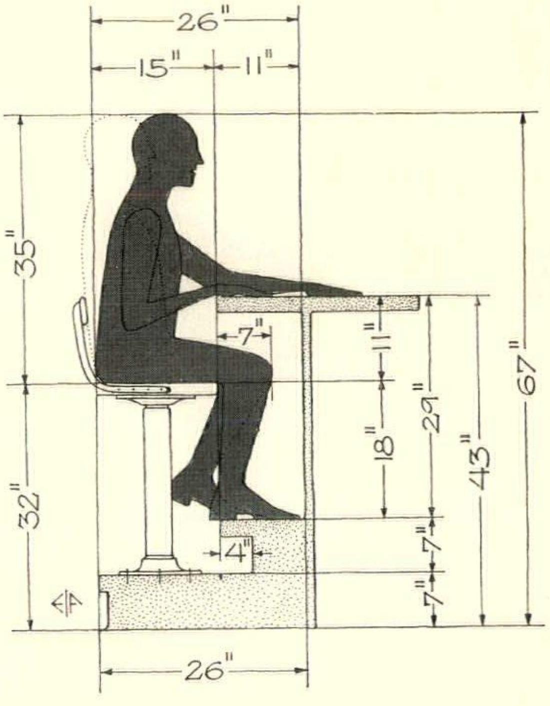


S

The Geometry of the Human Figure—When furniture is built-in, ease and convenience of getting seated is important. The front edge of fixed seats must never project under the table; and the seat depth should not be less than 15 inches, exclusive of the 3-inch slope of the back. These points are indicated in **Diagram R** which shows desirable clearance dimensions of a built-in breakfast nook or restaurant booth. Space in excess of the 64-inch minimum width should be added to the table width to maintain the desired relation between table edge and seat width. In **Diagram P** knee room is assured by the 11-inch counter overhang and the slope of the counter face. Chairs are fixed but revolving as in **Diagrams Q and S.** Elbow room should not be less than 27 inches, as illustrated in **Diagram N** on preceding page.

The Legal Side of Architecture

BY CLINTON H. BLAKE

Blake & Voorhees, Counsellors-at-Law

Construction Contracts Should Control Builders' Liability

HOW far is a contractor liable for defects and deficiencies in the work? To what extent is he a guarantor that the work, as he performs it, shall be safe and satisfactory for the purpose involved? These are questions with which every practicing architect is confronted repeatedly and about which his clients will seek advice. The ordinary rule is that, where a contractor has undertaken to carry out a given job, he assumes the risks incident to the performance of the work and is liable for any defects and deficiencies therein.

There is another angle to the problem, however, which is presented by a decision of the Supreme Court of Nebraska (State v. Commercial Casualty Ins. Co., 248 Northwestern 807). Issues in this case arose on an action against the surety on the contractor's bond to recover damages alleged to have been caused by the contractor's breach of the contract in failing to provide materials of sufficient tensile strength, for not safeguarding the work against expansion and for other alleged shortcomings. Under the contract the owner's engineers were made supervising agents of the work and given power to reject any material or work which did not comply with the contract terms. They were also authorized to approve and issue the final certificate.

The contract contained ambiguities and contradictions. One clause provided that steam pipes should be capable of carrying 250 pounds pressure to the square inch. The plaintiff contended this amounted to a warranty that the pipes would be suitable for this purpose. On the other hand, the contractor claimed that the contract called for specific materials and a specific manner of construction. He claimed that, if he followed the contract in these particulars, he was performing his full duty and was not required to decide whether the pipe line as specified would be sufficient for the purpose contemplated. Another similar claim was that the tie rods and limiting poles should have been installed over various expansion joints. No provision had been made in specifications or details for such rods or bolts.

In deciding the case, the Court laid down a number of interesting rules relative to the obligations of a contractor under these conditions, the effect of an architect's or engineer's certificate of approval and the effect of specifications, plans and contract upon the contractor's liability.

Among other things, the Court held as follows:

"Where a contract for the construction of a steam pipe line makes the engineers of the owner supervising agents with power to reject any material or work that does not comply with the terms of the contract and authorizes the engineers to approve and issue final certificate, such certificate of approval by the engineers constitutes at least prima facie evidence that the work has been performed according to the contract. . .

"It is a rule that, where there are general and special provisions in a contract relating to the same thing, the special will control over the general provisions; and, *if the contract is fulfilled according to the special provisions, the contractor has fully complied with the terms of his contract.* Whether the pipe line, as designed by plaintiff's engineers, and the specific material required and manner of construction were sufficient were questions on which the contractor was not required to pass judgment. His duty was to perform and fulfill the contract according to the specific terms and directions therein. . .

"Where plans and specifications for an improvement are prepared by engineers of the owner, who are to inspect and supervise the construction and see to it that materials are furnished and work performed in accordance with the specifications, ordinarily *the contractor is not liable for the sufficiency of the specifications,* but only for the skill with which he performs the work and the soundness of the materials used by him. . . "

In connection with the last point, the Court cited a Minnesota case as follows:

"Where a contractor makes an absolute and unqualified contract to construct a building or perform a given undertaking, it is the general, and perhaps universal, rule that he assume the risks attending the performance of the contract, and must repair and make good any injury or defect which occurs or develops before the completed work has been delivered to the other party. But where he makes a contract to perform a given undertaking in accordance with prescribed plans and specifications, this rule does not apply. *Under such a contract he is not permitted to vary from the prescribed plans and specifications even if he deems them improper and insufficient;* and therefore cannot be held to guarantee that work performed as required by them will be free from defects, or withstand the action of the elements, or accomplish the purpose intended."

THE Court further cited, with approval, cases decided in other states. One Maryland court held in substance that, if the contract prescribes materials chosen by the owner or his representative and the contractor is given no choice respecting them, no construction of the contract will be upheld which imposes upon the contractor an understanding that materials chosen will meet demands which may be made upon them; that even a general guarantee of the work for a period subsequent to completion will not be so construed as to place upon the contractor a liability for something which really is the result of a mistake or a miscalculation in the plans of the architect. Consistent with this holding, the decision referred to a New York case, where it was held that a building contractor who guaranteed that a roof would be water-tight was nevertheless not bound to do more than the specifications required.

Referring to the question of the expansion joints, the Court said:

"Plaintiff contends that the expansion joints should have provided for a greater expansion, or that there should have been more joints. The specifications in the contract indicate just how many and where the expansion joints should be placed, and provide for an expansion of not to exceed 5 inches for each joint. In this respect, the contractor complied with the terms of the contract. If the expansion for each joint were insufficient, or if there should have been more expansion joints placed in the line, this was not the fault of the contractor. It was the defect in the plans and specifications, provided by plaintiff's engineers."

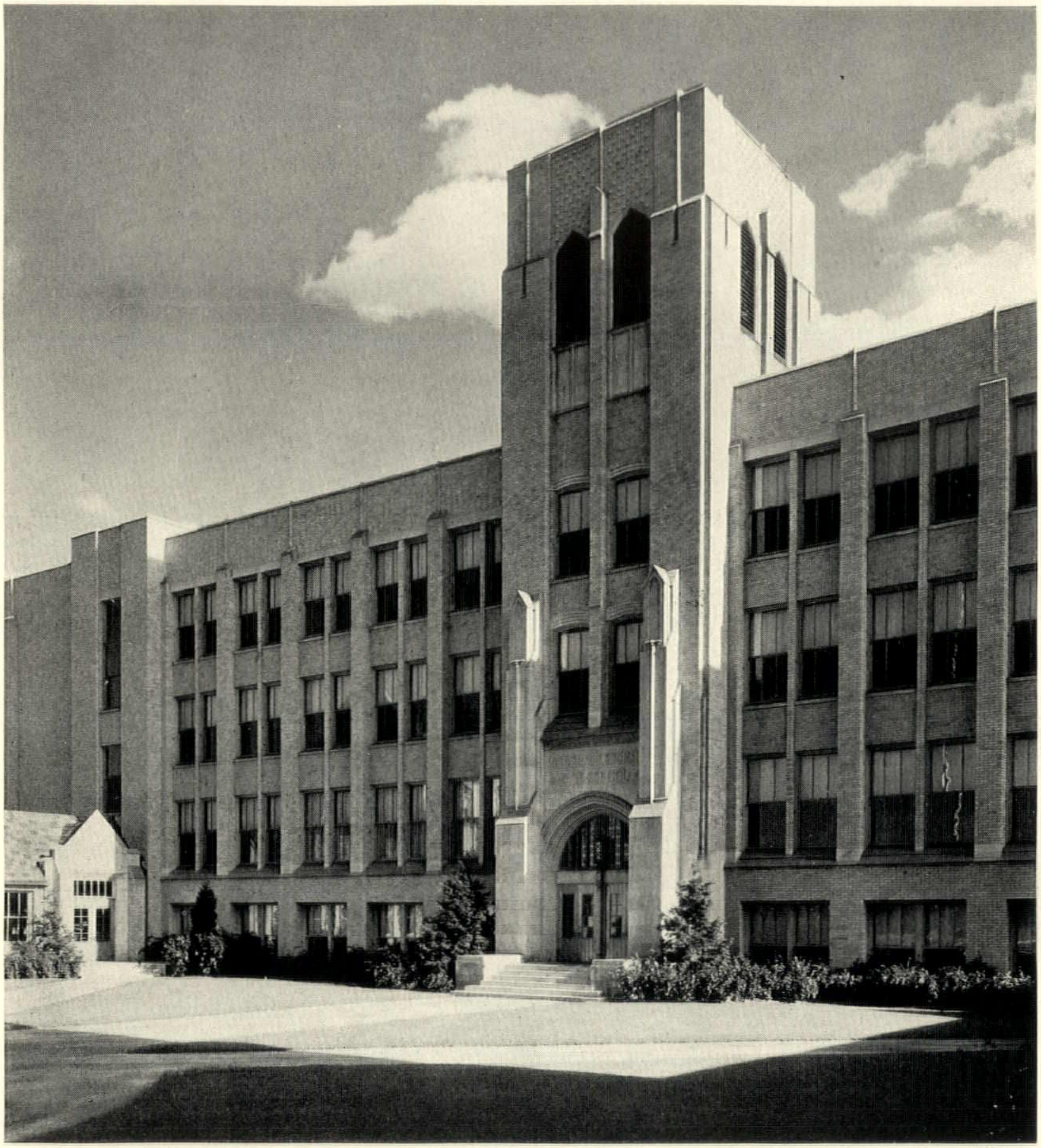
It is apparent that the theory upon which courts have proceeded is that ordinary liability of a contractor is definitely modified where he is required under the contract to do work in accordance with a method and to provide materials of a character definitely specified in his agreement with the owner. This is in accordance with sound sense and fair dealing.

On the other hand, it should be borne in mind that a contractor may be under some obligation, when as a man skilled in construction work he should know from a mere examination of the specifications and plans that the work provided for will not be safe or proper. In such a case he should make known this fact to the owner and either refuse to proceed with the work as set up or make it clear that he is doing so at the owner's risk and without responsibility for defects which may develop or injuries which may result. Where defects are of such a nature that personal injuries or substantial property damage may result, the contractor should, of course, refuse to be a party to the building operation, unless he can in some way protect himself from any resultant liability.

It should also be borne in mind that each case will be decided upon the basis of the particular contract involved in that case. For instance, the status of a contractor guaranteeing that a roof will be water-tight—as in the case above referred to—might be completely different were the contract provisions slightly changed. I have often found it advisable, in drafting contracts, to provide specifically that—irrespective of any of the other provisions of the contract—the contractor shall perform and provide whatever work and materials might be necessary to insure to the owner a building absolutely water-tight in all respects. When such a clause is embodied in the contract there can be no ambiguity; and the fact that certain materials and construction are elsewhere called for will not release the contractor from his liability to provide a completely water-tight job.

These decisions merely emphasize the importance of wording the construction contract to eliminate ambiguity and to place upon a contractor, in a way which will be fair both to him and the owner, an obligation to carry out the work in a manner which will give the desired result. Ambiguities and uncertainties in contracts must inevitably lead to confusion, to controversy and to loss.

IT is not advisable for the architect to assume the obligation of advising the owner as to legal matters or as to the legal form of a contract. The architect will do well, in his own interest, to make clear to the owner that any important construction contract—whether or not prepared by the architect—should be reviewed by the owner's own attorney. Naturally the architect will offer advice regarding architectural phases of the agreement. He probably will prepare a suggested form. But if the form is not one which has already been approved and decided legal—such, for example, as the standard A. I. A. form—the architect may well avoid a responsibility with respect to it that would lie beyond the scope of his professional training and duties.



PAUL HYDE HARBACH AND
JAMES WILLIAM KIDENEY, ARCHITECTS

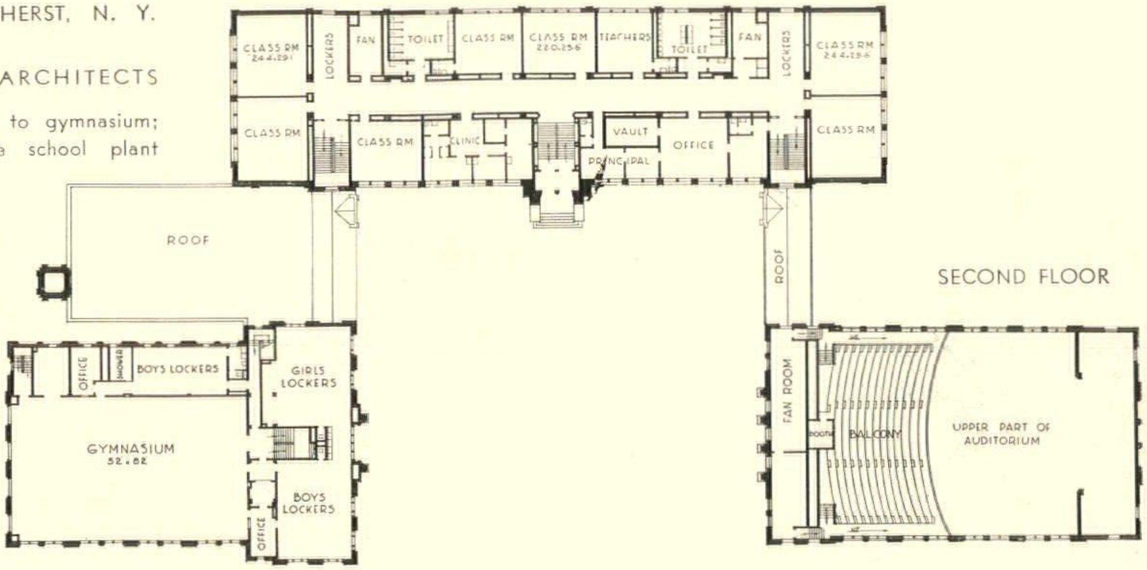
CENTRAL HIGH SCHOOL, AMHERST, NEW YORK

Photographs by George A. Ostertag

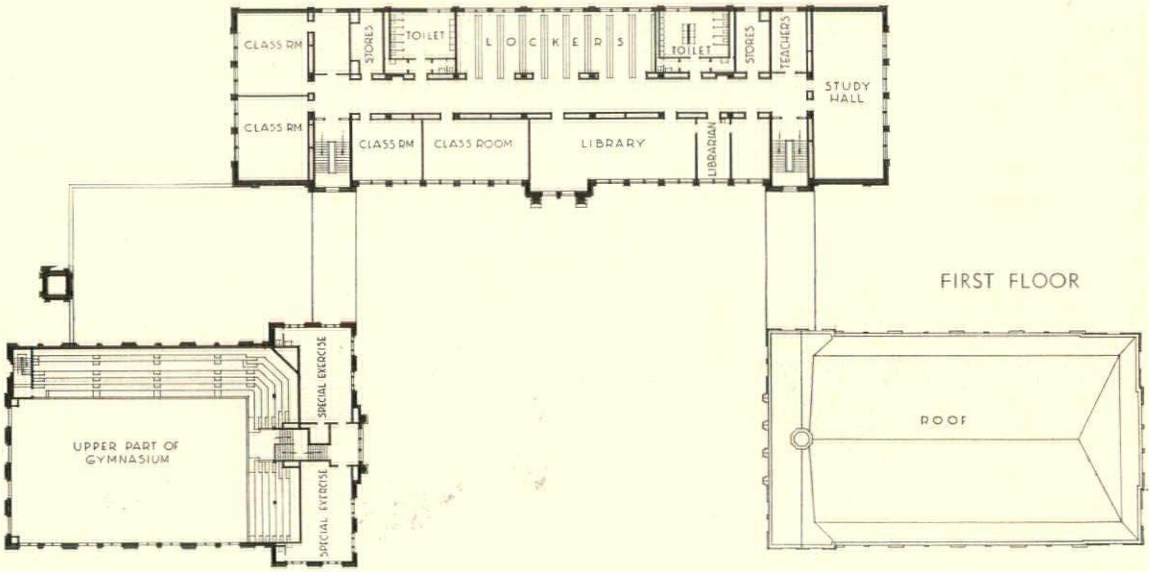
Construction: central portion, steel skeleton, concrete floors; wings, bearing walls, steel trussed roofs. Exterior: buff gray brick with slashed joints. Trim, buff limestone. Roof, variegated slate. Wood work, warm brown. Metal work, copper, weathered to rich brown

CENTRAL HIGH SCHOOL, AMHERST, N. Y.
PAUL HYDE HARBACH AND
JAMES WILLIAM KIDENEY, ARCHITECTS

On facing page; above, entrance to gymnasium; below, panoramic view of entire school plant



SECOND FLOOR



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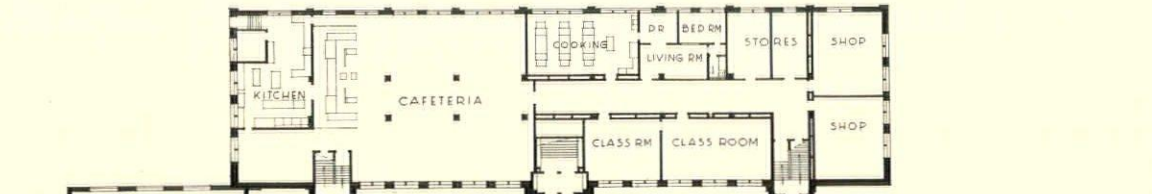

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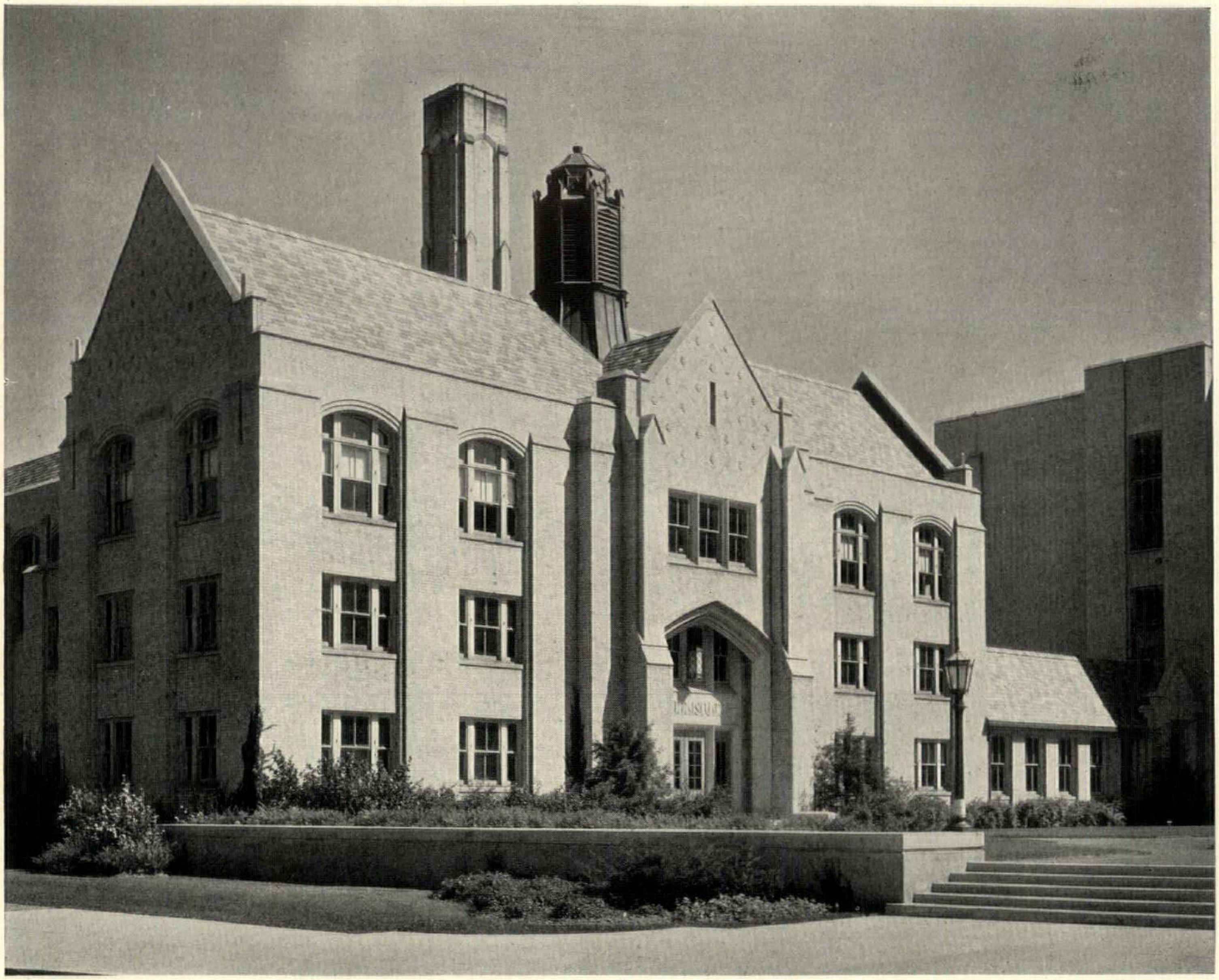
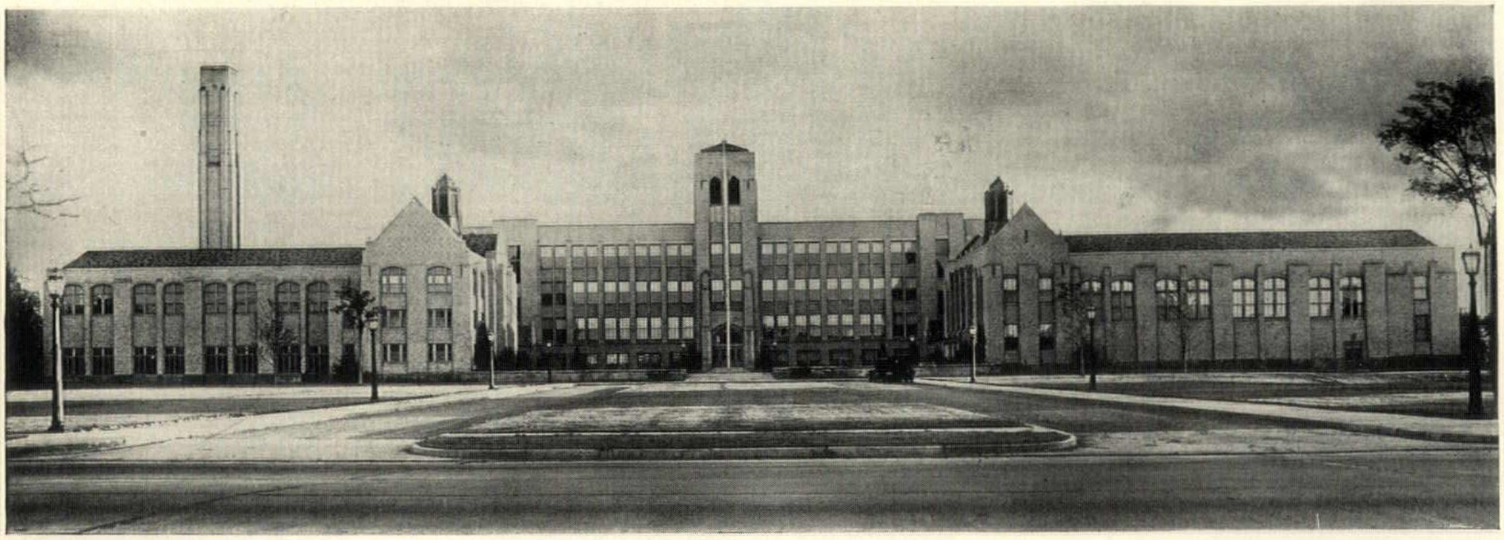




Entrance to auditorium wing

CENTRAL HIGH SCHOOL, AMHERST, NEW YORK. PAUL HYDE HARBACH AND JAMES WILLIAM KIDENEY, ARCHITECTS

A National Campaign for the Architect that will . . .

THE National Housing Act, providing more than three billions of dollars for encouragement of new building has been passed. Coming on top of the already discernible gains in general business reported in all sections of the country, it is assured that the building industry is on the threshold of better times.

AMERICAN ARCHITECT has pioneered in advocating recognition by the Federal Administration of the importance of the building industry as a means of stimulating economic recovery. In doing so this magazine has vigorously championed the architect as a necessary part of any building program. Now AMERICAN ARCHITECT is launching a national campaign in cooperation with the magazines with which it is affiliated to promote immediate building and modernization and to urge that the architect be prominently and definitely represented in both the Government's program and in private plans for renovation and new construction. The Hearst newspapers with more than five million daily circulation are cooperating with AMERICAN ARCHITECT.

The objective of this campaign is to inform the general public as to the value of architectural service and to create a demand for that service on buildings of all types, particularly—in view of the importance of the National Housing Act—in the residential and remodeling fields.

The names of the cooperating publications furnish convincing evidence of the powerful influence which the program will have in moulding public opinion so that it will be favorable to the architect and of the general benefits that will come to the entire profession as a result. AMERICAN ARCHITECT'S publicity program will be carried out through cooperation of the Stuyvesant Building Group of which this magazine is a member and which includes also, House Beautiful combined with Home and Field, and Town and Country.

The last named are consumer magazines read monthly by thousands interested in home building or remodeling. Good Housekeeping, an affiliated magazine, with a monthly circulation of nearly two million, is entirely in sympathy with the program and is conducting its own editorial campaign to stimulate new building and modernization and to promote the architect's service. Many influential newspapers which recognize AMERICAN ARCHITECT as a leader of architectural thought and as a source of real and accurate news, will cooperate and are now vigorously supporting the National Housing movement in several different ways.

1 **Tell the public about architectural service**

2 **Get recognition of the architect in Government and private building programs**

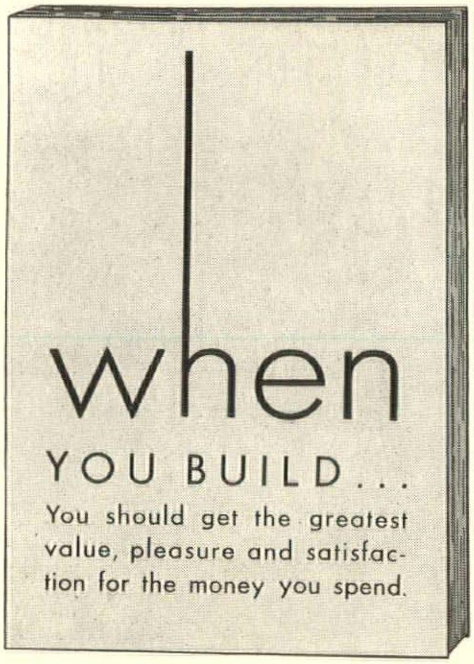
3 **Promote immediate building and modernization**

4 **Aid professional organizations and individual architects with local advertising campaigns**

Among the main features of AMERICAN ARCHITECT'S national campaign to advance interest in the architect and the value of his services will be the production of a booklet developed by AMERICAN ARCHITECT editors. This will be offered to the public through advertisements in journals of national circulation. It may be distributed also by architects themselves upon application to AMERICAN ARCHITECT.

The booklet, entitled "When You Build . . ." by Benjamin F. Betts, will tell the prospective owner how he can be assured the greatest value, pleasure and satisfaction from the money he will spend for his building operation. It will answer the layman's questions regarding the value of good building and will explain how an architect works as the logical agent to insure this desired result. For the owner it will point out ways to avoid the common pitfalls of poor planning and shoddy construction; and for the architect it will present to the prospective owner practical reasons for retaining professional advice upon every phase of a building problem.

But if AMERICAN ARCHITECT'S national program



when

YOU BUILD...

You should get the greatest value, pleasure and satisfaction for the money you spend.

Two powerful parts of American Architect's National Campaign. Advertisements similar to this one will appear in magazines with which American Architect is affiliated. They will stress the value of architectural service and urge the importance of building and modernizing now. The booklet "When You Build . . . ," will tell the layman how the architect can assure his getting the greatest value in his building project

avoid higher costs . . .

BUILD NOW!

A BUILDING revival is setting in. The power of the Federal Government supports it. Financial barriers have been removed. The National Housing Act, now operating under President Roosevelt's sponsorship, appropriates billions to finance home-building and modernizing. Soon the effect of this impetus will be seen in every community. Architects will become active. Building trades will get employment. A national demand for building materials and household equipment will result.

It will pay you to build your house now before competition becomes keen; before the best sites are selected; before the prices of labor and materials go higher.

Consult your architect. He will give you reliable advice as to site and style of architecture, to meet your particular requirements. He knows how to produce a modern, soundly constructed, livable house. He will suggest the latest approved equipment for heating, air conditioning, lighting, refrigeration and countless things that enter into the completed structure; and he will see that they are purchased with economy. His experience will save you much more than his fee by safeguarding you against mistakes and faulty construction.

If you intend to finance your house through your bankers, the architect's judgment will carry weight with them.

Consult your Architect

Now is the time to save money, get the best labor and materials . . .

SECURE ENDURING VALUE

THE STUYVESANT BUILDING GROUP

Town & Country **American Architect** **House Beautiful**

572 MADISON AVENUE, NEW YORK

Send for This Valuable Booklet "WHEN YOU BUILD," by Benjamin F. Betts, Editor of American Architect. This new free booklet explains what the prospective home owner should know about building. It shows how to get the most satisfaction and value when you build.

is to be most effective, it must be backed up by intensive local activities of individual architects and professional organizations. Some of the ways by which architects can capitalize locally the value of a national program are:

1. Use AMERICAN ARCHITECT articles as the basis for sales arguments to individual clients.
2. Distribute the booklet "When You Build. . ." to prospects and to others, who, at some future time may be in a position to build.
3. Advertise the value and availability of architectural service in local newspapers.
4. Contact local newspaper editors with a view toward publishing architectural news of all kinds, including articles on the economic and planning phases of house building or remodeling.
5. Use every opportunity to promote good architecture by explaining what it is and how it can be obtained. This can be done in speeches or illustrated lectures before civic societies, clubs, and schools.
6. Work with local city organizations in developing campaigns of civic improvement, even if it merely takes the form of a clean-up campaign.
7. Cooperate in developing local model exhibitions of new building and modernization projects.
8. Present a radio program to inform the public about the economic and planning sides of home building, repair and modernization. This might well be done under sponsorship of some financial agency with money to lend in the building field under one of the provisions of the National Housing Act.
9. Work with officials of banks, mortgage companies and building and loan associations to make retention of registered architects a requirement for the granting of building loans.

Thus the local architect can bend his efforts in cooperating with the campaign of the Stuyvesant Building Group. AMERICAN ARCHITECT stands ready to assist local organizations in any way that may prove practicable; and although it is obviously impossible for the magazine actively to sponsor or direct local efforts, its Editors will be glad to give advice to any architect or organization seeking it.

Leadership in the building industry is admitted to be one of the greatest of today's needs. It is possible for architects to assume this leadership today, but it is possible only by energetic and properly coordinated action of organizations and individuals.

Heating, Cooling and Air Conditioning

AMERICAN ARCHITECT REFERENCE DATA

Number 12, July, 1934

Heating, Cooling and Air Conditioning

AMERICAN ARCHITECT REFERENCE DATA

Number 12. July, 1934

AIR conditioning should be looked upon as merely an extension of the problem of heating and ventilating buildings. Instead of providing a comfortable temperature during cold weather only, it extends the comfort season all through the year. It also enhances comfort and aids health by controlling the quality of the air.

Considered in this way, air conditioning falls within the province of architectural practice to about the same extent as the design of heating installations. Average sized projects, including practically all residential work, may be designed by the architect. Special problems of any sort, and all projects of large size, should be developed by a competent consulting engineer collaborating with the architect.

The purpose of this article and its reference data is two-fold: First, to provide a sound background knowledge of methods of designing complete air conditioning systems of any size or character, to enable the architect to collaborate effectively with consulting engineers and manufacturers of equipment; second, to provide simplified methods of selecting appropriate equipment for winter, summer or all-year air conditioning of residences, small stores or offices, and other normal projects that the architect may have to undertake without employing counsel.

TRENDS AND OBJECTIVES

IT is already evident that even the simplest heating installation will eventually be expanded to provide winter air conditioning (which embraces (1) heating, (2) humidification, (3) air motion, and (4) air cleaning). Therefore, any heating plant designed or modernized today should at least be readily adapted to future development into a winter air conditioning installation, even if the owner is not aware of the manifold advantages of the more advanced equipment. Otherwise early obsolescence will endanger the investment.

Similarly the demand for summer comfort is expanding so rapidly it will soon become common practice, rather than occasional practice, to equip dwellings, offices and many types of commercial and institutional buildings for summer air conditioning. This embraces (1) cooling, (2) dehumidification, (3) air motion, and (4) air cleaning. Since two of these four functions, air motion and air cleaning, are common both to winter and summer air conditioning, it is obviously the dictate of wisdom and foresight to plan even the simplest heating or winter air conditioning installation so it may eventually be expanded to provide summer comfort and convenience as well.

Leading authorities uniformly predict that all-year air conditioning will become as commonplace as central heating plants are today. Most of them further believe that the standards for summer comfort will be as rigid as those now governing the winter season, requiring summer air conditioning of all rooms that are heated in winter. Why, they say, should people demand the ability to move freely about a building in winter, with all rooms at a comfortable temperature, and then tolerate being confined to one or two rooms that are comfortably cool in the summer?

The ultimate objective of all heating and cooling projects is, therefore, all-year air conditioning. With this objective in mind, the data presented hereinafter will assist the reader to select equipment for any individual aspect of air conditioning (heating, cooling, humidification, dehumidification, air motion or air cleaning) with due respect for the ultimate adaptation of the equipment to provide all-year comfort conditioning.

STANDARD CONDITIONS TO BE MET

THE conditions to be attained for maximum human comfort under normal circumstances, and the range of variation sometimes encountered are expressed in the following "design" standards. If the equipment selected will satisfy these requirements, its operation may be adjusted to suit the great majority of occupants.

Heating Equipment should be capable of maintaining an indoor temperature of 72 F in all ordinary living quarters, offices and rooms where occupants are sedentary, regardless of outdoor temperatures. Temperatures for special rooms and con-

SIMPLE DEFINITIONS OF ESSENTIAL AIR CONDITIONING TERMS

Dry-Bulb Temperature is the temperature of air as indicated by a thermometer of standard type.

Wet-Bulb Temperature is the lowest temperature which a wetted body will attain when exposed to an air current. It is measured by a standard thermometer having its bulb wetted by water and exposed to vigorous air circulation.

Effective Temperature is an arbitrary composite index of the effect on the human body of a combination of temperature, humidity and movement of air. It has been experimentally determined and is used as an index to air conditions which affect human comfort.

Dew-Point Temperature is the temperature at which air would become fully saturated (100% relative humidity) with its present moisture content. Its importance in air conditioning lies in the fact that when air containing a certain amount of moisture is cooled below its dew-point temperature, part of its moisture content is condensed. This makes it possible to dehumidify air by refrigeration.

Relative Humidity is a measure of the quanity of water vapor in a given body of air expressed as a percentage of the total amount of water vapor the same air would contain at the same temperature if fully saturated. It should be noted that the amount of water vapor in saturated air varies with the temperature of the air.

Sensible Heat is heat that raises the temperature of a body which absorbs it. It is measured by a standard thermometer.

Latent Heat is heat that is absorbed or given off by a substance when changing its state from solid to liquid or gas, or vice versa without changing its temperature. It is important in air conditioning as the heat required to evaporate water for humidification purposes and the heat released by water vapor when condensed in the dehumidifying process.

British Thermal Unit is substantially the quantity of heat required to raise I lb. of water one degree F. (from 63 to 64 F.). It is expressed as Btu and is the measure of quantity of heat as distinguished from pressure of heat, which is temperature.

Degree-Day is a unit representing a difference of one-degree Fahrenheit existing for one day between the average indoor and outdoor temperatures. The standard degree-day is based on an average indoor temperature of 65 F. Degree-day tables are based on Weather Bureau records and reflect both the number of days in a heating season and the number of degrees Fahrenheit through which a building must be warmed during that season.

Equivalent Direct Radiation is that amount of heating surface which will give off 240 Btu per hour. It is used for measuring the capacity of radiators, convectors, and boilers as an alternate for their output in Btu. By definition equivalent direct radiation applies to steam temperatures, but custom employs an equivalent direct radiation for hot water radiation equal to 150 Btu per hour. Unless hot water radiation is specified, E. D. R. always refers to steam heating equipment.

Adsorption designates the property of certain substances to condense water vapor without themselves being changed either physically or chemically. Silica-gel, activated alumina and some other materials will take up and condense considerable quantities of water vapor from surrounding air at normal temperatures and will then release it again by evaporation when heated.

Absorption connotes the property of substances to assimilate others with some definite physical or chemical change. The application of this term in air conditioning usually applies to refrigeration equipment where the cycle is operated by direct application of heat as in domestic gas refrigerators.

ditions are listed in Table 1. Temperature should be measured 30″ from the floor and the temperature difference per foot of height from floor to ceiling should not exceed .75 F.

Humidifying Equipment should be capable of maintaining a relative humidity of 40% indoors during the heating season when outdoor temperatures are above 35 F if windows are single glazed, and 0 F if windows are suitably double glazed. When outdoor temperatures fall to these points, condensation may prove troublesome on glass areas and it is preferable to tolerate lower indoor humidities during the intervals of severe weather. The theoretical winter comfort zone is shown in Table 2, which indicates in bold face type the optimum Effective Temperature range in relation to dry-bulb temperature and relative humidity. Note that summer requirements differ from those ideal in winter.

Air Motion should be maintained in the winter heating season at a rate that will assure uniform distribution of heat (within .75 F temperature difference per foot of height) at all times. Since neither radiators, convectors nor gravity warm air systems will provide such circulation when cool or cold, some form of blower or fan equipment is usually desirable to maintain adequate air motion. Such devices are essential to air cleaning. See Table 3 for recommended air changes.

In summer, air motion requirements depend upon related comfort equipment. When used with mechanical refrigeration, fans or blowers should be capable of circulating the air in the cooled space at least 3-6 times per hour. When used for evaporative cooling they should be able to change the air 6-10 times per hour. When used for night air cooling (either attic fans, central fans or both) they should be able to completely change the air 30 to 35 times per hour.

The temperature, velocity and method of introducing air must be such as to obviate drafts. Warm air should never exceed 150 F and preferably should not exceed 140 F. The difference in temperature between cooled air and the room temperature into which it is introduced should not exceed 5 F if it enters horizontally below the breathing zone, 10 F if above the breathing zone, or up to 20 F if wide diffusion can take place, as in theaters, before the cooled air reaches the occupants.

Air Cleaning Equipment should be able to remove from air circulated by fans or blowers substantially all dust, pollen, soot and grit, and substantially all smoke or perceptible odors. Since air cleaning requires mechanical air motion, the type and over-all effectiveness of equipment is dependent upon the volume and frequency of mechanical circulation and the design of the filters or washers employed. Velocity through filters should not exceed 800 f.p.m. over the gross face area of the filter and the resistance to the flow of air should range between ⅛ and ¼ inches of water pressure.

Cooling Equipment should be capable of lowering temperatures indoors not over 15 F below the prevailing outdoor temperature. This is the maximum cooling effect that can be tolerated for health as well as comfort. Cooling is seldom required until outdoor temperatures exceed 80 F and equipment need not cool the interior of normally occupied space below 75 F. The range of cooling effect required for comfort is, however, directly related to the concurrent indoor relative humidity; hence cooling cannot be considered alone.

Dehumidification Equipment must be related to cooling equipment (or vice versa) so that the resultant Effective Temperature (see definitions) will be approximately 66° E.T. for winter heating and 71° E.T. for summer cooling. Summer comfort may result from dehumidifying alone, or cooling alone within a narrow range, or by both in varying proportions within the total range of summer comfort control. It is therefore possible to place emphasis on either cooling or dehumidifying capacity (according to local climatic conditions) and to use the other as an adjunct of the dominant equipment. See Table 4 for the permissible range of dry-bulb temperature and relative humidity which will fall within the proper Effective Temperature range.

Automatic Control of heating, cooling or air conditioning is one of the prime essentials of comfort. Human comfort exists within a remarkably narrow range and is affected by temperature, humidity and air motion. It is beyond the normal skill of laymen to manually control these variables to maintain comfort conditions even if convenience and economy of operation are left out of consideration. Hence it is essential that equipment be so balanced in design and so governed by sensitive automatic controls that the foregoing standard conditions will be maintained regardless of changes outdoors, and with a minimum of attention.

Characteristics of Available Equipment

THE selection of heating, cooling and air conditioning equipment would be comparatively simple if there were not so many different ways of accomplishing the desired results. Each basic type of equipment has advantages and limitations. No one type is universally adaptable to all types of buildings and to all climatic conditions. The following section, therefore, is devoted to a condensed summation of the principal characteristics of various types of equipment. Its purpose is to review the field rapidly so that detailed study for any given project may be immediately confined to the two or three types which appear best suited to the project requirements.

HEATING

Warm Air Heating, using ducts for the distribution of heat from a central source, is readily adaptable to winter, summer and all-year air conditioning, because its prerequisite is the circulation of air from the heated or conditioned space through the central plant where it can be treated as required. Gravity warm air heating plans may readily be converted to mechanical forced air circulating systems by the addition of a fan or blower, and to winter air conditioning by the further addition of an air washer or filter and a humidifier. Similarly, summer cooling equipment can be added by suitable enlargement of the central duct system.

The use of warm air heating is limited by the resistance developed in excessively long ducts and by the space required to house large ducts or plenums required to transport the air any considerable distance. Warm air heating is therefore primarily adapted to dwellings and other relatively small buildings. It should be noted, however, that ventilating systems, frequently installed in schools, churches, auditoriums and theatres, are adaptable to warm air heating and complete air conditioning.

TABLE 1—WINTER INSIDE DRY-BULB TEMPERATURES USUALLY SPECIFIED

Type of Building	Deg. Fahr.
RESIDENCES	
Living Rooms	70–72
Bathrooms and Dressing Rooms	75
Dining Rooms	75
Kitchens	66–68
SCHOOLS	
Class Rooms	70–72
Assembly Rooms	68–72
Gymnasiums	55–65
Toilets and Baths	70
Wardrobe and Locker Rooms	65–68
Kitchens	66
Dining and Lunch Rooms	65–70
Playrooms	60–65
Natatoriums	75
HOSPITALS	
Private Rooms	70–72
Private Rooms (Surgical)	70–80
Operating Rooms	70–95
Wards	68
Kitchens and Laundries	66
Toilets	68
Bathrooms	70–80
THEATERS	
Seating Space	68–72
Lounge Rooms	68–72
Toilets	68
HOTELS	
Bedrooms and Baths	70
Dining Rooms	70
Kitchens and Laundries	66
Ballrooms	65–68
Toilets and Service Rooms	68
STORES	65–68
PUBLIC BUILDINGS	68–72

TABLE 2—RECOMMENDED WINTER INDOOR AIR CONDITIONS

Showing Effective Temperatures in Degrees Fahrenheit for Various Relative Humidities.

Dry-Bulb Temps. Deg. Fahr.	RELATIVE HUMIDITIES (PER CENT)						
	30	35	40	45	50	55	60
67						64.0	64.3
68			64.0	64.2	64.5	64.8	65.1
69	64.1	64.4	64.8	65.1	65.4	**65.7**	**66.0**
70	64.8	65.1	65.4	**65.8**	**66.2**	66.5	66.8
71	65.5	**65.8**	**66.2**	66.6	67.0	67.3	67.7
72	**66.2**	66.5	66.9	67.3	67.7	68.1	68.5
73	67.0	67.3	67.7	68.1	68.5	68.9	
74	67.7	68.0	68.4	68.8			
75	68.4	68.7					
76	69.0						

Bold face type indicates theoretical ideal Effective Temperatures for Winter. From A. S. H. V. E. Guide, 1934

TABLE 3—AIR CHANGES AND MOTION RECOMMENDED FOR AIR CONDITIONING

	VOLUME PER PERSON PER MINUTE		AIR CHANGES PER HOUR	
	Cu. Ft. of air per person per min. from outside	Total Cu. Ft. of air circulated per person per minute	No. air circulations recommended per hour	Natural air changes by infiltration
Residences	10	30	3 to 4	1 to 2
Offices	10	30	4 to 6	2 to 3
Stores	8	30	4 to 6	2 to 4
Assemblies	8	30	5 to 7	
Dining Rooms	10	30	6 to 8	
Kitchens	—	—	30 to 60	

Piped Distribution Systems, employing steam, vapor or hot water as the heating medium, have a number of advantages for heating purposes, but are less readily adapted to air conditioning. The advantages of piped distribution systems are that heat may be transported long distances from a central plant, sections of the building may be zoned or subjected to localized control, the space required for distribution lines is relatively small, and uniformity of heating effect is readily assured by good design of the installation.

The adaptation of these systems to either winter air conditioning, summer air conditioning, or all-year air conditioning is made somewhat difficult by the fact that radiators and convectors are not normally equipped to provide air motion, air cleaning or proper humidification. Therefore, piped distribution systems usually require the installation of unit blowers, humidifiers and air cleaners in each space or zone that is to be completely conditioned in winter.

Summer air conditioning requires the use of unit coolers with their own fans and air cleaners. Some cooling may be done by piping cold water through existing radiation if the system is designed for heating with hot water and the radiators are equipped with drip pans and drains to remove condensation. Some auxiliary method of maintaining air circulation is then required for adequate diffusion.

Therefore, buildings having piped distribution systems require a multiplicity of units if the entire structure is to have all-year air conditioning; but individual spaces may be readily conditioned by the use of such units without any major modification of the central heating plant.

Combination Systems use both direct radiation and indirect warm air heating. They have a central steam or hot water boiler, connected by normal piping lines to direct radiators in spaces where heating alone is required, and to indirect heating elements in one or more systems of warm air ducts serving spaces where air conditioning is required.

The advantages inherent in the combination system are: (a) Parts of the structure, such as service areas, kitchens, garages, storage space, and bathrooms or toilets, may be heated by radiators and isolated from the return duct systems where objectionable odors would otherwise be recirculated through the apparatus. (b) Widely separated sections of a building that are to be completely air conditioned may have independent systems of ducts with local indirect heating units. (c) The central heating plant may be used all year to provide domestic hot water or to supply any summer steam demand.

The combination system is readily adapted to existing warm air heating systems, and to the conversion of parts of piped distribution systems to localized air conditioning of special zones or groups of rooms.

In residences, for example, the combination system may include direct radiation in the garage, kitchen, servants' quarters, and bathrooms, and may use a basement central air conditioner and duct distribution serving all of the main living quarters and bedrooms. The boiler may be operated all year for domestic hot water and possibly for steam-jet refrigeration.

In commercial buildings, space rented for restaurants, banking quarters or other special purposes, or special groups of offices, may be air conditioned with units of suitable capacity located remotely from the main boiler room, and the rest of the building may be efficiently heated by the usual radiation. Even where the entire building is to be completely air conditioned, it is often more economical to divide the building into sections, each equipped with its own blowers, duct systems or air conditioning equipment, than to have one central system installed in the basement. The individual zones can then be served by steam lines carried long distances through the building in a minimum of space, and the main boiler plant may also provide power or steam for a central refrigeration plant.

Boilers, Furnaces and Fuels should all be selected with due regard to present or future air conditioning requirements. Automatic operation is highly desirable in all small heating installations for reasons already given. Only large plants that are constantly attended may be manually operated with reasonably satisfactory results. Therefore, the boiler or furnace originally selected should either be equipped with an oil burner, gas burner or automatic stoker, or should be readily adapted to such units when opportunity affords.

Consideration should be given to the use of the main heat source for domestic hot water and possibly for steam-jet refrigeration. Warm air furnaces seldom provide a satisfactory means of heating the domestic hot water supply in winter, and cannot be operated for this purpose during the summer season. When it is thus necessary to have a separate domestic hot water source, advantages are often gained by selecting a unit using the fuel employed for winter heating.

Both steam and hot water boilers may be equipped with indirect heaters for supplying domestic hot water, and both types of plants may be operated all year for this purpose by cutting off the distribution lines in summer. This change-over from winter to summer operation is more readily made with steam than with most hot water systems because the former may be automatically controlled so that no steam is generated in summer, while the typical hot water system requires some form of shut-off valve to prevent circulation of hot water during this period. Steam boilers may also be used to operate steam-jet refrigerating equipment, but in this case also the heating mains must be provided with suitable valves.

HUMIDIFICATION

A CHARACTERISTIC of most man-made heating systems heretofore employed is that they do not provide for the maintenance of the proper amount of moisture in the heated air. No heating system in common use, whether warm air, steam, vapor or hot water, meets this deficiency unless humidifying equipment is especially provided. The amount of moisture required to maintain satisfactory relative humidities indoors varies widely according to climatic conditions, but there is no section of the country where at some part of the heating season humidification is not essential to satisfactory air conditioning.

Methods of Humidification include: (a) evaporation of water in heated pans or while passing over heated surfaces: (b) exposing extensive water surfaces to large volumes of air in motion; (c) the mechanical atomization of water into a fine mist; and (d) forcing air to pass through sprays of water.

It should be understood that the evaporation of water by any method requires the absorption of heat, and this heat must either be introduced into the water or else it will be taken from the air by the evaporation process. There is, therefore, a heat load to be considered whenever humidification equipment is employed.

In selecting humidifying equipment consideration should be given to the character and cost of water. Evaporative-type humidifiers leave a sludge or hard sediment when the water supply contains mineral salts. This sediment, however, can usually be removed by periodic cleaning of trays or evaporating surfaces throughout the winter heating season. The atomization method is not usually affected by the content of the water, but where recirculating spray equipment is used there is danger of clogging the spray heads if sediment is not first filtered from the water, or if the orifices are not large enough to permit sediment to pass through. Where water is costly the evaporative, atomizing and recirculating spray methods have the advantage as they do not waste water. The spray method as used in ordinary air washers also serves to clean the air. In some units the water is filtered and used over again but in others it is wasted to the sewer.

TABLE 4—RECOMMENDED SUMMER INDOOR AIR CONDITIONS

(A) Corresponding to Various Outdoor Temperatures

OUTDOOR TEMP. (Deg. Fahr.)	INDOOR AIR CONDITIONS WITH DEW-POINT CONSTANT AT 57 F.				
I Dry-Bulb Temp.	II Dry-Bulb Temp.	III Wet-Bulb Temp.	IV Rel. Humidity %	V Grains of Moisture per Cu. Ft. of Air	VI Effective Temperature
95	80.0	65.0	44	4.87	73
90	78.0	64.5	47	4.88	72
85	76.5	64.0	50	4.95	71
80	75.0	63.5	53	5.01	70

(B) Permissible Range of Effective Temperatures

Indoor Dry-Bulb Temps. Deg. Fahr.	RELATIVE HUMIDITIES (PER CENT)						
	30	35	40	45	50	55	60
	Effective Temperatures (Degrees Fahrenheit)						
74					69.3	69.7	70.1
75			69.1	69.5	70.0	71.5	**71.0**
76	69.0	69.4	69.9	70.5	**70.8**	**71.3**	71.8
77	69.7	70.2	**70.7**	**71.2**	71.6	72.1	72.6
78	**70.4**	**70.9**	71.4	71.9	72.4	73.0	
79	71.1	71.6	72.2	72.6			
80	71.8	72.4	72.9				

Bold face indicates theoretical ideal Effective Temperatures for summer.

Dual Purpose Humidifiers offer some economy in equipment cost. Air washers are commonly employed for humidifying purposes; the necessary heat of evaporation being taken from the air unless warm water is used in the sprays. They are similarly used for cooling and dehumidifying purposes by employing refrigerated water. Evaporative coolers are actually humidifiers employed for summer cooling effect in climates where the outside relative humidity is below permissible summer standards; hence they may be used as a part of both winter and summer air conditioning equipment.

Control of Humidification should be automatic to the highest possible degree. It can be effected in four ways: (1) By balancing the capacity of the humidifier to the heating plant so that the amount of moisture evaporated is approximately proportioned to the amount of heat supplied. This method fails to recognize variations in outside relative humidities; hence it is far from being a precise or normally satisfactory control. (2) By interconnected thermostats of the wet-bulb and dry-bulb types arranged to maintain the proper differential between wet-bulb and dry-bulb temperatures. (3) By the direct use of humidistats controlling the operation of the humidifying sprays or the supply of water to evaorators or atomizers. Humidistats are not as sensitive or accurate as thermostats; hence their control is not so precise. (4) By the use of a thermostat controlling the temperature of the air leaving the spray chamber before it is reheated or mixed with warm and circulating air. This control is precise because the air leaves the spray chamber 80 to 90% saturated and at substantially the temperature of the water; hence by governing the temperature of the leaving air and by the use of thermostatic controls on the reheaters or mixing dampers, both the final temperature and the final humidity are readily controlled.

Automatic controls of any type should be capable of manual adjustment to reduce humidities temporarily when excessive condensation appears on windows.

COOLING

THERE are five basic methods of comfort cooling: by ice, by electric refrigeration, by steam-vacuum refrigeration, by evaporative cooling, and by the use of fans to air-cool the interior of buildings at night as a means of retarding the effect of solar radiation in the daytime. The characteristics of each type follow:

Ice Cooling requires relatively inexpensive equipment consisting usually of an ice storage tank or cabinet, a means of melting the ice with water or air, and a means of forcing the air directly into the rooms, or the cooled water through suitable heat exchangers which indirectly cool circulated air. Equipment is available for both central cooling and unit room cooling. The operating cost of such equipment depends largely upon the delivery cost of ice in bulk and the frequent charging of the ice container. The chief disadvantage of ice cooling lies in the fact that daily requirements must be estimated in advance and suitable delivery arrangements made. This constantly reminds the owner of the cost of operating his cooling equipment and consequently tends to minimize its use under conditions when an automatic plant would readily be permitted to operate. Also, shortage of ice compels a shut-down.

Electric or Compression Refrigeration may be used in two ways: first, by the direct expansion of the refrigerant in cooling coils or unit coolers through which air is circulated, or, second, by the indirect cooling of water and the use of this chilled water in the form of sprays for cooling air or for piping throughout the building to direct radiation. With either method of applying electric refrigerating equipment there is a further choice as to whether

TABLE 5—WINTER CLIMATIC CONDITIONS IN THE UNITED STATES

STATE	CITY	I Min. Outdoor Design Temp. Degrees F.	II Max. Grs. of Moisture to be added per cu. ft. of Outside air.	III Av. Wind Velocity Dec., Jan., Feb., Miles per hr.	IV Direction of Prevailing wind Dec., Jan., Feb.	V Degree Days in Htg. Season.	VI Approximate length of Htg. season in days.
Ala.	Mobile	20	2.41	8.3	N	1471	120
	Birmingham	10	2.72	8.6	N	2408	149
Ariz	Phoenix	15	2.58	3.9	E	1404	134
	Flagstaff	— 5	2.99	6.7	SW	7145	203
Ark.	Fort Smith	—10	3.05	8.0	E	3214	157
	Little Rock	0	2.92	9.9	NW	2811	152
Cal.	San Francisco	30	1.93	7.2	N	3264	208
	Los Angeles	30	1.93	5.1	NE	1504	132
Colo.	Denver	—10	3.05	7.4	S	5873	191
	Grand Junction	— 5	2.99	5.6	SE	5576	181
Conn.	New Haven	— 5	2.99	9.3	N	5895	184
D. C.	Washington	0	2.92	7.3	NW	4626	172
Fla.	Jacksonville	25	2.19	8.2	NE	890	110
Ga.	Atlanta	10	2.72	11.8	NW	2891	155
	Savannah	20	2.41	8.3	NW	1490	128
Idaho	Lewiston	0	2.92	4.7	E	4924	179
	Pocatello	—10	3.05	9.3	SE	7985	238
Ill.	Chicago	—10	3.05	17.0	SW	6315	188
	Springfield	— 5	2.99	10.2	NW	5370	178
Ind.	Indianapolis	— 5	2.99	11.8	S	5297	178
	Evansville	0	2.92	8.4	S	4164	161
Iowa	Dubuque	—20	3.16	6.1	NW	6788	188
	Sioux City	—20	3.16	12.2	NW	7023	185
Kan.	Concordia	— 5	2.99	7.3	N	5556	179
	Dodge City	— 5	2.99	10.4	NW	5034	169
Ky.	Louisville	— 5	2.99	9.3	SW	4180	168
La.	New Orleans	25	2.19	9.6	N	1023	120
	Shreveport	15	2.58	7.7	SE	1938	140
Me.	Eastport	—15	3.09	13.8	W	8531	219
	Portland	—10	3.05	10.1	NW	7012	192
Md.	Baltimore	0	2.92	7.2	NW	4533	164
Mass.	Boston	— 5	2.99	11.7	W	6045	189
Mich.	Alpena	—10	3.05	11.3	W	9540	233
	Detroit	— 5	2.99	13.1	SW	6494	188
	Marquette	—10	3.05	11.4	NW	8692	205
Minn.	Duluth	—20	2.41	11.1	SW	9480	211
	Minneapolis	—15	3.09	11.5	NW	7851	194
Miss.	Vicksburg	20	2.41	7.6	SE	1822	130
Mo.	St. Joseph	0	2.92	9.1	NW	5142	173
	St. Louis	— 5	2.99	11.8	NW	4585	172
	Springfield	0	2.92	11.3	SE	4542	168
Mont.	Billings	—20	3.16	6.9	W	7115	201
	Harve	—25	3.20	8.7	SW	8699	206
Neb.	Lincoln	—15	3.09	10.9	N	6231	189
	North Platte	—20	3.16	9.0	W	6433	182
Nev.	Tonopah	0	2.92	9.9	SE		
	Winnemucca	— 5	2.99	9.5	NE	6359	198
N. H.	Concord	—10	3.05	6.0	NW	6852	187
N. J.	Atlantic City	0	2.92	10.6	NW	5175	182
N. Y.	Albany	—10	3.05	7.9	S	6889	197
	Buffalo	— 5	2.99	17.7	W	6821	193
	New York	0	2.92	13.3	NW	5348	180
N. M.	Santa Fe	0	2.92	7.3	NE	6063	189
N. C.	Raleigh	20	2.41	7.3	SW	3234	159
	Wilmington	20	2.41	8.9	SW	2302	136
N. D.	Bismarck	—25	3.20	8.2	NW	8498	187
	Devils Lake	—25	3.20	11.4	W	10112	198
Ohio	Cleveland	0	2.92	14.5	SW	6154	186
	Columbus	0	2.92	9.3	SW	5323	177
Okla.	Oklahoma City	5	2.83	12.0	N	3613	164
Ore.	Baker	0	2.92	6.0	SE	7166	200
	Portland	5	2.83	6.5	S	4468	185
Pa.	Philadelphia	5	2.83	11.0	NW	4855	173
	Pittsburgh	0	2.92	13.7	NW	5235	179
R. I.	Providence	0	2.92	14.6	NW	6014	186
S. C.	Charleston	20	2.41	11.0	N	1769	135
	Columbia	10	2.72	8.0	NE	2364	145
S. D.	Huron	—20	3.16	11.5	NW	8169	195
	Rapid City	—15	3.09	7.5	W	7163	190
Tenn.	Knoxville	5	2.83	6.5	SW	3670	160
	Memphis	10	2.72	9.6	NW	2950	154
Texas	El Paso	15	2.58	10.5	NW	2428	143
	Forth Worth	15	2.58	11.0	NW	2148	140
	San Antonio	15	2.58	8.2	N	1202	129
Utah	Modena	0	2.92	8.9	W	6600	207
	Salt Lake City	0	2.92	4.9	SE	5553	185
Vt.	Burlington	—10	3.05	12.9	S	7620	187
Va.	Norfolk	15	2.58	9.0	N	3349	160
	Lynchburg	0	2.92	5.2	NW	4019	162
	Richmond	10	2.72	7.4	S	3725	165
Wash.	Seattle	10	2.72	9.1	SE	4968	197
	Spokane	—10	3.05	5.3	SW	6353	195
W. Va.	Elkins	0	2.92	4.8	W	5697	182
	Parkersburg	0	2.92	6.6	S	4884	174
Wis.	Green Bay	—15	3.09	12.8	SW	7823	191
	La Crosse	—20	3.16	5.6	NW	7290	172
	Milwaukee	—15	3.09	11.7	W	7372	199
Wyo.	Sheridan	—25	3.20	5.3	NW	7993	205
	Lander	—20	3.16	3.0	NE	8266	201

NOTES: Figures in Column I from Heating & Ventilating with corrections. Figures in Column 3 from A. S. H. V. E. Guide. Figures in Column 4 from A. S. H. V. E. Guide. Figures in Column 5 from A. S. H. V. E. Guide and Fan Engineering.

NOTES: Figures in Column 2 computed for 66⅔% relative humidity at minimum outdoor design temperatures and 40% relative humidity at 70 F. indoors.

Figures in Column 6 computed by dividing the degree-days in the heating season by the difference between the average outdoor temperature from October 1st to May 1st and 70 F.

TABLE 6—SUMMER CLIMATIC CONDITIONS IN THE UNITED STATES

STATE	CITY	I Max. Outdoor Design Temp.	II Design Outdoor Rel. Hum. for Cooling.	III Max. Grs. of Moisture to be removed per cu. ft. of Outside Air	IV Summer Wind Velocity Miles per Hr.	V Prevailing Summer Wind Direction.	VI Approximate length of cooling season in days.
Ala.	Birmingham ...	93	48	2.97	5.2	S	136
	Mobile	94	50	3.54	8.6	SW	165
Ariz.	Phoenix	110	23	1.20	6.0	W	151
Ark.	Little Rock ...	95	44	2.75	7.0	NE	133
Calif.	Los Angeles...	88	41	.90	6.0	SW	153
	San Francisco..	85	42	.46	11.0	SW	77
Colo.	Denver	90	22	—1.59	6.8	S	94
Conn.	New Haven ...	88	52	2.45	7.3	S	101
D. C.	Washington ..	93	47	2.81	6.2	S	113
Fla.	Jacksonville ..	94	50	3.54	8.7	SW	175
	Tampa	94	52	3.88	7.0	E	180
Ga.	Atlanta	91	48	2.52	7.3	NW	130
	Savannah	95	50	3.79	7.8	SW	157
Idaho	Boise	95	18	—1.75	5.8	NW	85
Ill.	Chicago	88	50	2.17	10.2	NE	97
	Peoria	91	48	2.52	8.2	S	100
Ind.	Indianapolis ..	90	45	1.85	9.0	SW	107
Iowa	Des Moines ...	92	43	1.94	6.6	SW	90
Ky.	Louisville	94	41	2.03	8.0	SW	117
La.	New Orleans..	94	52	3.88	7.0	SW	165
Maine	Portland	85	50	1.50	7.3	S	93
Md.	Baltimore	93	47	2.81	6.9	SW	121
Mass.	Boston	88	50	2.17	9.2	SW	96
Mich.	Detroit	88	46	1.63	10.3	SW	97
Minn.	Minneapolis ..	84	57	2.18	8.4	SE	91
Miss.	Vicksburg	95	47	3.27	6.2	SW	155
Mo.	Kansas City...	92	45	2.26	9.5	S	113
	St. Louis......	93	47	2.81	9.4	SW	113
Mont.	Helena	87	24	—1.67	7.3	SW	60
Nebr.	Lincoln	93	41	1.83	9.3	S	96
Nev.	Reno	93	18	—1.93	7.4	W	110
N. J.	Trenton	93	43	2.16	10.0	SW	105
N. Y.	Albany	90	48	2.30	7.1	S	88
	Buffalo	83	60	2.32	12.2	SW	92
	New York.....	91	48	2.52	12.9	SW	105
N. M.	Santa Fe......	87	24	—1.67	6.5	SE	96
N. C.	Asheville	87	48	1.62	5.6	SE	145
	Wilmington ...	93	54	3.95	7.8	SW	149
N. D.	Bismarck	88	38	.48	8.8	NW	98
Ohio	Cleveland	87	48	1.62	9.9	S	99
	Cincinnati	93	43	2.16	6.6	SW	110
Okla.	Oklahoma City.	96	40	2.26	10.1	S	121
Ore.	Portland	83	38	— .34	6.6	NW	100
Pa.	Philadelphia ..	93	45	2.48	9.7	SW	112
	Pittsburgh	91	43	1.75	9.0	NW	106
R. I.	Providence ...	85	57	2.40	10.0	NW	99
S. C.	Charleston ...	94	60	5.22	9.9	SW	150
	Greenville	93	47	2.81	6.8	NE	145
Tenn.	Chattanooga ..	94	44	2.53	6.5	SW	145
	Memphis	93	49	3.14	7.5	SW	131
Texas	Dallas	99	35	1.93	9.4	S	150
	Galveston	93	54	3.95	9.7	S	160
	San Antonio...	100	37	2.52	7.4	SE	156
	Houston	93	54	3.95	7.7	S	160
	El Paso.......	98	22	— .72	6.9	E	142
Utah	Salt Lake City.	95	22	—1.06	8.2	SE	100
Vt.	Burlington	85	50	1.50	8.9	S	98
Va.	Norfolk	91	51	2.98	10.9	S	125
	Richmond	95	42	2.40	6.2	SW	120
Wash.	Seattle	83	27	—1.68	7.9	S	88
	Spokane	89	22	—1.68	6.5	SW	90
W. Va.	Parkersburg ..	90	34	.21	5.3	SE	111
Wis.	Madison	89	47	1.95	8.1	S	86
	Milwaukee ...	87	48	1.62	10.4	S W	86
Wyo.	Cheyenne	85	25	—1.73	9.2	S	95

NOTES: Figures in Column 1 from A. S. H. V. E. Guide. Figures in Column 2 computed from A. S. H. V. E. Guide. Figures in Column 3 computed from figures in Columns 1 and 2 and are for conditions in Table No. 4. Figures in Column 4 from A. S. H. V. E. Guide. Figures in Column 5 from A. S. H. V. E. Guide. Figures in Column 6 computed by deducting the length of heating season in days (from Table No. 5) from 285.

Summer cooling season in days does not necessarily indicate the period of operation of cooling equipment.

the compressor shall be water cooled or air cooled. If air cooled, the compressor must be located outside of the room to be cooled, but with water-cooled units the compressor may be installed within the space being conditioned. This affects the choice of unit summer air conditioners, and this choice in turn may be influenced by the cost of city water consumed by the condenser. For further details regarding electric refrigerating equipment, see AMERICAN ARCHITECT Reference Data No. 3—Mechanical Refrigerating Equipment—November, 1932.

Steam-Vacuum Refrigeration has only recently come within the field of normal architectural practice, having hitherto been adapted to relatively large installations requiring special engineering design. Today steam-jet refrigerating units are available in sizes small enough for use in the larger residences or equivalent store, restaurant or commercial and institutional structures.

The underlying operating principle is based upon the fact previously noted that when water is evaporated, heat is absorbed. A jet of steam under high velocity is used to create a vacuum in a container that is equipped with spray nozzles from which city water at ordinary washer temperatures is diffused in the form of a fine mist. Under the high vacuum conditions prevailing within the chamber, evaporation takes place at relatively low temperatures producing a chilling effect similar to that developed at normal atmospheric pressures. The recirculating water entering at perhaps 55 F. is chilled to a temperature of 40 F to 45 F and this cooled water is thereupon circulated for air conditioning purposes in exactly the same manner as cold water produced by electric refrigeration or ice melting. However, the vapor thus produced within the spray chamber and the steam used in the jet have to be withdrawn and condensed. This requires the use of additional water as in the case of water cooled electric refrigeration condensers, but more water is required in the steam-vacuum process. A similar process uses no steam, creating the vacuum with centrifugal exhausters.

The choice of vacuum refrigeration as compared with electric refrigeration therefore depends upon several factors: (a) the cost of water, (b) the cost of generating steam, and (c) the cost of electric current. Where water costs are very high, cooling towers are usually employed to cool the water used in the condensers and thus permit it to be reused over and over again except for that which is lost in the cooling tower. These cooling towers are available in two types: the familiar outdoor type which may take the form of a roof super-structure or a spray cooling pond, and the indoor or housed type which employs a fan or blower.

The space required for a more complete description of vacuum jet refrigerating equipment and the various types of cooling towers that may be used with it, is hardly warranted in this discussion, because in larger plants the problem requires the services of a competent consulting engineer, and the smaller plants offered by manufacturers are properly balanced in design so that the architect need not concern himself with the details of their composition. The choice between vacuum and electric refrigeration is largely a matter of carefully balancing the several cost elements above mentioned, plus the initial cost and the probable life of the apparatus. In the case of vacuum refrigeration there are no moving elements employed in the refrigerating process itself; the mechanical equipment consists solely of a condensation removal pump and, in some types, an exhauster.

Gas Refrigeration warrants consideration in areas where there is a low cost gas supply. At present gas refrigerating units of the absorption type (similar to domestic gas refrigerators) are not in commercial production in sizes suitable for air conditioning loads, as the chief interest in the use of gas for air conditioning purposes has largely centered around dehumidification by the adsorption process as will be developed later.

Evaporative Cooling is a practical and low cost method of comfort cooling in climates where the outdoor relative humidities prevailing throughout the cooling season are below those required for summer comfort. In such locations the addition of moisture to the air is permissible and, therefore, evaporative cooling is logical as well as effective.

Evaporative coolers are similar to air washers and consist of a spray chamber through which the indoor air is constantly circulated. A part of the spray water, which is at substantially the same temperature as the entering air, is evaporated and draws its heat of evaporation from the air, cooling it. At the same time it increases the moisture content or relative humidity of the outgoing air. Evaporative cooling is low in cost and requires a minimum of equipment. It should not be attempted where prevailing outdoor relative humidities equal or exceed those shown in Table 4(a) as representing desirable summer cooling conditions.

Fan Cooling should not be confused with the cooling effect produced by vigorous air circulation. The latter does not lower temperatures but simply increases the rate of evaporation of body moisture and thereby produces a cooling effect upon the body, just as a summer breeze on a sultry day may make high temperatures more bearable.

Fan cooling, as considered here, uses cool night air to lower the temperature of the building mass. All materials absorb and hold heat. During warm days the interior building surfaces, and even the furniture and fixtures, are warmed and retain this heat for some time after the air itself becomes cooler. In most sections of the United States nighttime temperatures are considerably below day temperatures throughout the summer season. Fan cooling takes advantage of this fact to thoroughly ventilate the interior of a building during the night period, thereby removing as much as possible of the heat retained by the building mass before the next period of daytime heat arrives.

This night cooling effect can be secured without the use of any fans or other equipment if the windows of a building are kept open from about six o'clock in the evening until six in the morning and are then closed and sunny windows shaded during the daytime. Since this is not practical in all buildings fans are used to augment natural circulation.

In residences fans are located in the top floor or attic, and the attic stairway or other suitable opening becomes a duct for conveying the air from the lower floors through the fan to the outside. The fan capacity should be such as to change the air in the space to be cooled from 30 to 35 times per hour.

The advantage of this method is that it may reduce the cooling load on mechanical refrigerating equipment possibly 60% or more of what would be required if nighttime cooling were not employed. The chief disadvantage of this method is that it makes no provision for cleaning the large volume of air passing through the dwelling. People who suffer from hay fever or asthma may find their condition aggravated by the dust brought in, whereas normal methods of air conditioning using filters or washers usually offer a high degree of relief to these sufferers.

A system that avoids this difficulty but that requires oversize filter or air-washer capacity and abnormally large ducts employs the usual central heating or cooling unit fan and filter equipment with an auxiliary attic fan. The basement fan is then arranged to introduce outside air at night-time instead of recirculating the indoor air, and the attic fan serves to remove the air thus introduced.

In any case, the cost of operating these blowers should be checked against the cost of operating systems using normal quantities of cooled air.

Automatic Control of Cooling introduces a factor not present in thermostatic control of heating. Experience indicates the total temperature drop during the summer period should never exceed 15 F and rarely should exceed 10 F if persons move from the cooled building to out-of-doors at frequent intervals. Thus in summer it is necessary to maintain a limited temperature difference, not a constant temperature. Furthermore, summer comfort is so definitely a product of both dry-bulb temperature and relative humidity that the desired effective temperature range can only be maintained when all three factors—outdoor temperature, indoor temperature and relative humidity—are properly correlated.

While the type of controls necessarily varies according to the kind of summer air conditioning equipment employed, the general principle underlying this three-part control is to use a differential thermostat to keep the temperature difference within proper bounds and then to control the indoor relative humidity in relation to the indoor temperature either by means of wet- and dry-bulb thermostats, by so called "effective temperature" control devices, or by a hygrostat integrated with suitable thermostats.

DEHUMIDIFICATION

THERE are two practical methods of dehumidifying air. One is to cool the air below the dew-point temperature. At this temperature the air is saturated and below it the excess moisture is condensed and leaves the air in the form of dew. The other method is to pass the air over substances or through liquids that have such an affinity for moisture as to mechanically or chemically remove a large percentage of the air-borne vapor.

Before discussing these methods in detail it is important to remember that when moisture is given up by air, heat is released. This is the same amount of heat that is absorbed when water is evaporated. Dehumidification, therefore, produces heat which must be removed by cooling equipment just as humidification requires heat which must be added to the load of the heating plant. This heat is called latent heat as distinguished from the heat we can feel, which is termed sensible heat.

It is also important at this point to recall the fact that summer comfort is dependent upon both dry-bulb temperature and relative humidity. Consequently, in producing summer comfort in a section where prevailing humidities are excessively high, the equipment must have greater dehumidifying capacity than is necessary in areas where outdoor relative humidities are low. These factors all have an important bearing on the selection of suitable equipment.

Dehumidification by Cooling is a method commonly employed where refrigeratiing equipment is available or where the local water supply does not exceed 45 or 50 F. Under this process the air is chilled below its dew-point temperature where its moisture content is reduced by condensation, and then is reheated to a temperature that may be introduced into the conditioned space. This reheating is accomplished in either of two ways: (a) by the actual application of heat through tempering coils, or (b) by mixing the cold dry air with a suitable amount of unconditioned, recirculated air.

This method of dehumidification is applied in two principal ways. Where air washers are used as dehumidifiers the spray water is reduced in temperature below the dew-point temperature of the entering air. Normally, spray waters are maintained at around 45 F. The action of the spray is practically instantaneous in removing the excessive moisture content of the air, and the heat released is absorbed by the spray water rather than by the air, which leaves the washer at a temperature close to its dew point.

The other method is to pass air over refrigerated coils or heat exchangers. When this is done, moisture is condensed upon the cold surfaces and is carried off into the drain.

The Adsorption Method makes use of the property of certain substances, notably silica-gel and activated alumina, to mechanically withdraw water vapor from air. Latent heat released by this adsorption process is imparted to the air, thereby warming it so that the air passing through this type of dehumidifier must be cooled by some other means.

The means usually employed to cool the air again is the evaporative cooling method previously described. The effectiveness of silica-gel and activated alumina in adsorbing moisture is used to dry air considerably below that required for comfort purposes. The addition of moisture through the evaporative cooling process can thereby be tolerated. Where water costs are high the evaporative cooler may be equipped with an indoor or outdoor cooling tower as described for steam-vacuum refrigeration, but where water costs are low, the excess water used in the cooler is wasted.

A feature of this process is that the silica-gel or activated alumina must be freed of the water it withdraws from the air, which is done by heating the material in a chamber separated from that in which the adsorption process takes place.

The development of equipment employing the adsorption process of dehumidification has been temporarily retarded, but designs have passed the experimental stage and it is expected units will soon be marketed. Operating costs closely parallel those obtained with compression or vacuum refrigeration.

AIR MOTION

THE two elements of complete air conditioning which are common to both summer and winter air conditioning are air motion and air cleaning, and these in turn are intimately related because air cleaning cannot be accomplished without air motion. While air motion sufficient for heating purposes might be, and frequently is, secured by gravity, the velocities developed are inadequate to meet air conditioning standards. Therefore, it may be assumed that power driven fans or blowers are essential elements in most summer or winter air conditioning installations.

The choice between a blower* and a fan for circulating air is almost wholly dependent upon the frictional resistance which the air stream must overcome in passing through ducts, filters or other kinds of equipment. Fans, typified by the ordinary desk fan or airplane propeller, can move large volumes of air at very low cost provided there is no appreciable static head or frictional resistance to overcome. They are most commonly used in free air. Blowers, operating on the centrifugal principle, can overcome very considerable static heads or frictional resistance, and are therefore used in most duct systems, and where filters, air washers, evaporative coolers or similar elements introduce a pressure or suction to be overcome by the blower.

In the selection of fans or blowers it is well to keep in mind that the volume of air to be moved and the velocity of air to be maintained for winter heating purposes may vary from that desired for summer comfort conditions. Where it is possible to use the same fan or blower for all-year air conditioning purposes, it is necessary to select blower equipment on the basis of maximum load, and to use variable speed motors or changeable pulley ratios so that the volume of air moved can be varied with seasonal requirements.

Another factor in selecting fans and blowers is quietness of operation. This involves the use of quiet-running motors (generally of special design adapted to meet these difficult conditions), and the operation of the fan or blower at relatively low tip speeds. Most of the noise caused by modern fans or blowers is due to the air itself rather than to the motor. A large blower operating at low speed will move as much air as a smaller blower at higher speed, but it will do so with less noise. Generally speaking, blowers are quieter than fans.

Constant Vs. Intermittent Fan Operation is one of the moot questions of air conditioning. Theoretically the maintenance of ideal air conditioning standards requires constant air motion, although the quantity of air to be moved will be less in the winter than in the summer. Some types of air conditioning equipment are designed to keep the fans or blowers in constant operation so that the only variables remaining to be controlled are temperature and humidity. The majority of equipment, however, relates the operation of the fan to the demand for heating or cooling effect, and does not maintain air circulation—and its concomitants, air cleaning and prevention of air stratification—unless the thermostat calls for heat in the winter or starts the cooling apparatus in action in the summer. Against the obvious advantage of maintaining a constant circulation and cleaning of air must be balanced the power cost of continuous operation. In the opinion of some authorities the periods of idleness under intermittent operation are not great enough to develop uncomfortable air stratification or "cold 70" in winter, or stagnation of enclosed conditioned space in summer.

AIR CLEANING

THE two common methods of cleaning air are filtering and air washing.

Air filters are of several basic types: (a) fabric filters, consisting of layers of cloth, porous paper, or other woven or felted fabrics, (b) fibrous filters, usually consisting of pads of loosely held mineral or inert vegetable fibres, and (c) viscous filters, consisting of relatively coarse mineral and metal fibres coated with a viscous material to which dust and bacteria adhere as the air passes through the interstices in the mat.

The first two types are called dry filters and are cleaned either by shaking out the dust, by discarding the dirty filter material and replacing it with a fresh unit, or, in the case of cloth fabrics, by washing or vacuum cleaning the filter. Viscous type filters are renewed by washing the dirt-laden surface and recoating with fresh liquid which may be done periodically or as a continuous operation. It is a characteristic of most filters that their resistance to the passage of air increases as they accumulate dirt, but their efficiencies are high and their operating cost is relatively low.

Air washers remove dust, bacteria, little smoke and many air-borne odors by washing the air with fine sprays of water. Free water in the air is then removed by baffles or eliminator plates which are themselves wetted by the sprays. Dust or dirt not caught by the sprays themselves are caught by enforced impingement upon these wet surfaces.

The static head of an air washer is constant and it

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*For convenience, the word blower is used in this article to denote a centrifugal housed fan and the word fan to denote a disc or propeller type fan.

has the advantage over filters of removing odors as well as much of the infinitely fine dust particles that might not be entrapped by a filter. Air washers may also perform other functions as humidifiers, dehumidifiers and evaporative coolers. Their chief disadvantages are: (1) cost of water and power required to operate them—important only where rates are high or with non-recirculating washers or where restrictions may be imposed upon the use of water during droughts. (2) The tendency to shut them off for long periods. Frequently the advantages of both types are combined by installing an air filter ahead of an air washer.

Capacity of Air Cleaning Equipment is directly related in practice to the volume of air moved by fans or blowers and is seldom determined by the cleanliness or dirtiness of the entering air. The surface area of filters and the size of air washers should be such that they can handle the maximum volume of air moved by the fan at a velocity not exceeding 800 ft. per minute at the filter face without introducing a static head over .25 in. water pressure.

How to Estimate Loads

BEFORE providing definite and simple rules for determining the various loads to be carried it is important to note the economic significance of thermal insulation, multiple glazing and weatherstripping in relation to heating and cooling. This subject was adequately covered in AMERICAN ARCHITECT Reference Data No. 11, "Thermal Insulation of Buildings," May 1934, which should be read in connection with this study.

In evaluating the economic worth of thermal insulation in that article, heating loads only were considered and cooling loads neglected. In climates where the mean winter temperature is below 35 F. the selection of insulation methods for heating economy takes adequate care of summer cooling as well. Above that mean temperature the relatively higher cost of cooling makes it necessary to include cooling loads and their possible reduction in determining the amount of insulation showing the most satisfactory economies.

In addition to ordinary insulation, multiple glazing and weatherstripping, summer cooling loads may be profitably lessened by the use of awnings, shades and curtains on all windows exposed to direct sunlight. These will be evaluated later.

In the Reference Data on "Thermal Insulation of Buildings," heat losses to be reduced were estimated for the entire structure in order to simplify the study of insulation methods and materials. But in heating, cooling and air conditioning practice it becomes necessary to consider individual room units. Here, therefore, the rules of procedure are designed to provide data on individual room loads as well as total loads. These data will be referred to in AMERICAN ARCHITECT Reference Data No. 13, to appear in September 1934, as a basis for selecting radiators, convectors, registers, etc. and for computing pipe and duct sizes.

THE WORK FORMS

TO save many unnecessary steps and extra calculations a set of work sheets of original design are presented on inserted pages. These sheets (which will be available in sets at low cost) have three distinct values:

1. They visualize the procedure established in the following rules.

2. They enable any architect or member of his force to make a complete set of calculations (without detailed engineering knowledge) that will establish the capacity required of any type of equipment used in heating, cooling or air conditioning. The economic chart enables the reader to compare the characteristics, investment and operating costs of various types of equipment to determine the one which best meets the project requirements.

3. They may be used by architects as standard forms for receiving competitive bids; by requiring competing manufacturers to submit their own calculations for capacity on a common basis. Otherwise the variations in method now used throughout the field may show such diverse results as to make a fair comparison of equipment difficult.

It is not necessary, however, to employ these exact forms in following the rules given below. Any set of computation sheets may be used to record the data. It is highly advisable, in any event, to record all calculations involved in each project.

MAXIMUM HEATING LOADS

THE total heating load of a building is made up of: (1) heat required to offset losses through walls, floors, ceilings or roof, including glass areas; (2) heat required to warm air introduced for ventilation purposes or by infiltration; (3) heat required to evaporate water for humidification; and usually (4) heat required in steam or water boilers to indirectly heat the domestic hot water. In certain projects, such as theaters and industrial plants, the total demand may be reduced by the body heat supplied by occupants and the heat generated by consumption of electricity and gas.

Data Required for computation of heating loads include:

(a) Local climatic conditions. See Table 5 for data relating to winter conditions in major cities in the United States.

(b) Desired indoor temperature. See Tables 1 and 2.

(c) Area of all walls, floor, ceiling or roof, and glass areas between heated and unheated space and volume in cubic feet of all rooms. These areas and volumes should be listed room by room and may be taken from drawings or by direct measurement of the building.

(d) Coefficient of heat transmission of each type of wall, floor, ceiling and roof construction, and of all glass areas and doors. See AMERICAN ARCHITECT Reference Data No. 11, "Thermal Insulation of Buildings," May, 1934, for coefficients of common constructions and for methods of determining the coefficients of any construction.

(e) Infiltration of air in cubic feet, either computed from crackage of windows and doors, or based on assumed air changes. See "Thermal Insulation of Buildings" for complete data and Table 3 for air change data.

These data may be conveniently entered on the accompanying Form 1—Individual Room Data—using as many such sheets or equivalent memoranda sheets as are required. The procedure in finding the maximum winter heating load per room is clearly indicated in Form 1 and is further established in the following rules.

RULE 1 . . . To find the maximum winter heat loss through walls, floors, roof, etc.:

1. Multiply the net area of each surface by its coefficient of heat transmission (Column II x Column III). The product is the heat transfer in Btu per hour per degree F for each area (Column IV or Col. VI).

2. Find in Table 7 the allowance to be added for wind and exposure for all outside surfaces. Apply this percentage to the item in Column IV, lines A to F inclusive and enter both percentage and amount in Column V. The sum of Columns IV and V is then entered in Column VI, which gives the total Btu per hour per degree F.

3. Multiply this by the design temperature difference in degrees F. For surfaces exposed to the outside, this design temperature difference (Column VII) is the difference between the desired indoor temperature and the outdoor design temperature. Where surfaces separate heated space from unheated space, such as basement or attic, it is customary to use half this temperature difference where the actual temperature of adjacent cold space is not known. Where floors are on the ground, the temperature difference may range from 5 F to 25 F. Multiply the total Btu per hour per degree F in Column VI by the design temperature difference in Column VII, and enter the total in Column VIII. This is the total maximum Btu per hour required to offset heat losses through these surfaces.

RULE 2 . . . To find the maximum winter heat loss through glass areas:

1. Multiply the gross area of all windows by the coefficient of heat transmission 1.13 for single glazing or .56 for double glazing to arrive at the loss through glass in Btu per hour per degree F. The areas are entered in Column II, the Coefficient *U* in Column III, and the product in Column IV (or Col. VI).

2. Add the proper allowance for wind exposure where required, and complete the computation, as in Rule 1.

Exposure allowances referred to in the preceding rules are based on experience and recognize two factors: Orientation and wind velocity. While some authorities neglect exposure allowances entirely, others believe their omission fails to recognize the extra heating burden carried by rooms having severe exposures; hence they are included in this procedure. The recommended allowances are shown in the following table:

TABLE 7

Orientation	*Walls Not Exposed to Prevailing Winds*	*Walls Exposed to Prevailing Winds*
North	5%	15%
East	0%	10%
South	0%	10%
West	0%	10%

RULE 3 . . . To find the maximum winter heat load due to infiltration and ventilation:

1. Select from Table 3 the average air changes per hour for the given room and multiply the volume of the room in cubic feet by the number of air changes. This gives the total infiltration in cubic feet per hour. To this should be added any further supply of outside air purposely introduced for ventilation. (If it is preferred to actually compute infiltration by the more accurate crackage method, see "Thermal Insulation of Buildings," May, 1934). Enter the total infiltration and ventilation air volume in cubic feet per hour in Column II, line L.

2. Multiply the volume of air to be heated from Column II, line L by the factor .018 (in Column III) and enter the product in Column VI. The total thus entered is the heat required to warm the entering air in Btu per hour per degree F.

3. Multiply this total by the design temperature difference (Column VI x Column VII) to find the hourly heat load due to outside air, which should be entered in Column VIII.

The total of Column VIII is the maximum Btu required per hour to offset maximum heat losses and is the basis upon which radiation required by the room and total load of the building are computed. It is equivalent to what is called the Room Basic Factor (RBF) by the National Warm Air Heating and Air Conditioning Association and the Furnace Blower Manufacturers' Association, except that this factor is 1000 times greater; that is, the Room Basic Factor unit equals 1000 Btu. It may be noted that the method of computation outlined above uses actual coefficients of heat transmission instead of a limited group of factors employed under the Warm Air Code. Hence some variation in results may be expected when the two methods are compared. The method here given is usually the more accurate.

Maximum Heating Load of Building is found by adding together the hourly heat loss in Btu of all rooms. Form 3 provides a convenient place for listing the data for all rooms together. To use this form enter the room numbers and identifying names in Column I and the maximum Btu per hour (the total of Column VIII in Form 1) in Column II. The sum of these individual room loads, shown in the total of Column II, Form 3, is the net heating load required by the building before adding piping and pick-up loads, humidification load and domestic hot water load (if any).

On the reverse side of Form 3 will be found methods for determining the proper size or capacity of a steam, vapor or hot water boiler, or warm air furnace, required to carry the total building load.

The Piping Load, representing loss from pipes and ducts in walls, floors, basement, etc. may be taken at 15% of the total room load if all pipes are well insulated; up to 60% if pipes are bare.

Domestic Hot Water Load should be determined from data in Table 8 as follows: Select the requirements in gallons per maximum hour for the number of families or fixtures involved and multiply by 1000 to find the maximum load in Btu per hour.

The Pick-up Load, which is literally extra capacity allowed for rapid heating after rooms have been permitted to cool, may be based on the following percentages of the total room load:

Automatic oil, gas and stoker fired boilers, and furnaces	25%
Coal and coke, manually controlled:	
Constantly attended	25%
Intermittently attended, small	50%
large	25%
Intermittently operated (churches, etc.)	50%

Boiler Size for steam, vapor and hot water boilers is based upon the sum of the total room load, including humidification load if any, piping load, domestic hot water load, and pick-up load. The humidification load may be determined by Rule 8 and should always be included. When boiler ratings are given in Equivalent Direct Radiation (EDR) follow Rule 4, which may also be used to determine the radiation required by individual rooms.

TABLE 8
DOMESTIC HOT WATER REQUIREMENTS

KIND OF BUILDING	GALLONS PER DAY Per Family	GALLONS PER DAY Per H.W. Fixture	GALLONS PER MAX. HR. Per Family	GALLONS PER MAX. HR. Per H.W. Fixture	GALLONS PER AV. HR. Per Family	GALLONS PER AV. HR. Per H.W. Fixture
Small Residence.....	100		20		10	
Large Residence.....	150		30		15	
High Class Apts.....	200		25		15	
Middle Class Apts...	150		20		12	
Low Class Apts......	100		15		10	
	Per Room					
High Cl. Trans. Hotel	200	85		10		5
High Cl. Res. Hotel.	50	50		9		4
Av. Commercial Hotel	150	70		7		3

TABLE 9—FACTORS USED IN FINDING AIR CIRCULATION

In Cu. Ft. per Min. for Different Air Temperatures at Inlet Register Openings in Rooms

FOR WINTER HEATING Return Air Temp. 65° F. Inlet Air Temp., °F.	FOR WINTER HEATING Factor	FOR SUMMER COOLING FACTORS FOR DIFFERENT INSIDE TEMPERATURES Inlet Air Temp., °F.	75° F.	80° F.
100	.0265	60	.0618	.0463
105	.0231	62	.0713	.0515
110	.0206	64	.0843	.0579
115	.0185	66	.1030	.0662
120	.0168	68	.1324	.0773
125	.0155	70	.1854	.0927
130	.0143	72	.3090	.1159
135	.0132	74	.9270	.1545
140	.0123	76	....	.2317
145	.0116	..	....	....
150	.0109	..	....	....

Factors in this table are on basis of dry air at 70 F. For other temperatures at which air may be handled, increase these factors 2% for each 10 F. above 70 F. To find a factor for any condition not given in the table divide .927 by the temperature difference between the entering air and the room air (return or leaving air).

RULE 4 . . . To find Equivalent Direct Radiation (EDR) divide the heat load in Btu by 240 for steam or by 150 for hot water radiation systems.

Warm Air Furnace Size is determined by adding the total room load in Btu per hour, including the humidification load if any, and the piping load. Inasmuch as the domestic hot water load is rarely carried by warm air furnaces, this item is used separately to determine the capacity needed in a separate domestic hot water source. No allowance is made for pick-up load with warm air furnaces. Such furnaces are usually rated in total Btu per hour, but where used for mechanical warm air heating this rating is affected by the volume of air in cubic feet per minute to be heated. This must be determined by completing the data called for in Columns III, IV and V of Form 3, which are also used to find required fan or blower capacities. In AMERICAN ARCHITECT Reference Data No. 13, to appear in September, 1934, there will be a more complete discussion of register temperatures and the significance of the procedure herein outlined.

RULE 5 . . . To find the capacity in cubic feet per minute required in a warm air furnace:

(1) Choose register temperatures from Table 9, preferably between 130 and 140 F and enter in Column III, Form 3. Enter the corresponding factor in Column IV.

(2) Multiply the data in Column III by the factors in Column IV. This shows the cubic feet

TABLE 10—CALORIFIC VALUES OF COMMON FUELS

Fuel	Quantity	Approximate Range of Calorific Values	Probable Combustion Efficiency	Value Used in Rule 6 Unless Actual Value Is Known
Coal	per short ton	24,000,000 to 29,000,000	55-65%	15,600,000 Btu.
Domestic Fuel Oil . . .	per gallon	136,000 to 155,000	60-80%	100,000 Btu.
Manufactured Gas . .	per 1,000 cubic ft.	450,000 to 650,000	70-82%	400,000 Btu.
Natural Gas	per 1,000 cubic ft.	1,000,000 to 1,200,000	70-82%	800,000 Btu.

per minute required for mechanical warm air heating of individual rooms, the total being entered in Column V. The total of this column gives the total cubic feet per minute to be handled by the furnace.

These rules depend upon accepting the manufacturer's rating of his equipment. The buyer should ascertain that these ratings have been established in accordance with accepted codes as follows: Gas burning equipment of all types, American Standard A.G.A. Rating; boilers, American Society of Heating & Ventilating Engineers Standard Code for Rating Solid Fuel Boilers; furnaces, National Warm Air Heating and Air Conditioning Association Code.

FUEL CONSUMPTION

RULE 6 . . . To find total fuel consumption per season or year:

1. Enter in Form 3, Column VI, the Btu per hour per degree F from totals of Column VI in Form 1 and find total Btu per hour per degree F for the building by adding this column.
2. Add to this the selected percentage allowance for piping load.
3. Multiply this sum by the number of degree-days for the locality (Table 5, Column V) and by 24 hours per day. The final product is the total Btu per season required for heating.
4. Find the average humidity load according to Rule 9.
5. Find the average domestic hot water load as follows: Find in Table 8 the gallons of water required per day for the required number of families or fixtures (Col. 1) and multiply by 1000 to convert to Btu per day. Multiply this by the number of days in the heating season if a separate source of hot water is used in summer, or by 365 days if the heating plant is operated all year for this purpose.
6. Add the totals obtained above (3, 4 and 5) to find the total Btu per season required for all purposes.
7. Divide this grand total by the calorific value of the fuel used as given by Table 10 (or as computed more accurately by the method described in "Thermal Insulation of Buildings"). The result is the total fuel consumption in tons of coal, gallons of oil or cubic feet of gas according to the fuel factor used.

HUMIDIFICATION LOADS

THE capacity of humidification equipment needed to serve a given building may be determined by the following rule:

RULE 7 . . . To find the maximum quantity of water required per hour for humidification:

1. Enter on Form 3, Col. VII the total volume of air in cu. ft. per hour to be introduced into each room, taken from Form 1, Col. II, Line L, and find the total air introduced by adding this column.
2. Multiply this total by the number of grains of moisture to be added per hour from Table 5, Col. II. This gives the quantity of water in grains required under maximum load. To convert to gallons, divide by 58,100 (based on 7000 grains per pound, 8.3 lbs. per gallon).

Heat required to evaporate this water must be computed as part of the heating load, whether the heat is applied to the air or to the water. Proceed as follows:

RULE 8 . . . To find the maximum heat load due to humidification: Multiply the maximum grains of moisture required per hour (from Rule 7) by the factor .153. This gives the heating load in Btu per hour and should be added in calculating boiler or furnace size on the reverse of Form 3.

RULE 9 . . . To find the average heat load due to humidification: Take 50% of the maximum humidity heat load as found in Rule 8. This gives the average load per hour. Multiply this by the number of days in the heating season (from Table 5, Col. VI) and by 24 (hours per day) to get the seasonal load in Btu required for humidification. This should be used in calculating fuel consumption. See Rule 6.

SUMMER COOLING LOADS

THE data required for determining summer cooling loads—and the required capacity of equipment—include:

(a) Areas of all outside walls and roof; areas of all floors, partitions and ceilings separating space to be cooled from warmer parts of the building and areas of outside doors. These should be entered in Form 2 as indicated.

(b) Area of all windows, skylights and glass in doors as a total. This should be entered in Form 2, line E. Also measure separately the area of all glass

(*Continued on page 97*)

AMERICAN ARCHITECT TIME-SAVER WORK SHEETS

FORM No. 1

Reference Data No. 12 Heating, Cooling and Air Conditioning July, 1934

Job No.________

INDIVIDUAL ROOM DATA - WINTER CONDITIONS

Sheet____of_____

Project____ Location________________________ Date____________
Outside Design Temperature______________________________F. Inside Design Temperature______________________________F.
Outside Design Relative Humidity__________________________% Inside Design Relative Humidity____________________________%
Prevailing Winds: Direction__________________Velocity________m.p.h. Computations made by____________________________
NOTES____

Line	Exp-osure	I ITEM	II Areas, sq. ft. Volumes, cu. ft. per hr.	III Coeffic-ients *U*; & Factors	IV Btu. per hour per degree F. (net)	V Add for Wind and Exposure %	 Amount	VI Total Btu. per hour per degree F.	VII Design Temp. Diff.	VIII Total Btu. per hour (max. load)

ROOM No.___________ Floor__________ Dimensions____________x_________ Ceiling Height___________ Volume__________cu. ft.
Room Name__________________________ No. Air Changes Due to Infiltration____________ Other Air Supplied___________cu. ft. per hr.

A		Exposed Wall sq. ft.								
B		Exposed Glass sq. ft.								
C		Exposed Doors sq. ft.								
D		Exposed Wall sq. ft.								
E		Exposed Glass sq. ft.								
F		Exposed Doors sq. ft.								
G	Cold Wall or Partition sq. ft.									
H	Cold Wall or Partition sq. ft.									
I	Glass & Skylights, no wind exp. sq. ft.									
J	Cold Ceiling or Roof sq. ft.									
K	Cold Floor sq. ft.									
L	Infiltration & Air Supply cu. ft. /hr.			.018						
M	**TOTALS**									

WINDOWS, SKYLIGHTS AND DOORS

Exposed			Exposed			Not Exposed		
No.	Size	Area	No.	Size	Area	No.	Size	Area

ROOM No.___________ Floor__________ Dimensions____________x_________ Ceiling Height__________ Volume__________cu. ft.
Room Name__________________________ No. Air Changes Due to Infiltration____________ Other Air Supplied__________ cu. ft. per hr.

A		Exposed Wall sq. ft.								
B		Exposed Glass sq. ft.								
C		Exposed Doors sq. ft.								
D		Exposed Wall sq. ft.								
E		Exposed Glass sq. ft.								
F		Exposed Doors sq. ft.								
G	Cold Wall or Partition sq. ft.									
H	Cold Wall or Partition sq. ft.									
I	Glass & Skylights, no wind exp. sq. ft.									
J	Cold Ceiling or Roof sq. ft.									
K	Cold Floor sq. ft.									
L	Infiltration & Air Supply cu. ft. /hr.									
M	**TOTALS**									

WINDOWS, SKYLIGHTS AND DOORS

Exposed			Exposed			Not Exposed		
No.	Size	Area	No.	Size	Area	No.	Size	Area

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American Architect Time Saver Work Sheets

SOURCES OF DATA AND PROCEDURE

Column II - Take areas from plans or actual building. Infiltration equals volume of room in cubic feet multiplied by air changes per hour; add air supplied for ventilation.

Column III - Coefficients of heat transmission *U* from AMERICAN ARCHITECT Reference Data No. 11, "Thermal Insulation of Buildings," or A.S.H.V.E. Guide.

Column IV - Product of Col. II multiplied by Col. III

Column V - Wind and exposure. South, east and west, 0%; north 5%; plus 10% for each and every side exposed to prevailing wind.

Column VI - Add exposure allowance in Col. V to Btu. per hour in Col. IV. Also the product of Col. II by Col. III where no exposure allowance is added.

Column VII - Design temperature difference equals inside design temperature less outside design temperature. See Table 5. Where walls, ceiling or floor (lines G, H, J & K) separate heated from unheated enclosed space, use ½ design temperature difference for exposed surfaces. Where floor is on the ground, the temperature difference may range from 5 F to 25 F.

Column VIII - equals product of Col. VI × Col. VII.

		I		II	III	IV	V		VI	VII	VIII
Line	Exposure	ITEM		Areas, sq. ft. Volumes, cu. ft. per hr.	Coefficients *U*; & Factors	Btu. per hour per degree F. (net)	Add for Wind and Exposure %	Amount	Total Btu. per hour per degree F.	Design Temp. Diff.	Total Btu. per hour (max. load)

ROOM No.________ Floor________ Dimensions________×________ Ceiling Height________ Volume________cu. ft.

Room Name________________ No. Air Changes Due to Infiltration________ Other Air Supplied________ cu. ft. per hr.

A		Exposed Wall	sq. ft.								
B		Exposed Glass	sq. ft.								
C		Exposed Doors	sq. ft.								
D		Exposed Wall	sq. ft.								
E		Exposed Glass	sq. ft.								
F		Exposed Doors	sq. ft.								
G		Cold Wall or Partition	sq. ft.								
H		Cold Wall or Partition	sq. ft.								
I		Glass & Skylights, no wind exp.	sq. ft.								
J		Cold Ceiling or Roof	sq. ft.								
K		Cold Floor	sq. ft.								
L		Infiltration & Air Supply	cu. ft./hr.		.018						
M		**TOTALS**									

WINDOWS SKYLIGHTS AND DOORS

Exposed			Exposed			Not Exposed		
No.	Size	Area	No.	Size	Area	No.	Size	Area

ROOM No.________ Floor________ Dimensions________×________ Ceiling Height________ Volume________cu. ft.

Room Name________________ No. Air Changes Due to Infiltration________ Other Air Supplied________cu. ft. per hr

A		Exposed Wall	sq. ft.								
B		Exposed Glass	sq. ft.								
C		Exposed Doors	sq. ft.								
D		Exposed Wall	sq. ft.								
E		Exposed Glass	sq. ft.								
F		Exposed Doors	sq. ft.								
G		Cold Wall or Partition	sq. ft.								
H		Cold Wall or Partition	sq. ft.								
I		Glass & Skylights, no wind exp.	sq. ft.								
J		Cold Ceiling or Roof	sq. ft.								
K		Cold Floor	sq. ft.								
L		Infiltration & Air Supply	cu. ft./hr.								
M		**TOTALS**									

WINDOWS, SKYLIGHTS AND DOORS

Exposed			Exposed			Not Exposed		
No.	Size	Area	No.	Size	Area	No.	Size	Area

AMERICAN ARCHITECT TIME-SAVER WORK SHEETS

Reference Data No. 12 **Heating, Cooling and Air Conditioning** July, 1934

INDIVIDUAL ROOM DATA - SUMMER CONDITIONS

FORM No. 2

Job No.__________

Sheet_____of_____

Project______________________________ Location______________________ Date__________

Outside Design Temperature____________F. Inside Design Temperature_________ F. Normal Design Temp. Difference___________F.

Outside Design Relative Humidity__________________________% Inside Design Relative Humidity_____________________________%

Prevailing Summer Winds: Direction______________Velocity_________m.p.h. Computations made by__________________________

NOTES____

I			II	III	IV	V	VI
Line	Exposure	ITEM	Areas, Volumes Grains Moisture Occupants etc. as indicated	Coefficients of Transmission U and Factors	Btu. per hour per degree F.	Design Temperature Difference	Total Heat to be Removed - in Btu. per hour

ROOM No.__________ Floor__________ Dimensions__________ × _________ Ceiling Height___________ Volume__________cu. ft.

Room Name_________________________ No. Air Changes Due to Infiltration___________ Other Air Supplied__________cu. ft. per hr

A		Wall Exposed to Sun sq. ft.					
B		Wall Exposed to Sun sq. ft.					
C		Wall Exposed to Sun sq. ft.					
D	North Wall or Warm Partition sq. ft.						
E	Glass, Total Area sq. ft.						
F	Sun Load Through Glass Btu./hr.		(Compute as indicated below and enter max. load here)→				
G	Outside Doors sq. ft.						
H	Warm Floors sq. ft.						
I	Warm Ceiling or Roof sq. ft.						
J	Infiltration & Air Supply cu. ft. / hr.			.018			
K	Occupants Number			250.0			
L	Electric Lights Watts			3.415			
M	Electric Motors Input in H.P.			2546.0			
N	Other Heat Emitting Apparatus						
O	**TOTAL SENSIBLE HEAT per hour**						
P	Moisture to be Removed Grains per hr.			.151			
Q	**TOTAL, INCLUDING LATENT HEAT**						

TO FIND SUN LOAD ON WINDOWS, SKYLIGHTS AND GLASS IN DOORS

	Exposure	No.	Size	No.	Size	Total Area	Btu./sq. ft.	Gross Btu./hr.	Allowance for Shade %	Allowance for Shade Amount	Net Sun Load Btu./hr.
R	East						140				
S	South						100				
T	West						150				
U	Flat Skylights						200				
V	MAXIMUM SOLAR LOAD through glass = the sum of any flat Skylight load and the greatest net load on any I wall =										

SOURCES OF DATA AND PROCEDURE

Column II - Data from plans or building, and project requirements.

Column III - Coefficients of heat transmission U from AMERICAN ARCHITECT Reference Data No. 11, "Thermal Insulation of Buildings" or A.S.H.V.E. Guide.

Column IV - is the product of Col. II × Col. III.

Column V - Normal design temperature difference is outside design temperature (Table 6) less inside design temperature but should not exceed 10 to 15 F. To allow for sun effect on exterior: frame and masonry walls under 8" thick exposed to sun, add 25 F. to normal design temperature difference; roofs of frame or light masonry, add 60 F.; roofs of heavy construction add 40 F.; ceilings under roof with space between not ventilated add 20 F. Where heavy masonry walls are in full shade deduct 5 F. from normal.

Column VI - is the product of Col. IV × Col. V. Also in lines K to N inclusive it is product of Col. II × Col. III.

Line E - Glass; Total Area - is the sum of all glass areas regardless of exposure to the sun.

Line F - Sun Load Through Glass - is computed as indicated on lines R to V inclusive. In extreme south decrease south exposure factor to 75; in north increase to 120. Lower factors may be used throughout where clouds are frequent. Deductions for shade: outside Venetian blinds 90%; awnings 75%; tree shade, light 40 - 80%, heavy 80-100%; inside Venetian blinds, shades 40%, draperies etc. 10-30%.

Line N - Other Heat Emitting Apparatus - should include stoves, ranges, steam tables, etc. emitting heat during summer period. For factors see Table 11.

Line P - Moisture to be Removed in Grains per Hr. - equals cu. ft. of air per hr. (Col. II, line J) × number of grains to be removed per cu. ft. from Table 6, plus 1000 grains per occupant.

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I			II	III	IV	V	VI
Line	Exposure	ITEM	Areas, Volumes Grains Moisture Occupants etc. as indicated	Coefficients of Transmission U and Factors	Btu. per hour per degree F.	Design Temperature Difference	Total Heat to be Removed - in Btu. per hour

ROOM No.__________ Floor__________ Dimensions__________×__________ Ceiling Height__________ Volume__________cu. ft.

Room Name__________________________ No. Air Changes Due to Infiltration__________ Other Air Supplied__________cu. ft. per hr.

A		Wall Exposed to Sun sq. ft.					
B		Wall Exposed to Sun sq. ft.					
C		Wall Exposed to Sun sq. ft.					
D	North Wall or Warm Partition sq. ft.						
E	Glass, Total Area sq. ft.						
F	Sun Load Through Glass Btu./hr.			(Compute as indicated below and enter max. load here)→			
G	Outside Doors sq. ft.						
H	Warm Floors sq. ft.						
I	Warm Ceiling or Roof sq. ft.						
J	Infiltration & Air Supply cu. ft. / hr.			.018			
K	Occupants Number			250.0			
L	Electric Lights Watts			3.415			
M	Electric Motors Input in H.P.			2546.0			
N	Other Heat Emitting Apparatus						
O	**TOTAL SENSIBLE HEAT per hour**						
P	Moisture to be Removed Grains per hr.			.151			
Q	**TOTAL, INCLUDING LATENT HEAT**						

TO FIND SUN LOAD ON WINDOWS, SKYLIGHTS AND GLASS IN DOORS

	Exposure	No.	Size	No.	Size	Total Area	Btu./sq. ft.	Gross Btu./hr.	Allowance for Shade %	Amount	Net Sun Load Btu./hr.
R	East						140				
S	South						100				
T	West						150				
U	Flat Skylights						200				
V	MAXIMUM SOLAR LOAD through glass = the sum of any flat Skylight load and the greatest net load on any I wall =										

ROOM No.__________ Floor__________ Dimensions__________×__________ Ceiling Height__________ Volume__________cu. ft.

Room Name__________________________ No. Air Changes Due to Infiltration__________ Other Air Supplied__________cu. ft. per hr.

A		Wall Exposed to Sun sq. ft.					
B		Wall Exposed to Sun sq. ft.					
C		Wall Exposed to Sun sq. ft.					
D	North Wall or Warm Partition sq. ft.						
E	Glass, Total Area sq. ft.						
F	Sun Load Through Glass Btu./hr.			(Compute as indicated below and enter max. load here)→			
G	Outside Doors sq. ft.						
H	Warm Floors sq. ft.						
I	Warm Ceiling or Roof sq. ft.						
J	Infiltration & Air Supply cu. ft. / hr.			.018			
K	Occupants Number			250.0			
L	Electric Lights Watts			3.415			
M	Electric Motors Input in H.P.			2546.0			
N	Other Heat Emitting Apparatus						
O	**TOTAL SENSIBLE HEAT per hour**						
P	Moisture to be Removed Grains per hr.			.151			
Q	**TOTAL, INCLUDING LATENT HEAT**						

TO FIND SUN LOAD ON WINDOWS, SKYLIGHTS AND GLASS IN DOORS

	Exposure	No.	Size	No.	Size	Total Area	Btu./sq. ft.	Gross Btu./hr.	Allowance for Shade %	Amount	Net Sun Load Btu./hr.
R	East						140				
S	South						100				
T	West						150				
U	Flat Skylights						200				
V	MAXIMUM SOLAR LOAD through glass = the sum of any flat Skylight load and the greatest net load on any I wall =										

AMERICAN ARCHITECT TIME-SAVER WORK SHEETS

Reference Data No. 12 Heating, Cooling and Air Conditioning July, 1934

TOTAL LOADS—WINTER AND SUMMER CONDITIONS

FORM No. 3

Job No.__________

Sheet_____ of_____

Project____________________ Location____________________ Date____________

____________________ Computations made by____________________

		WINTER CONDITIONS						SUMMER CONDITIONS					
I		II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII
Room No.	Room Name	Max. Btu./hr. Form 1. Col. VIII	Register Temp. Table 9	Factor Table 9	Cu. ft. Air Circulated per min. Col. II x Col. IV	Total Btu. per hr. per degree F. Form 1. Col. VI	Cu. ft. Air Supply per hour Form 1. Col. II Line L	Max. Btu./hr. Sensible Heat Form 2. Col. VI Line O	Minimum Register Temp. Table 9	Factor Table 9	Cu. ft. Air Circulated per min. Col. VIII x Col. X	Total Btu./hr. including Latent Heat Form 2. Col. VI Line Q	Max. Grains Water Removed per hr. Form 2. Col. II Line P
TOTALS See Reverse Side													

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CAPACITIES REQUIRED IN EQUIPMENT

BOILER, Steam, Vapor, Hot Water

(1) Total Room Load, Btu./hr. (Form 3. Col. II) ----------

(2) Humidification Load, Btu. (See Humidifier) ----------

(3) Piping Load, 15% insulated - 60% bare of Item (1) ----------

(4) Pick-up Load, 25% - 50% of Items (1) and (2) ----------

(5) Domestic Hot Water Load (Gals. per hr. x 1000) ----------

(6) Total Boiler Capacity in Btu. ----------

(7) E.D.R. (Divide [6] by 240 for steam, 150 for water) ----------

Boiler Selected ----------

Humidification load, line 2, is maximum Btu. per hr. found in Humidifier calculation, line 4. Piping load varies with length of distribution lines and use of insulation on pipes. Pick-up load minimum for automatic and large heating plants; maximum for intermittently operated boilers, as in churches, schools. For domestic hot water load, see Table 8.

FURNACE, Mechanical Warm Air

(1) Total Room Load, Btu. (Form 3. Col. II) ----------

(2) Humidification Load, Btu. (See Humidifier) ----------

(3) Piping Load, 10% - 15% of Item (1) ----------

(4) Domestic Hot Water Load, if any ----------

(5) Furnace Capacity in Btu. ----------

(6) C.F.M. Air Required (Form 3. Col. V) ----------

Furnace Selected ----------

Data from same sources as for boilers. C.F.M. air required governs furnace casing capacity.

REFRIGERATION, Mechanical

(1) Total Btu. per hr. incl. latent heat (Form 3 Col. XII) ----------

(2) Cap. in Tons at 40 F. Evap. Temp. (Item 1 ÷ 12,000) ----------

Compressor Selected ----------

Units may be rated in maximum Btu. per hr., line 1, or in tons, line 2. Rating should be based on 40 F. in evaporator regardless of actual evaporator temperature, in order to make a fair comparison of units. Above calculations include dehumidifier load only where unconditioned air is used to reheat or temper the air cooled to the dew-point temperature.

FAN or BLOWER

(1) Winter C.F.M. (Form 3 Col. V plus 15%) ----------

(2) Summer C.F.M. (Form 3 Col. XI plus 15%) ----------

(3) Auxiliary Night Air Fan ----------

Fans or Blowers Selected ----------

Select fan or blower on basis of maximum load, lines 1 or 2, and change fan speed during period of lightest load. Capacity of fan used for cooling with night air, if not operated as an auxiliary to summer circulating fan, equals volume of building in cu. ft. x 30 to 35 air changes per hr. divided by 60 to reduce to cu. ft. per minute. If used with central circulating fan deduct central capacity.

FUEL CONSUMPTION

(1) Total Btu./hr./deg. F (Form 3 Col. VI) ----------

(2) Ave. Piping Load (15% insulated, 60% bare of [1]) ----------

(3) Ave. Heating Load Btu./hr./deg. F. (Add 1, 2) ----------

(4) Degree hours in season (Deg. Days x 24) ----------

(5) Heating Load, Btu. per season (Item 3 x Item 4) ----------

(6) Ave. Humidifying Load, Btu./season (see Humidifier) ----------

(7) Dom. Hot Water Load (Gals./day x 1000 x no. days) ----------

(8) Total Btu. per season (Add 5, 6, 7) ----------

(9) Calorific Valve Fuel, as used (Table 10) ----------

(10) Fuel Consumption (Item 8 divided by Item 9) ----------

Average humidity load, line 2, is average Btu. per season as found in Humidifier calculations, line 6. Degree days, line 5, obtained from Table 5. Domestic hot water load, line 7, is usually the all-year load; hence number of days is usually 365. If summer and winter loads are to be segregated, estimate number of days in heating season from Table 5.

HUMIDIFIER, including Heat Load

(1) Cubic ft. Air per hr. (Form 3, Col. VII) ----------

(2) Max. Grains Moisture to be added per cu. ft. (Table 5) ----------

(3) Total Max. Grains Moisture per hr. (Item 1 x Item 2) ----------

(4) Maximum Btu. per Hour (Item 3 x .153) ----------

(5) Average Btu. per hour (50% of Item 4) ----------

(6) Ave. Btu. per season (Item 5 x days in season x 24) ----------

(7) Max. Capacity in Gals. per hr. (Item 3 ÷ 58,100) ----------

Humidifier Selected ----------

Humidifier capacity in grains of moisture per hr. is shown in line 3 and in gallons per hr. in line 7. This total may be applied to a single central unit or proportioned according to the volume of space to be conditioned by each one of several unit humidifiers. Maximum Btu. per hr., line 4, is required to determine boiler or furnace size. Average Btu. per hr., line 6, is required in computing fuel consumption.

DEHUMIDIFIER

(1) Max. Grains Water Removed /hr. (Form 3 Col. XIII) ----------

(2) Max. Capacity in Gals. per hr. (Item 1 ÷ 58,100) ----------

Dehumidifier Selected ----------

Dehumidifiers are rated in maximum grains of water condensed per hr. line 1, or in gallons per hr., line 2. If absorption type dehumidifier is employed with an evaporative cooler, additional capacity is needed; see text.

FILTER or AIR WASHER

(1) Maximum Cu. ft. per min. (Blower capacity) ----------

(2) Velocity at Filter (not over 800) F.P.M. ----------

(3) Required Area at not over .25" Static Resistance ----------

Filter or Air Washer Selected ----------

Capacity is equal to maximum fan or blower capacity. Velocity thru filter should not exceed 800 F.P.M. and static resistance should range above 1/8" to 1/4" water pressure.

AMERICAN ARCHITECT TIME-SAVER WORK SHEETS

Reference Data No. 12 **Heating, Cooling and Air Conditioning** July, 1934

ECONOMIC STUDY OF AVAILABLE EQUIPMENT

FORM No. 4

Job No.__________

Sheet___ of______

Project____ Location______________________ Date___________

____ Data Entered by________________________________

PROJECT REQUIREMENTS Loads from Form 3	CHARACTERISTICS OF AVAILABLE EQUIPMENT with comparable items expressed as percentage of project requirements = 100%					
BOILER, Steam, Vapor, or Hot Water	Make	%	Make	%	Make	%
	Model		Model		Model	
Budget	Cost		Cost		Cost	
Capacity in Btu./hr.						
(or) E. D. R.						
Fuel (kind and grade)						
FURNACE, Mech. Warm Air (or Indirect Heater)	Make		Make		Make	
	Model		Model		Model	
Budget	Cost		Cost		Cost	
Capacity in Btu./hr.						
Cu. Ft. per Min.						
Fuel (kind and grade)						
HUMIDIFIER (S) (Where multiple units are used enter total capacity)	Make		Make		Make	
	Model		Model		Model	
	No. Used		No. Used		No. Used	
Budget	Total Cost		Total Cost		Total Cost	
Max. Grains Moisture / hr. evaporated						
Static Resistance, inches water						
Total water used, gals./hr.						
REFRIGERATION, Mechanical (including cooling coils)	Make		Make		Make	
	Model		Model		Model	
Budget	Cost		Cost		Cost	
Cap. in Btu./hr. at 40 F. Evap.						
(or) Tons, at 40 F. Evap.						
Water for Condenser, gals./hr. at.......F.						
Motor Horse Power (or lbs. steam/hr.)						
DEHUMIDIFIER (Cost may be incl. in Refrigeration)	Make		Make		Make	
	Model		Model		Model	
Budget	Cost		Cost		Cost	
Max. Grains Moisture/hr. evaporated						
Total water used, gals./hr.						
FAN or BLOWER	Make		Make		Make	
	Model		Model		Model	
Budget	Cost		Cost		Cost	
Cu. Ft. per Min.						
Static Resistance, inches water						
Motor Horse Power						
FILTER or AIR WASHER	Make		Make		Make	
	Model		Model		Model	
Budget	Cost		Cost		Cost	
Cu. Ft. per Min.						
Static Resistance, inches water						
Total water used, gals./hr.						

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TOTAL INVESTMENT AND ANNUAL OPERATING COST
of Winter, Summer or All-Year Air Conditioning Equipment

A. TOTAL INVESTMENT

ITEM	No. Units	First Selection Make	Cost	Second Selection Make	Cost	Third Selection Make	Cost
Boiler or Furnace							
Winter Conditioner Unit (s)							
Summer Conditioner Unit (s)							
All-Year Air Conditioner (s)							
(or) Humidifier (s)							
Refrigerating Equip.							
Dehumidifier; if separate							
Fans or Blowers							
Filter or Air Washer							
Automatic Controls							
Oil or Gas Burner, or Stoker							
Separate Dom. Hot Water Heater, if any							
Radiation, Piping etc. or Duct Work, Registers, complete							
TOTAL							

B. ANNUAL OPERATING COST

ITEMS	Notes & Sources		Quantity	Unit Cost	Annual Cost
FUEL COSTS					
Winter Heating	Form 3, Fuel Consumption				
Summer Domestic Hot Water	Form 3, Fuel Consumption				
Absorption Dehumidifier	Form 3 or Manufacturer				
TOTAL FUEL COST PER YEAR					
ELECTRIC POWER	KW Input	Hours Operated			
Fan or Blower Motors					
Refrigeration Compressor					
Oil Burner or Stoker					
Circulating Pumps					
TOTAL POWER COST PER YEAR					
WATER CONSUMPTION	Av. Gals. / hr.	Hours Operated			
Humidifier					
Air Washer					
Evaporative Cooler					
Refrigeration Condenser					
Absorption Dehumidifier					
Cooling Towers					
TOTAL WATER COST PER YEAR					
OTHER COSTS	Lbs. / hr.	Hours Operated			
Steam Consumption, where purchased					
Filter cleaning or replacements	According to Type				
Maintenance, Attendance, Ash Removal, etc.					
FIXED CHARGES					
Depreciation	Cost divided by yrs. of life				
Interest on Investment	Cost x interest rate				
TOTAL ANNUAL OPERATING COST					

HOW TO USE THIS FORM

The purpose of this form is to provide a convenient means of comparing competitive items of equipment which are tentatively selected as being suited to the project. Unless an entire air conditioning plant is designed and constructed to meet the special conditions of the project, it must be expected that standardized units may offer slightly greater or slightly less capacities than are indicated by the computed loads. It is therefore desirable never to compare costs unless performance characteristics are compared at the same time. Use the face of this form as follows: In the first column under "Project Requirements" enter budget allowances in dollars and the loads as computed in Form 3 In the next three columns enter preliminary selections of equipment, with manufacturers' ratings and contractors' estimated cost installed. The reverse side of the form may be used to summarize total investment required by three combinations of equipment and to estimate annual operating cost of the most favorable combination as indicated. Note: Ordinarily HP Output of motors = KW Input exposed to the east, south and west, and all flat skylights, and enter in Form 2, lines R, S, T and U. By flat skylights is meant all skylights receiving direct sunlight; only sloping skylights facing the north should be omitted from sun load calculations, and even these should be included in the gross area of glass shown on line E.

(c) Infiltration and air supply. Determine as described in Rule 3, using summer conditions.

(d) Number of occupants normally in the room when cooling plant is operated. In residences due allowance should be made for guests when computing loads in living and dining rooms.

(e) Heat producing apparatus including wattage of lights (line L), horsepower of electric motors (line M) and such items as stoves, ranges, steam tables, etc., as listed in Table 11.

(f) Moisture to be removed from the air, part of which is due to excessive outdoor relative humidity and part to the moisture given off by occupants. See Rule 15.

(g) Coefficients of heat transmission *U* as in Form 1.

(h) Design temperature difference, which is the maximum outdoor design temperature (from Table 6, Col. I) less the desired indoor temperature (Table 4(a) Col. II). However, this difference should never exceed 15 F and rarely should exceed 10 F unless occupants remain in the cooled space several hours at a time, except as follows:

Walls and roofs exposed to sun develop higher temperatures than the air because of their absorption of solar heat. Therefore, the normal design temperature difference should be increased according to the construction: frame and masonry walls under 8" thick, exposed to sun, add 25 F; roofs of frame or light masonry, add 60 F; roofs of heavy construction add 40 F. Where heavy masonry walls are in full shade deduct 5 F. If uncooled and ventilated space intervenes between ceiling and roof, the normal temperature difference need not be increased; but if space between the ceiling and roof is not ventilated at least 20 F should be added to the normal design temperature difference.

With these data entered as indicated in Form 2 or its equivalent for each room under consideration, proceed as follows:

RULE 10 . . . To find the summer cooling load due to walls, ceilings, floors, doors and all glass areas (See Form 2, lines A, B, C, D, E, G, H and I): Multiply the areas in square feet (Col. II) by the coefficients of heat transmission (Col. III; also identical with those used in Form 1, Col. III) to get the Btu per hour per degree F (Col. IV). Multiply these products by the selected design temperature differences (Col. V) and enter the results as total heat to be removed in Btu per hour in Col. VI.

TABLE 11—HEAT TRANSMISSION IN BTU OF VARIOUS KINDS OF EQUIPMENT

ELECTRIC EQUIPMENT	
Lights and electric appliances	3,415 per watt hour
Electric motors	2,546 per horse-power hour input
Electric Ranges	
Small burner	3,412 per hour
Medium burner	4,100 per hour
Large burner	7,700 per hour
Oven	10,236 per hour
Appliance Connection	2,250 per hour
Warming compartemnt	1,023 per hour
GAS EQUIPMENT	
Natural gas fired equipment generally	1,000 per cu. ft. gas
Manufactured gas fired equipment generally	500 per cu. ft. gas
Natural gas bunsen burners	3,000 per hour
Manufactured gas bunsen burners	1,500 per hour
Natural gas fish-tail burners	5,000 per hour
Manufactured gas fish-tail burners	2,500 per hour
Restaurant coffee urns, per gal. capacity	1,600 per hour
Dish warmers, per sq. ft. of shelf	600 per hour
Steam tables, per sq. ft. of top	650 per hour
Restaurant range—4 burners and oven	100,000 per hour
Residence gas ranges	
Giant burner	12,000 per hour
Medium burner	9,000 per hour
Oven	1,000 per cu. ft. space per hour
Pilot	250 per hour

NOTE:

Hoods over ranges, steam tables and other kitchen apparatus will reduce their heat emission to the room by 70 to 80%

The Sun Load Through Glass is an important part of the summer cooling load. It is due to the property of glass to admit a very large part of direct solar heat, and must be clearly distinguished from the normal heat transfer through glass from the air on one side to the air on the other. Factors have been established experimentally which indicate the amount of heat passing through vertical and horizontal glass areas. These factors vary with orientation because incidence of the solar beams changes from morning through noon to evening. While this whole subject of sun load is highly controversial at present, the following procedure is recommended as being conservatively safe.

Since the sun effect is only on one wall at a time, or is at an extreme angle of incidence if it strikes two walls at a time, the maximum solar heat load on glass is taken as the greatest load on any one wall exposure plus the whole load on flat skylights.

RULE 11 . . . To find additional sun load through windows, skylights and glass in doors receiving direct sunlight:

1. Enter in Form 2, lines R, S, T and U, the sizes and total area of glass according to its orientation as indicated. Multiply by the factors 140 for east, 100 for south, 150 for west and 200 for flat skylights, as shown on this form. In the extreme south decrease south exposure factor to 75; in extreme north increase to 120. All these values are high enough for climatic conditions where bright sunshine normally accompanies high humidities and high temperatures. Where sun is frequently clouded

on extremely warm humid days they may be reduced. The product is the gross heat load in Btu per hour due to the solar heat entering through glass when the sun is shining.

2. Select from Table 12 the proper percentage allowances for shade cast by trees or buildings or for the use of awnings, shades or curtains. Enter as indicated on Form 2, compute the allowances and deduct from the gross Btu per hour to find the net sun load in Btu per hour. The total of the skylight load and the greatest load on any one exposure as shown in the last column should be entered on line "v" and carried to line F in Column VI.

Summer Infiltration is computed as for winter infiltration (see Rule 3) except that the number of air changes due to ventilation may vary in some cases. Refer to Table 3. Enter the total cubic feet per hour on Form 2, Col. II, line J and proceed as follows:

RULE 12 . . . To find amount of sensible heat to be removed from air introduced by infiltration and/or ventilation: Multiply the volume of air in cubic feet (Col. II) by .018 and enter the product in Col. IV. Multiply this product by the design temperature difference (Col. V) and enter the total heat to be removed due to outside air in Col. VI.

Heat Introduced by Occupants must be included in the majority of projects. This heat takes two forms, sensible heat which is recognized here, and latent heat, which is considered later.

RULE 13 . . . To find the heat to be removed due to body heat of occupants: Multiply the number of occupants by 250 (Cols. II and III) and enter the product as Btu to be removed in Col. VI. (This factor means that 250 Btu per hour are emitted by the average adult at rest at temperatures around 76-77 F. For men at hard work the body sensible heat emission may range up to 460 Btu per hour.)

Heat Produced by Lights, Motors and Apparatus may be readily calculated from the data given in Table 11.

RULE 14 . . . To find the heat emitted by lights, motors and other equipment: Find the heat emitted in Btu per hour in Table 11; enter the units in Col. II and the factors in Col. III and the product of these two in Col. VI. This product is the total Btu per hour to be removed. Factors for lights in watts and motors in horsepower input are included in Form 2.

The Total Sensible Heat found by adding lines A to N inclusive in Col. VI is the amount of heat to be removed from the air in a room without reducing its relative humidity. Since this has a bearing on duct sizes and the cubic feet of air to be circulated it should be summarized for all rooms on Form 3, Col. VIII.

The Refrigeration Load, upon which the size of equipment is based, is the sensible heat load plus the latent heat load. The latter should be determined as part of the dehumidifier calculations in accordance with Rule 16 and entered in Cols. II, III and VI of Form 2. The grand total of Col. VI (line Q) should be entered for each room to be cooled on Form 3, Col. XII where the total Btu to be removed by refrigeration equipment may be readily summed up.

The Evaporative Cooling Load is the sensible heat load only, if it may be assumed the evaporative cooling method is used where outdoor relative humidities are low enough to permit their increase in the cooling process. Table 6 shows such locations by a minus quantity in Column III for the grains of moisture to be removed per cubic foot of outside air. The minus figures, actually representing the amount of moisture that may be added per cubic foot of air introduced, are then multiplied by the cubic feet of air to be circulated (Form 3, Col. XI) and by the factor .151. Then multiply this product by 60 to find the maximum Btu absorbed per hour by the evaporation effected. If the total Btu absorbed by evaporation equals or exceeds the cooling load as shown on Form 3, Col. VIII, an evaporative cooler may be used to carry the entire heating load. When it does not balance the estimated cooling load, the evaporative cooler must be supplemented by mechanical refrigeration or an adsorption dehumidifier.

It should be noted that all of the air to be circulated would be taken in from the outside. The otherwise normal quantity of air indicated in Form 2, line J would be inaccurate for evaporative cooling calculations. In most cases part of the air would be taken through the humidifier and part of it by-passed to prevent too great a rise in the relative humidity of the total air circulated. The minimum register temperature selected and entered in Form 3, Col. IX, should also be raised as high as possible to increase the quantity of air circulated to the maximum permitted by size of apparatus, ducts and power requirements.

DEHUMIDIFICATION LOADS

THE amount of moisture to be removed from the air to bring the relative humidity down to the required point is governed by two factors: (1) the difference between the relative humidity of the outdoor air and the indoor design relative humidity, and (2) the amount of moisture evaporated from the bodies of occupants. The removal of this moisture causes as much heat to be released as was originally absorbed when it was evaporated. This latent heat must be removed either by refrigeration, or, when the adsorption method is employed, by repeating the evaporating process as described previously.

When mechanical refrigeration is used the air must be cooled below the dew-point temperature (around 57 F) which may be below the temperature at which the cooled air should enter the conditional space. Hence it must be reheated. This reheating may be done with steam or hot water; but in this case the refrigerating load must be computed on a design temperature difference based on the

TABLE 12—SUN LOAD THROUGH GLASS—DEDUCTIONS FOR SHADE

In Per Cent of Gross Calculated Load

Outside light colored Venetian blinds	90%
Awnings shading whole window	75%
Inside light colored opaque shades or Venetian blinds	40%
Inside draperies and curtains	10 to 30%
Tree shade, heavy	80 to 100%
Tree shade, light	40 to 80%
Windows in constant shade of building	100%

dew-point temperature. And to this extra cooling load must be added the cost of reheating.

The more logical method is to cool only enough of the air to the dew-point temperature to remove the greater part of its water vapor. Then this "superdry" and supercooled air is mixed with untreated air in such proportions that the air in the room will have both the desired temperature and the desired relative humidity.

Where this method is employed the capacity of refrigerating equipment need not be increased beyond that computed for cooling alone, except for the latent heat to be removed due to dehumidification. This method being the more commonly used it is the only one developed in detail in these rules and work sheets.

RULE 15 . . . To find the amount of moisture to be removed from the air (dehumidification):

1. Find in Table 6, Col. III for the locality the maximum number of grains of moisture to be removed per cubic foot of outside air. Multiply by the number of cubic feet per hour introduced by infiltration and air supply (Form 2, Col. II, line J) to find the number of grains of moisture to be removed from the air before allowing for occupants.

2. To this total add the moisture evaporated from occupants which is found by multiplying the number of occupants by 1000. (This figure represents the number of grains of moisture evaporated per hour per adult at rest and is commonly used in cooling calculations despite the fact that men at hard work (at 77 F) may evaporate up to 5600 grains per hour.)

3. The sum of these two products is the total grains of moisture to be removed per hour. This should be entered in Form 2, Col. II, line P. Also enter in Form 3, Col. XIII, and add to get the total for the building. To convert to pounds, divide by 7,000; to convert to gallons divide the number of grains by 58,100. These conversions are significant only where equipment capacities are given in pounds of water or gallons instead of grains.

RULE 16 . . . To find the latent heat to be removed by refrigeration: Multiply the total number of grains of moisture to be removed per hour (as found in Rule 15 and entered in Form 2, Col. II, line P) by .151. Enter the product as the latent heat to be removed in Btu in Col. VI, line P.

Where the adsorption method of dehumidifying is employed the significant factors are basically the same as those found above but are modified by the operation of the particular equipment selected. In addition to the net amount of moisture to be removed, the adsorption unit must also take up enough additional moisture to permit an evaporative cooler to absorb the total heat load without producing a final relative humidity above that established as acceptable. Manufacturers of such equipment should be consulted.

WINTER AND SUMMER AIR CIRCULATION

THE selection of fans or blowers of a capacity adequate to maintain proper circulation of air in winter, summer or both, involves consideration of duct sizes, lengths and the resistance developed by bends, registers, etc. These matters will be discussed in detail in AMERICAN ARCHITECT Reference Data No. 13, to appear in September, 1934.

However, an acceptable short cut method, based on adding a percentage allowance for distribution load, is presented in the following procedure:

RULE 17 . . . To find approximate fan or blower capacity required for winter and summer air circulation:

1. For winter air circulation follow the procedure described under "Warm Air Furnace Size" using Form 3, Cols. II, III, IV and V and the data in Table 9. The total cubic feet of air per minute thus found not only represents the volume to be handled by a warm air furnace but also is the volume to be handled by the fan or blower before allowing for duct losses. Add 15% for duct losses.

2. For summer air circulation, first enter on Form 3 in Col. VIII the maximum Btu per hour of sensible heat (Form 2, Col. VI, line O) for each room. In Column IX and X enter the desired register temperature and its appropriate factor from Table 9. (See discussion of air motion for basis on which to choose the inlet air temperature and from this choose the factor corresponding to the temperature which is nearest to that established for design purposes.) Multiply the items in Col. VIII by the factors in Col. X and enter the products in Col. XI as cubic feet of air circulated per minute. Add 15% to total of Col. XI to find fan or blower capacity required in summer.

3. Select blowers or fans rated at the total cubic feet per minute (cfm) thus found for winter or summer conditions, when operating against an assumed static head of ¼" to ½" of water unless the actual static head is known.

Note that where summer requirements exceed winter requirements it may be advisable to choose the fan on the basis of the maximum load and operate it at lower speeds in the winter. This may be done by changing pulley ratios or by using a variable or multi-speed motor.

AIR FILTERS AND AIR WASHERS

THE selection of air filters or air washers is governed by the cubic feet of air to be cleaned per minute or per hour, and by the resistance to the passage of this air developed by the filter medium or washer sprays. Inasmuch as this resistance can be controlled within definite limits by increasing the area of the filter medium or the volume of the air washer chamber, the only data required upon which to base selection of equipment is (1) fan or blower capacity as determined by Rule 17 and (2) the permissible resistance or static head developed by the air cleaning device.

The determination of static head will be presented in AMERICAN ARCHITECT Reference Data No. 13 to appear in September, 1934. A short-cut method of selecting equipment is to assume that the static head developed by the filter or air washer shall range between ⅛ and ¼ inches of water pressure and that the velocity through filters or washers shall not exceed 800 ft. per minute.

RULE 18 . . . To find the required capacity of an air filter or air washer: Choose a unit rated by the manufacturer as capable of cleaning the volume of air to be handled by fans or blowers as determined by Rule 17, when the velocity through the cleaning mechanism does not exceed 800 ft. per minute over the gross face area of the filter, while developing resistance to the flow of air not exceeding 0.25 in. of water pressure.

Economic Study of Equipment

THE loads or required capacities that have been computed by the methods described represent ideal project requirements. It is rarely possible to find standard units in commercial production which are rated at precisely the capacities called for in a specific project. This problem may be solved in larger buildings by designing each element to carry the designed loads and then building the equipment from such special designs.

One major factor in the selection of equipment is always the item of initial cost. The selection of equipment purely on a cost basis, however, is seldom sound because the cheapest equipment may involve high operating costs or may not perform in accordance with project requirements; while higher priced units may show a substantial economy in operation and perform with maximum satisfaction.

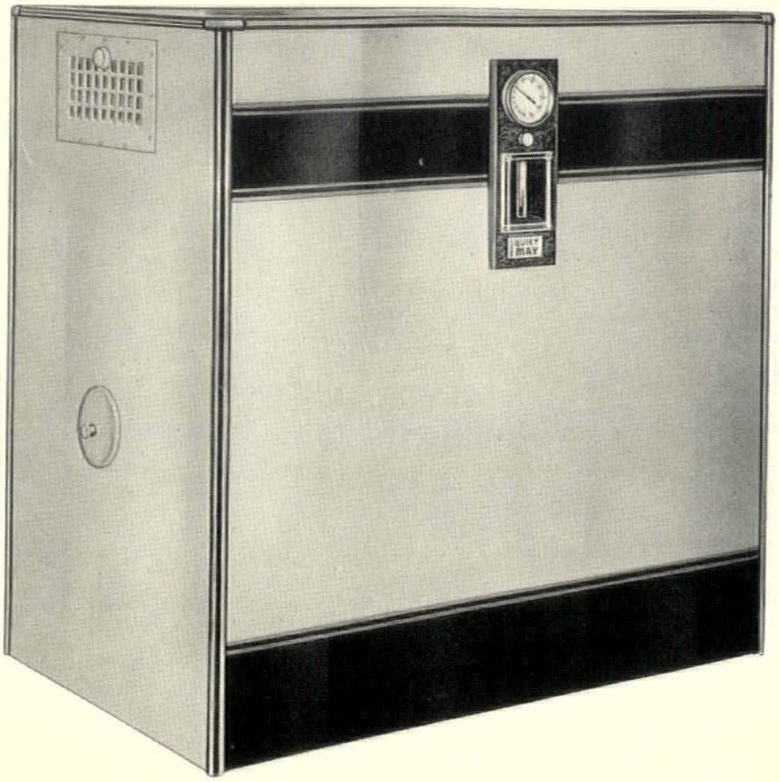
To assist in making selection which takes into consideration the essential factors of cost and performance it is recommended that Form 4 or its equivalent be used. In the first column under "Project Requirements" enter the computed loads or required capacities as developed in Form 3 and an apportionment of the total budget for heating, cooling and air conditioning between the various items of equipment involved. These values should be considered as 100% in rating the competitive equipment to be entered in the remaining three columns. In these columns are spaces in which to enter the make and model number of tentatively chosen equipment and the contractor's estimated cost of such equipment installed. Also enter the manufacturer's rating of his equipment in the lines corresponding to the loads or capacities entered in Column I. If desired, these costs and capacities also may be compared to project requirements by expressing them in percentage form. For example, if the computed load on a boiler is 140,000 Btu and the budget allowance for this unit is $500, a boiler that would deliver 150,000 Btu rated capacity would be entered as delivering 107% of the designed load. If the cost is $550, it would show 110% of the budget allowance. A cheaper unit costing only $450 and indicated as 90% of the budget, might only deliver 130,000 Btu or 93% of the project requirements.

By listing tentative selections in this manner the owner may quickly decide where he can make logical savings below his budget, or where he should exceed the budget in order to secure adequate performance. Between various items of equipment of substantially the same cost, he can quickly see the desirability of choosing the one which will come closest to the needs of his building.

The reverse side of Form 4 provides a means for listing the total investment and for computing the annual operating cost. Under "Total Investment" it will be noted that there is one space for "Radiation, Piping, etc. or Duct Work, Registers Complete." Here may be entered the contractor's estimate for the complete heating or air conditioning installation outside of the units of equipment embraced in this article. A detailed study of these elements will appear in AMERICAN ARCHITECT Reference Data No. 13, September, 1934.

The method of computing annual operating cost is self-evident. Space is provided here for only one computation. It is assumed that the comparisons made on the face of Form 4 and in the total investment summary will have reduced the choice to one combination of units that seems outstandingly advantageous to the buyer. If the selection will be influenced by operating costs, calculations of the latter should be repeated on a separate form.

Prepared under the guidance of Perry West, M.E., consulting engineer, Newark, N. J., by the Technical Editor, American Architect.



A color scheme of grey and black with chromium trim distinguishes the furniture-steel enclosure of the Quiet MAY Oil Furnace. Cabinet developed in collaboration with Donald Deskey, nationally famous industrial designer.

Presenting the

QUIET MAY OIL FURNACE

With Dual Function—(1) Comfort Heat (2) Tankless Hot Water

New applications of well-tried principles of combustion engineering have produced the unique Quiet MAY Oil Furnace. Freedom from hampering precedent and the opportunity to design each part efficiently to serve a definite need, have produced an Oil Furnace having advantages never before offered in the domestic heating field.

The Quiet MAY Oil Furnace is introduced in two sizes with a rated output of 600 and 900 square feet of direct steam radiation at the boiler. A larger unit, rated at 1200 square feet, will be available shortly. Experience shows these sizes will meet over 90% of residential heating requirements. Even the smallest home can be served by one of these units as the design is such that the frequency with which the burner is operated determines the fuel consumption and total heat output. There is no loss of efficiency under lighter loads than the boiler rating. See Table 1 for complete ratings.

Compactness, low water line, and ability to pass through ordinary doorways simplify installation. See Table 2 for all dimensions and clearances.

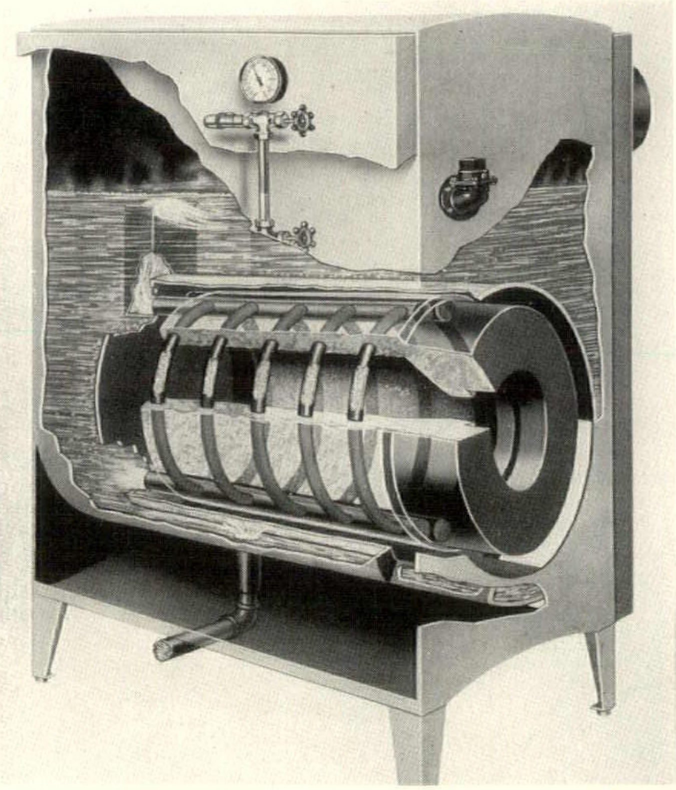
Truly a dual purpose boiler—(1) comfort heat, (2) tankless domestic hot water. The basic design provides for domestic hot water both Summer and Winter—and this is accomplished without accessories or even need for a storage tank. A tankless domestic hot water heater under independent automatic control supplies ample water, all year round, without costly Summer shut-off valves even on hot water radiation heating systems.

Where heating system is of hot water radiation type, the water is heated by steam, using the novel invention, Quiet MAY Transfer Heater, above the water line of a steam boiler. High efficiency, no loss of water from the boiler, and exceptional control of heating effect result from this simple and logical departure from past practices.

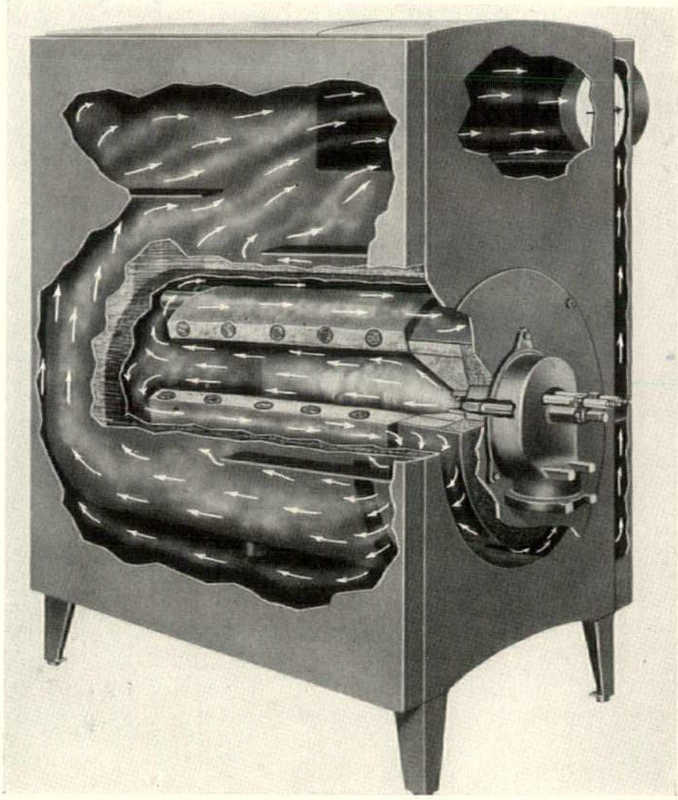
Controlled warmth in the basement is offered by the special air heater built into the furnace cabinet. Closing a louvre in Summer shuts off this heat that is so desirable in Winter, especially where the basement is used for recreation.

A finely built furniture-steel cabinet, finished in grey and black with chromium plated trim, encloses all working parts and presents real beauty of design. All connections are made at the rear of the boiler. This is a revolutionary development not heretofore accomplished.

A PRODUCT OF MAY OIL BURNER CORPORATION, BALTIMORE, MD.



Phantom Cut-away View
Quiet MAY Oil Furnace
Showing Ther-MAY-Lator Construction



Phantom Cut-away View
Quiet MAY Oil Furnace
Showing Heat Absorbing Surfaces

Facts About the New Quiet May Oil Burning Furnace

THE OIL BURNER MECHANISM is a development of the successful Quiet MAY Oil Burner which has been satisfactorily used all over the world for over ten years. It is of the pressure atomizing type with electric ignition, burning No. 3 oil. It has the famous Gerotor oil pump, genuine double sapphire-jeweled atomizing nozzle and all other features that have established the reliability of the Quiet MAY.

THE COMBUSTION CHAMBER is formed by the patented Quiet MAY Ther-MAY-Lator—a molded refractory cylinder having water passages that function as a little boiler within a big boiler. The small quantity of water within the Ther-MAY-Lator is quickly heated as soon as combustion starts; the water thus instantaneously heated is brought through a special channel to the water surface. Quick steaming results, giving rapid response to the call for heat.

AMPLE HEAT ABSORBING SURFACES are provided by the arrangement of the flue gas passages. The gases leave the combustion zone at the rear, pass forward around the Ther-MAY-Lator, and thence pass around the outside of the water shell before reaching the stack. Low stack temperatures result. No special chimney conditions are required.

THE TANKLESS HEATER supplies ample hot water Summer and Winter for domestic purposes. Its adequacy has been established by actual installations in various parts of the country. It is automatically controlled by a thermostatic device that operates the burner when the water temperature drops and stops it (unless the room thermostat is calling for heat) when the desired temperature is restored. Where peak demands for hot water are extremely heavy, a "built-in" tank-type heater of similar construction may be specified.

HOT WATER RADIATION HEATING SYSTEMS are served by this Quiet MAY Oil Furnace having a wholly new and practical "Transfer Heater" consisting of copper coils of special design situated above the water line in the steam dome. The boiler water does not flow through the hot water heating mains and radiators but remains in the boiler. At the same time the water circulating through the radiation system remains practically constant as it does not mix with the boiler water and, therefore, cannot inadvertently be boiled out of the furnace.

Two distinct advantages result: In the Summer the boiler can be operated below the steaming point to

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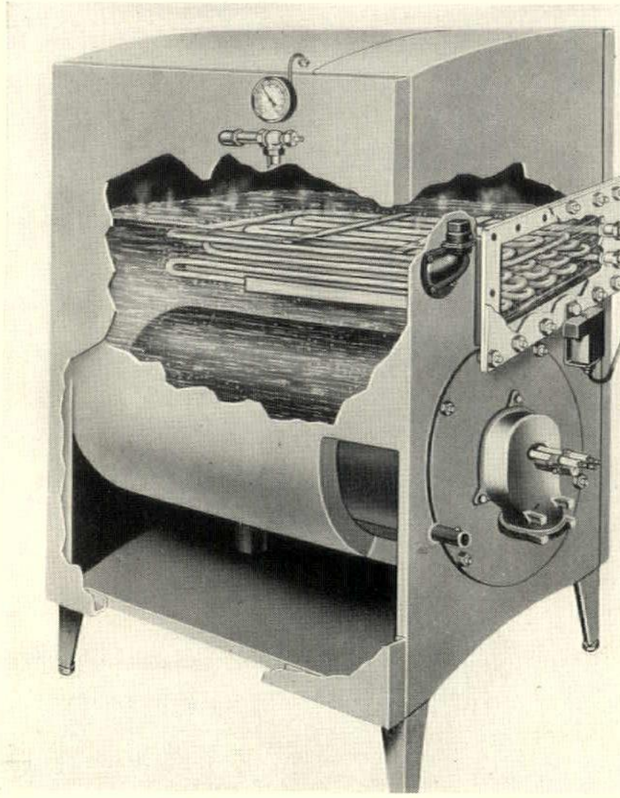
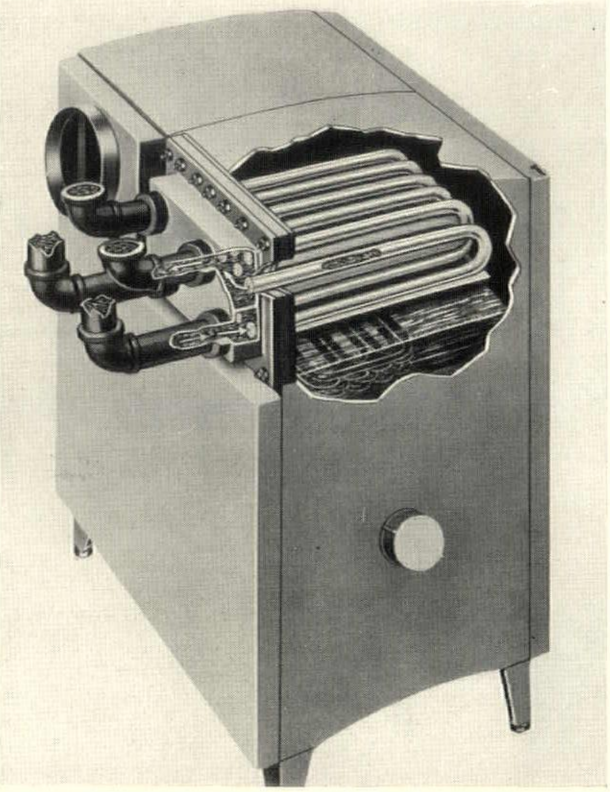


Phantom Cut-away View
Quiet MAY Oil Furnace
Showing Tankless Domestic Hot Water Heater



Phantom Cut-away View
Quiet MAY Oil Furnace
Showing Hot Water Radiation Transfer Heater

supply domestic hot water, without either heating the house or requiring an expensive motor driven shut-off valve on each main riser. In Spring and Fall, when only a slight amount of heat is needed, more precise control of heat delivery can be effected by this transfer heater than by heating the water direct.

BASEMENT HEATING during the Winter season is provided for by means of a built-in warm air heater controlled by a door in the rear end of the cabinet. Part of the air circulating between the casing and the boiler is used to preheat air for combustion. The balance may be used to warm the basement, to make it more comfortable for recreation purposes, or to prevent cold floors above.

WELDED STEEL CONSTRUCTION is used for all parts of the boiler except the water heater and transfer heater coils. Coils of either type can be removed without taking down the boiler. The boiler is built to meet the A. S. M. E. specification and each boiler bears the Hartford Boiler Inspector's stamp.

ATTRACTIVE APPEARANCE, pleasing to the most meticulous home owner, is offered by the grey and black furniture-steel cabinet with chromium plated trim. All operating parts are completely concealed; even the necessary pipe connections and the stack flue connection are brought out at the back, leaving nothing to mar the simple clean lines of the cabinet. A large access door with lock handle permits servicing the burner mechanism. The Quiet MAY Oil Furnace may be operated for test purposes without the cabinet, or the cabinet may be removed without disturbing any connections.

INSTALLATION is facilitated by (1) its compact size; (2) its ability to pass through normal size doorways; (3) its low water line, permitting use in basements with low headroom and allowing ample overhead space for piping; (4) simplified erection and handling on the job; and (5) the enforced necessity of making a correct piping installation because of the disposition of the return connections.

SERVICING has been reduced to an absolute minimum through the fact that the burner is designed and adjusted at the factory to operate at highest efficiency. No adjustment is ever necessary in the burner operation once the unit is installed, except a change in the atomizer if the grade of oil is changed. When the load is less than the rated load of the furnace, the burner operates less often, thus apportioning the fuel consumption to the load.

Quiet MAY Oil Furnaces are sold, installed and maintained by authorized factory-trained Quiet MAY Oil Burner dealers. Expert service is offered every user; installations may only be secured where these factory-trained service organizations are available.

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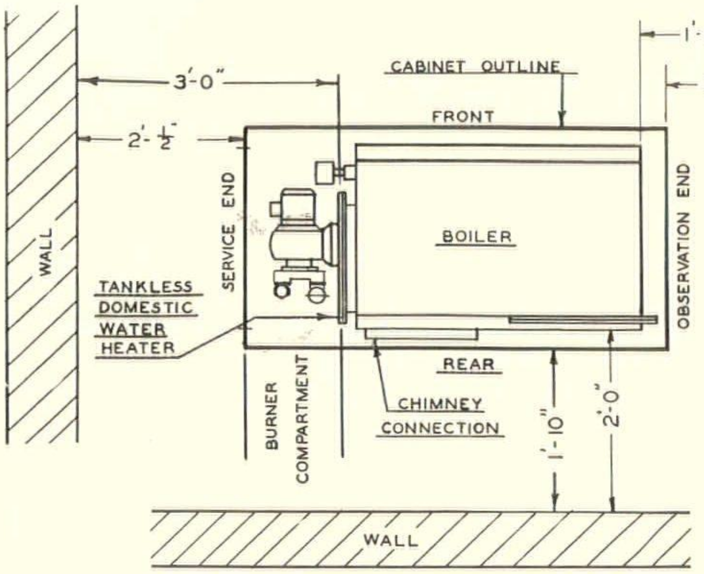
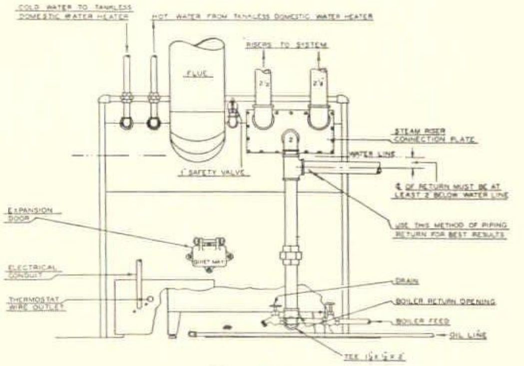
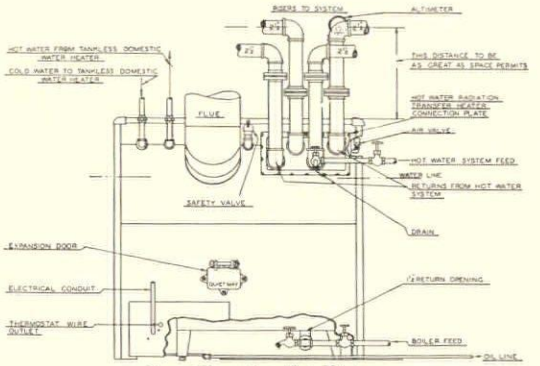


Plan and Clearance Diagram



Rear Elevation Steam



Rear Elevation Hot Water

Our Engineering Department has designed this advanced oil furnace. If these technical men can help you plan its incorporation in your projects, their services are available on request.

TABLE I. CAPACITIES

		Model S600—W960	Model S900—W1440	Model S1200—W1920
BOILER OUTPUT This should equal or exceed the standing radiation or total room load, plus piping and pick-up and humidification loads.	In Btu per hour	144,000	216,000	288,000
	In EDR Steam	600	900	1,200
	Water	960	1,440	1,920
DOMESTIC HOT WATER	Gallons per hour	180	270	360
MAXIMUM FUEL RATE	Gallons No. 3 oil per hour	1.3	1.9	2.6

TABLE II. DIMENSIONS AND RECOMMENDED CLEARANCES

OVER-ALL DIMENSIONS			
With Cabinet—Length	3'11"	4'5"	5'1"
Width	2'5"	2'9"	2'11"
Height	4'0"	4'3½"	4'3½"
Height of Water Line	2'11½"	3'2"	3'2"
DOOR WIDTHS ADMITTING BOILERS			
As shipped	2'4¼"	2'6¼"	2'7¾"
Gas passage cover with chimney connection removed	2'0"	2'3½"	2'5½"
Both gas passage covers removed	1'10"	2'0½"	2'3"

RECOMMENDED CLEARANCES	From Boiler	From Cabinet	From Boiler	From Cabinet	From Boiler	From Cabinet
Service End for servicing burner and removal of domestic hot water coil	3'0"	2'0½"	3'0"	2'0½"	3'0"	2'0½"
Observation End to see flame when checking operation.	1'6"	1'4"	1'6"	1'4"	1'6"	1'4"
Rear for piping, stack connection, etc. and removal of hot water radiation Transfer Heater	2'0"	1'10"	2'0"	1'10"	2'0"	1'10"
Over-all Clearance lengthwise.	7'3½"		7'9½"		8'5½"	
Front face to wall at rear	4'3"		4'7"		4'9"	

MAY OIL BURNER CORPORATION

Factory and Executive Offices
Baltimore, Maryland, U. S. A.

NEW YORK
6 East 39th Street

CHICAGO
35 East Wacker Drive

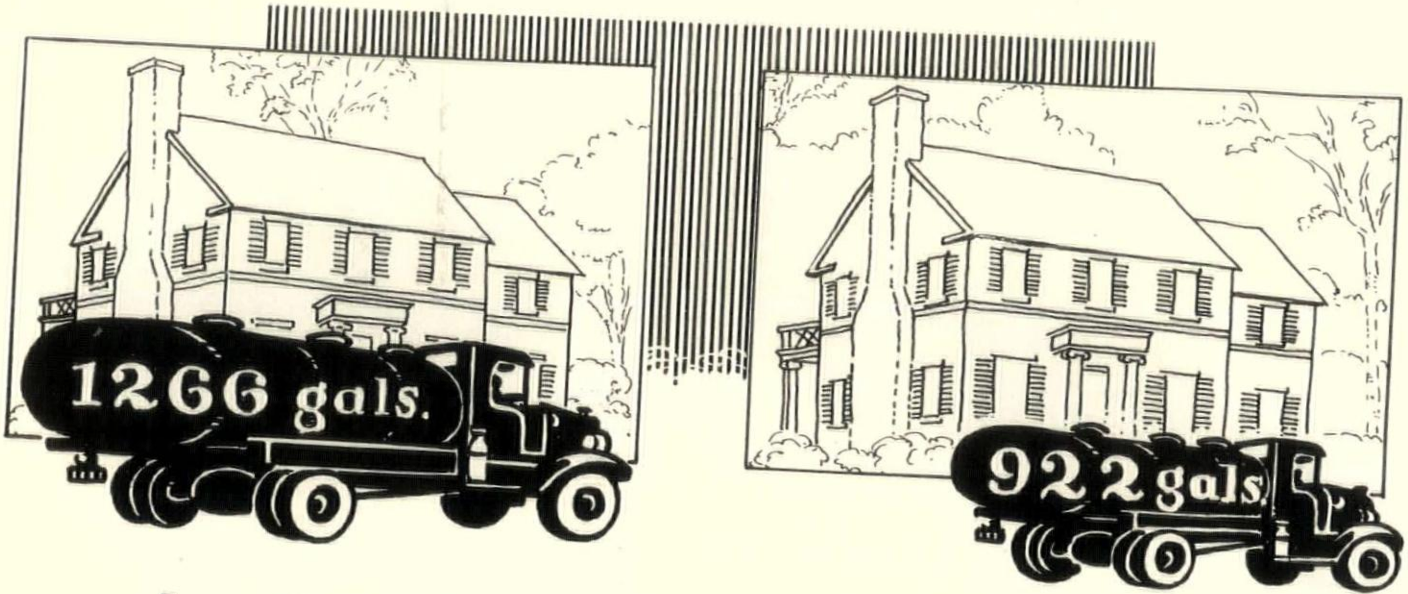
MAY OIL BURNER OF CANADA, LTD.
Toronto, Canada

BOSTON
1028 Commonwealth Avenue

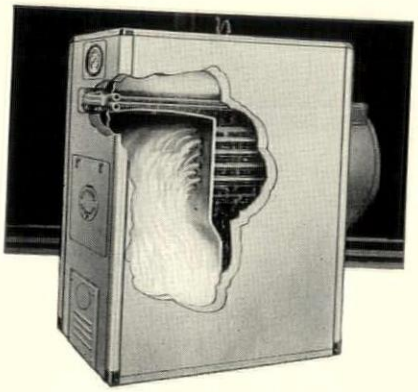
PARIS
15 Rue de la Paix

A PRODUCT OF MAY OIL BURNER CORPORATION, BALTIMORE, MD.

Twin homes



but 37.3% difference in fuel consumed!



These homes are in Hasbrouck Heights, N. J. They were constructed from the same plans, at the same time, by a prominent building company of that town. They are equipped with the same make of high grade oil burner. In only one respect do they differ. . . . *One home, saving 37.3% over the other in fuel cost, has a FITZGIBBONS Oil - Eighty Automatic Steel Boiler to supply heat, and with a FITZGIBBONS TANKHEATER to give year-round domestic hot water.* The other, a standard make oil-burning, cast-iron boiler with an indirect hot water heater.

During the hard winter of 1933-34, the FITZGIBBONS Oil-Eighty Automatic kept piling up savings for its owner—and building lasting good-will for the oil burner with which it was cooperating. And it will keep on piling up savings indefinitely, giving its owner *one year's free heat out of every four,* on the basis of the heating cost in the other home.

Space does not permit of telling here *why* the Oil-Eighty Automatic can make this difference in oil burner performance. But BULLETIN AA will give all the details.

Write for a copy—today.

Fitzgibbons Boiler Company, Inc.

GENERAL OFFICES: 570 SEVENTH AVE., NEW YORK, N. Y.
Works: OSWEGO, N. Y.
BRANCHES AND REPRESENTATIVES IN PRINCIPAL CITIES

FITZGIBBONS OIL-EIGHTY AUTOMATIC

Air Conditioning

DEMANDS

Minneapolis-Honeywell

CONTROLS

RESIDENCE OF MISS GRACE SPIELMAN, MINNETONKA MILLS, MINN. A simple but satisfactory low cost air conditioning system controlled by Minneapolis-Honeywell. Deep well water is used for year around air conditioning. A central control installed in the furnace governs the fan for circulating the air, both in summer and in winter, with a manual switchover. The water valve, which is in the fan circuit, can open only when the fan is running and is governed by the humidity controller.

■

FRANKLIN THEATRE . . . FRANKLIN SOUARE, LONG ISLAND, N. Y. The Minneapolis-Honeywell automatic controls installed on this central fan air conditioning system control the temperature in the theatre and the dew point of the air leaving the conditioner both summer and winter. Provision is also made for automatic changeover from summer to winter and visa versa. A minimum of fresh air is provided for according to the number of people in the theatre by the setting of a hand rheostat. A minimum of 30 damper positions is available.

■

ROSENTHAL'S, INC., BILTMORE HOTEL BLDG., OKLAHOMA CITY, OKLA. The automatic controls installed on the central fan air conditioning system in this store maintains the temperature in the store so that the temperature inside is raised only one degree for each rise of two degrees above 75° outside. In addition, humidity controllers reduce the velocity of the air through the cooling coils in order to produce greater dehumidification when required.

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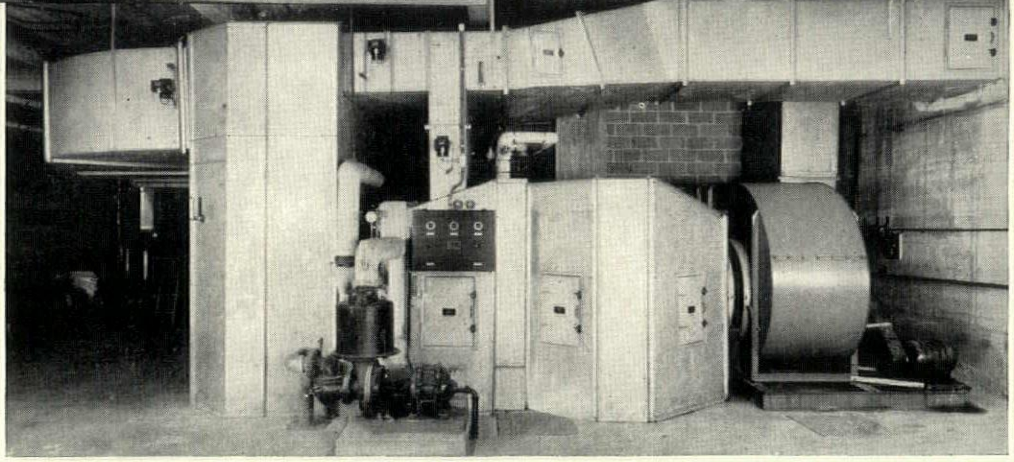


A TYPICAL AIR CONDITIONING INSTALLATION, showing the control panel, damper motors and steam valve in center background . . . The controllers for return air and dew point are locked inside of the panel to prevent tampering. Switches for energizing the control system and rheostat for positioning the fresh air damper are located on front of the panel.

■

THE many applications and exacting requirements of air conditioning demand perfect control. Without adequate control, the effectiveness and efficiency of any air conditioning system is seriously impaired . . . There is a Minneapolis-Honeywell Control System for every air conditioning or cooling need in which each individual control is designed to accomplish its particular function with characteristic Minneapolis-Honeywell accuracy and efficiency . . . For complete satisfaction in meeting any desired air condition requirement, recommend and install Minneapolis-Honeywell Controls. They are backed by 49 years of experience and engineering research . . . The Minneapolis-Honeywell Engineer in or near your city is available for consultation with your engineer at all times, without obligation . . . Minneapolis-Honeywell Regulator Company, 2738 Fourth Avenue South, Minneapolis, Minn. Branch or distributing offices in all principal cities.

MINNEAPOLIS-HONEYWELL

Control Systems

Important Improvements in Air Conditioning . . . .

. . OF VITAL CONCERN TO EVERY ARCHITECT

CLARAGE Vortex Control and Clarage Constant Velocity Registers are two new and outstanding developments in air conditioning.

They make possible decidedly improved results and marked economies in both first and operating costs.

Vortex Control, with its applications to systems protected by patent coverage, is a means of obtaining a variable capacity air conditioning system of the most efficient type and with least expense.

Constant Velocity Registers, with patents applied for, discharge the conditioned air at constant velocity regardless of volume changes. In other words, even though the system is operating as low as one-third capacity, these registers emit conditioned air at the same effective velocity as when the system is operating 100%.

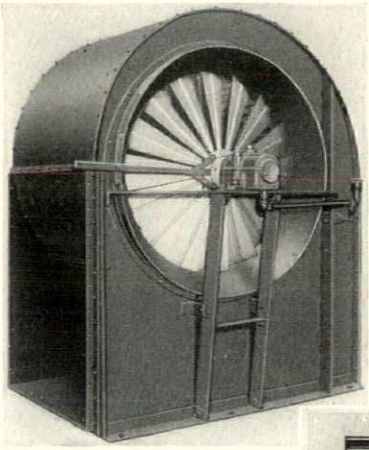
By combining these two new improvements, we offer the CLARAGE VARIABLE CAPACITY, CONSTANT VELOCITY SYSTEM.

The NEW CLARAGE VARIABLE CAPACITY, CONSTANT VELOCITY SYSTEM . . .

The operation of this system, under complete automatic control, fluctuates exactly in accordance with the demands placed upon it. ONLY the volume of conditioned air required by the sensible heat load existing at any given time is delivered. Any desired heating and humidifying effect can be accurately maintained in winter; any cooling and dehumidifying effect in summer.

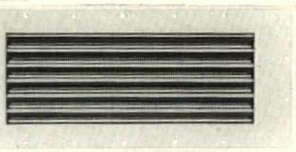
The system is ideal for conditioning factory departments or entire plants, offices, theatres, schools, stores, auditoriums, hospitals, etc. It gives every economy of the older types of variable volume systems plus one more: fan operating economy produced by Vortex Control.

Every architect should have technical details on these Clarage improvements. THEY ARE IMPORTANT! Use the Coupon below!



VORTEX CONTROL

gives any desirable fan capacity regulation, the fan operating at constant speed from a constant speed driver. It has an efficiency equal to and often higher than variable speed control, and it costs only a fraction as much. It is incorporated into the fan inlet as shown above—simple and trouble-free. It is automatically operated by a simple control system.



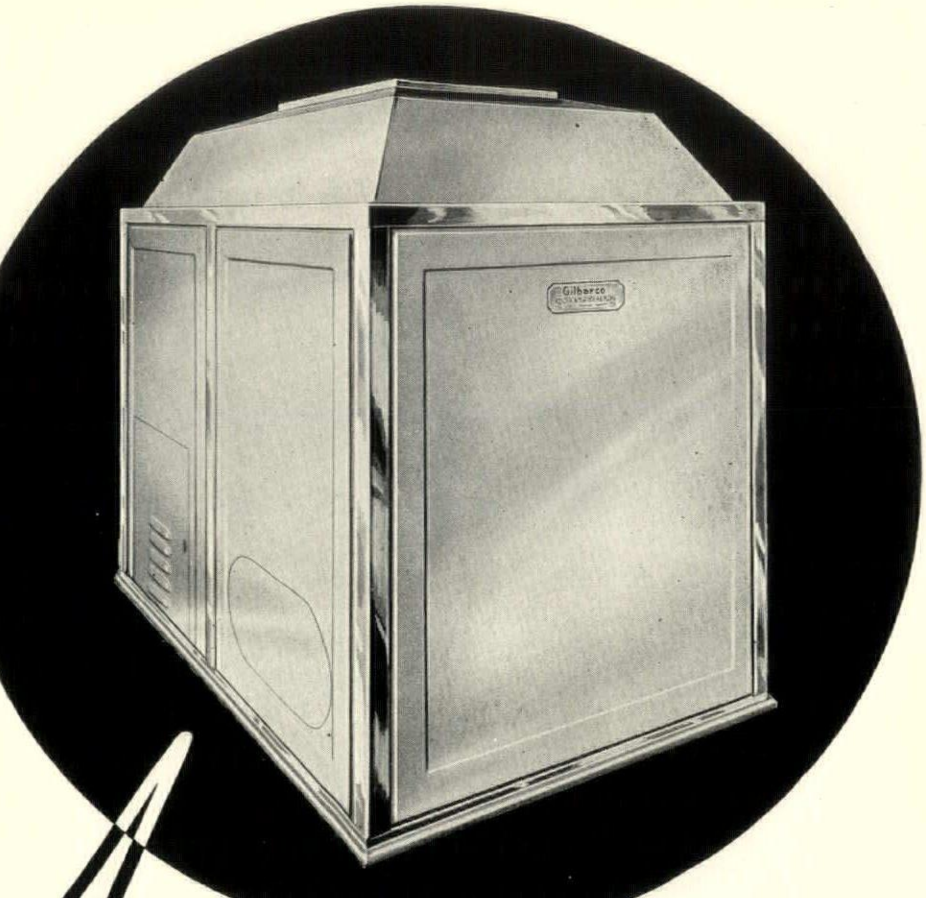
CONSTANT VELOCITY REGISTERS

maintain a velocity sufficiently high to insure rapid, uniform diffusion of conditioned air throughout the space serviced. Air noises? No, the registers are designed to discharge very quietly.

WIDE EXPERIENCE: For more than two decades Clarage has been a leading producer of air handling and conditioning equipment—a pioneer. Clarage installations are many and successful—wide experience in air conditioning work.

CLARAGE FAN COMPANY
Kalamazoo, Michigan
Without obligation, send me full details on Clarage Variable Capacity, Constant Velocity Air Conditioning System.
Name ....
Address ....

CLARAGE
Air Handling and Conditioning Equipment



Announcing

THE *new* GILBARCO

AUTOMATIC CONDITIONED-WARM-AIR UNIT

Nothing like it ever before offered for the small home! For old residences or new—you can specify the "Gilbarco" Conditioned-Warm-Air Unit with the positive knowledge that it does the heating job better—that it will provide faithful service year after year.

Along with complete automatic oil heating, this new "Gilbarco" Unit offers: (1) filtered air; (2) humidified air; (3) positive circulation of air replacing old style gravity circulation; (4) construction features far ahead of present day heating practice. You will appreciate its compactness—you will approve of its styling—you know its efficiency is assured by Gilbert & Barker design and engineering.

Send today for descriptive literature on this outstanding new "Gilbarco" development in automatic conditioned-warm-air heating.

Gilbarco
FLEXIBLE FLAME
OIL HEATING—AIR CONDITIONING

YOUR COPY IS WAITING

Our new Architects and Engineers Manual contains 24 pages of the most helpful oil heating information ever presented to American architects. A copy is yours for the asking.

GILBERT & BARKER MFG. COMPANY
Springfield *Established 1865* Mass.

●

SEND THE COUPON TODAY! NO OBLIGATION.

GILBERT & BARKER MFG. CO., Springfield, Mass. AA-7-34
Please send me a copy of the literature checked below:
☐ Architects & Engineers Manual ☐ "Gilbarco" Conditioned-Warm-Air Unit
Name..
Street..
City..............................State..................

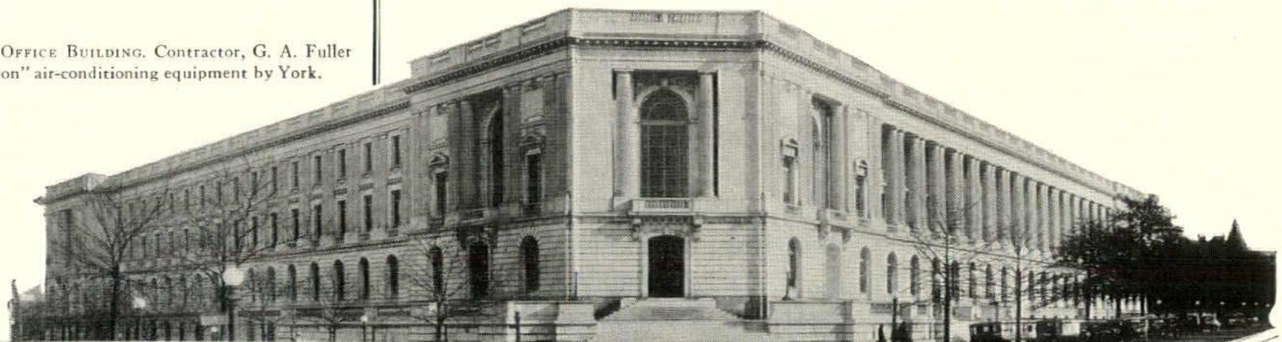
"FREON"

provides cooling comfort in the nation's capital

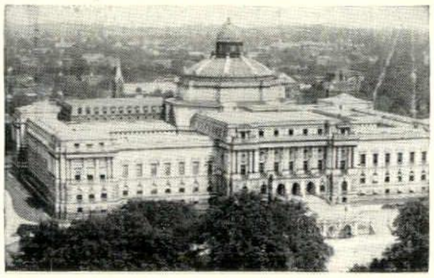
Post Office Building. Contractor, Mehring and Hansen. "Freon" air-conditioning equipment by York.

☆ ☆ ☆

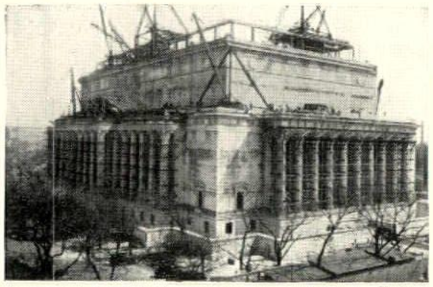
Senate Office Building. Contractor, G. A. Fuller Co "Freon" air-conditioning equipment by York.



Department of Justice Building. "Freon" air-conditioning equipment by York and Cooling and Air-Conditioning Corporation.



Library of Congress. Contractor, Cooling and Air-Conditioning Corporation. "Freon" refrigerating equipment by York.



Archives Building. Contractor, George A. Fuller Co. "Freon" air-conditioning equipment by York.

This safe refrigerant is used for air-conditioning in the newest government buildings

When its new government buildings are completed, Washington, D. C., will be the most beautiful capital in the world.

These new buildings represent the finest in architectural design and structure, in modern equipment and conveniences. Naturally, they are air-conditioned. Air-conditioning provides pleasant, cool atmospheric conditions all year round, increases efficiency of government employees, and safeguards their health.

"Freon" is the refrigerant used. In fact, more than 5,000 tons of refrigeration effect will be created by means of "Freon" in the five buildings shown on this page. One of the buildings—The Department of Justice—is the largest air-conditioned building in the world.

"Freon" is non-toxic, non-flammable, odorless—affording maximum safety and comfort to employees.

These outstanding qualities of "Freon" make it the preferred refrigerant for household refrigerators, for air-conditioning in theatres, apartments, hotels, trains—and for air-conditioning and refrigeration in fur storage vaults, florists' shops, meat markets, libraries and museums. In fact, you can recommend "Freon" wherever safety of life and goods is all-important.

FREON

REG. U. S. PAT. OFF.

a safe refrigerant

KINETIC

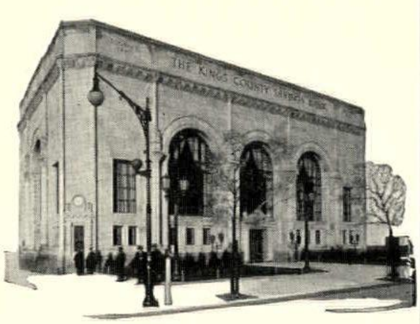
REG. U. S. PAT. OFF.

KINETIC CHEMICALS, INC., TENTH & MARKET STREETS, WILMINGTON, DELAWARE

Do you approve of "STOCK PLAN" HEATING PLANTS?

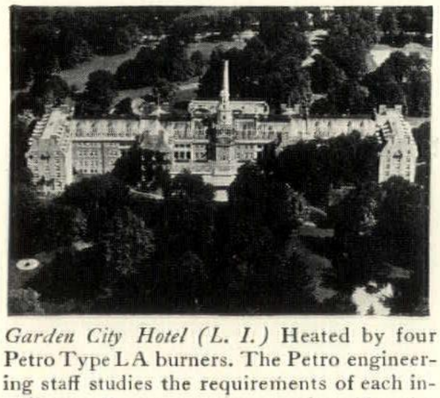
New York Hospital (Cornell Medical Center) Giant Petro Model M burners assure unfailing warmth to staff and patients.

Architects: Coolidge, Shepley, Bulfinch and Abbot, Boston



King's County Bank Wherever a business enterprise is dependent on the patronage of the public, Petro's model D2 burners' unfailing performance proves their worth.

Architects: Halsey, McCormack & Helmer, Inc., N. Y. C.



Garden City Hotel (L. I.) Heated by four Petro Type LA burners. The Petro engineering staff studies the requirements of each installation. Having no *one* type of 'stock' equipment, its recommendations are unbiased, sincere, and professional.

Architects: Ford, Butler & Oliver, New York City

CONSIDER THE FACTS THAT BOTH ARCHITECT AND HEATING ENGINEERS OUGHT TO FACE . . .

THE individually planned building . . . whether a 4-room gardener's cottage or a towering skyscraper . . . deserves an individually planned heating system. That's why Petro-&-Nokol automatic oil burning equipment deserves your special consideration. You are not restricted by the handicaps of a half dozen "ready-cut" models that differ *only* in capacity.

Examine the buildings on this page. You realize, at once, that no one *type* of oil burning equipment can possibly fit them all. Yet these structures are all heated by Petro-&-Nokol.

For *domestic* jobs alone, Petro-&-Nokol provides a range of radically different burners, because 29 years of oil burner building experience taught the thorough Petro-&-Nokol organization that variations in boilers and furnaces for house heating could never be satisfactorily fired by one simple burner in a mere range of sizes.

Petro-&-Nokol offers a complete line of over 66 models in *domestic* burners. And is recognized as the leading builder of heavy duty *industrial* and *commercial* burner equipment for hotels, apartments, stores, factories, office buildings, hospitals and institutions. Such installations, needless to say, demand sound engineering and demonstrated efficiency and economy.

Write for complete and comprehensive data.

PETRO -&- NOKOL

Domestic—Commercial—Industrial Oil Burners
Mfd. by PETROLEUM HEAT & POWER COMPANY
Stamford, Conn.

Oldest and Largest Organization exclusively devoted to Oil Heating

Riverside Memorial Church. The world's largest parish church. Heated by Petro fuel oil, burned in Petro model LA industrial burners.

Architect: Henry C. Pelton, New York City

Tudor Hall Apartment In these days of high vacancies apartment owners cannot risk any heating plant failures. Where two Petro Model LA automatic oil burners are on the job, there is no such risk.

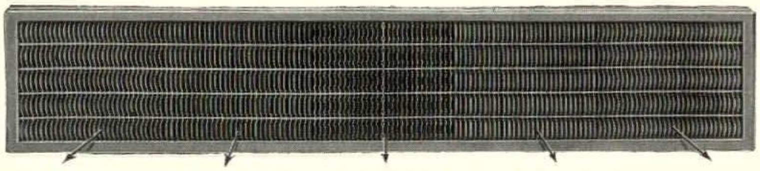
Architects: Springsteen and Goldhammer, New York City

Westchester County Center The problem of heating large auditoriums presents a special set of conditions, ideally met by Petro Model LA equipment.

Architects: Walker & Gillette, New York City

An Expression of Appreciation

To the Architects and Engineers of the United States and Foreign Countries, who, through their Research, Approval and use of Uni-Flo Products, have been responsible for our unprecedented success

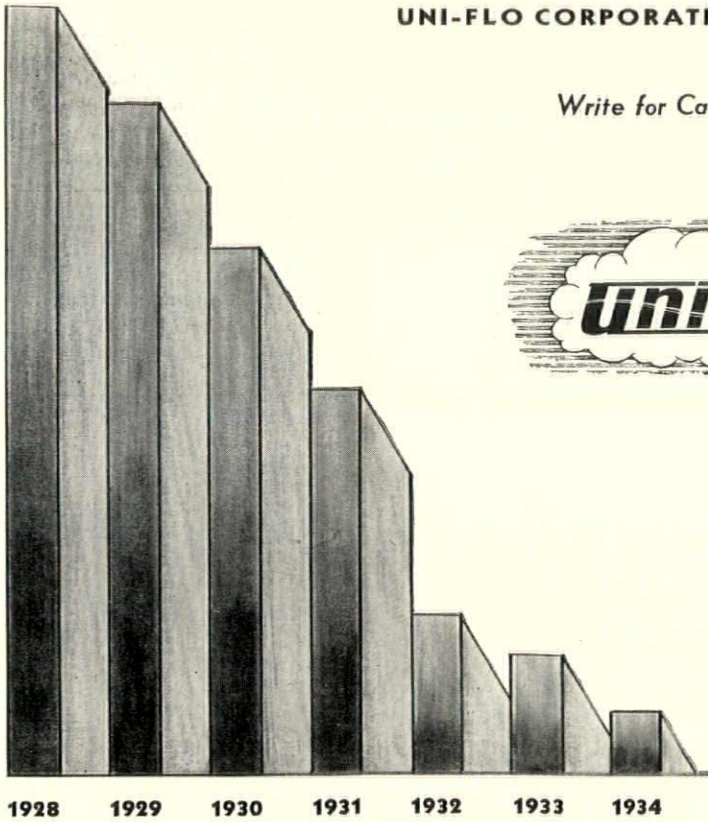


Uni-Flo 5-Way Directional Air Flow Outlet

AIR DISTRIBUTION ENGINEERS
and MANUFACTURERS
SPECIALIZING IN PRE-DETERMINED
AIR DISTRIBUTION OUTLETS

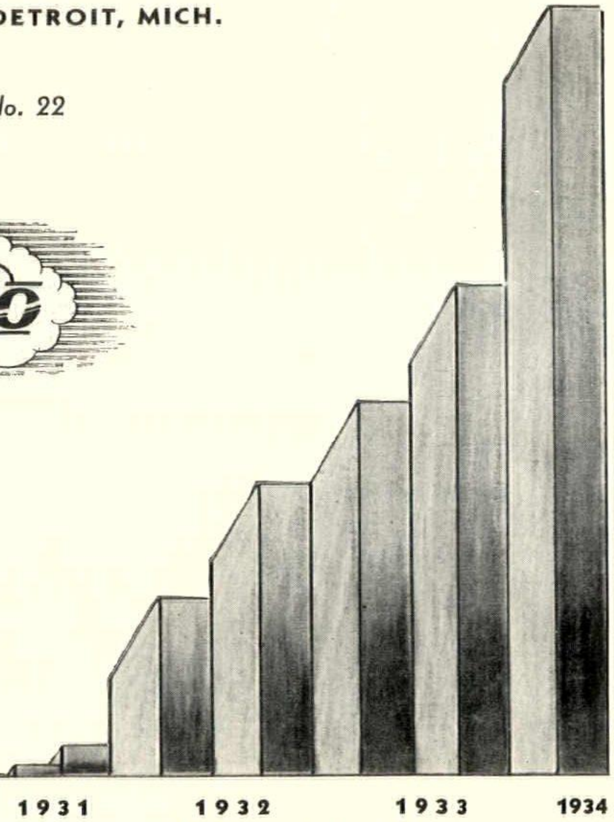
UNI-FLO CORPORATION, DETROIT, MICH.

Write for Catalog No. 22



DOWN *During the Depression*

COMPARATIVE CONSTRUCTION VOLUME CHART
TO JULY 1st, 1934 — BY YEARS

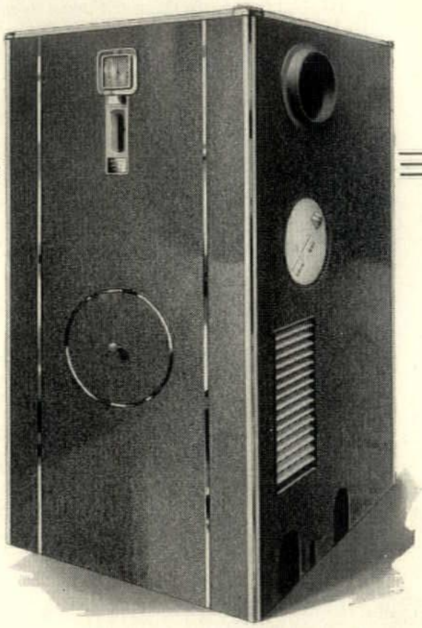


UP *During the Depression*

COMPARATIVE UNI-FLO VOLUME CHART
TO JULY 1st, 1934 — BY 6 MONTH PERIODS

Burnham builds a *New* Oil Burning Boiler

Having Many Outstanding Features



YOU can use in its built-in design, practically any of the standard makes of oil burners. You no longer have to take a boiler you don't care particularly for, to get a burner you do.

Service Advantage

Furthermore, there's the distinct advantage with a Burnham of being able to use a certain burner, that is well serviced in one section where others are not.

You have the Burnham Boiler you want, and a local-sold and serviced burner that insures best results.

Economy Claims

Of course, every maker of boilers claim their's has outstanding economy features possessed by no others. We are no exception. The only possible difference may be, that we can come pretty close to backing up our claims with proofs.

Provisions for Safety Devices

In addition to which, it has provisions for various safety devices and automatic controls.

Practically Noiseless

And we discovered a way to almost completely hush noisy burners, and make quiet ones still quieter.

Appearance

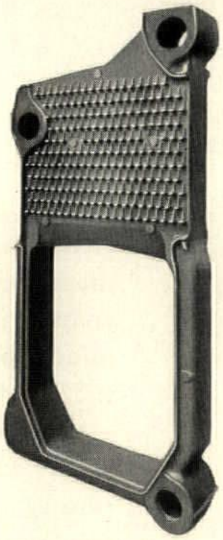
It has a good-looking sound and heat insulated jacket—in fact it is rather elegant in its restrained colors.

To which we might add that for over half a century Burnham has been making cast iron boilers and for 20 years steel ones as well.

Burnham Boiler Corporation

Irvington, New York

Representatives in All Principal Cities of the United States and Canada



Here is an intermediate section showing the row above row of the heat combs. Don't fail to note that the entire fire box—**bottom and all**—is water surrounded.

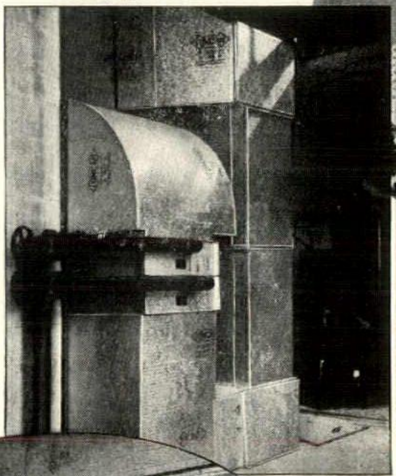
We are able to reduce the temperature of flue gases 1600° in 19″ of vertical travel by this scientific arrangement of comblike heating surfaces.

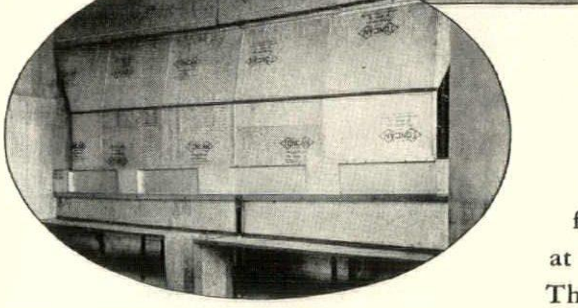
AN ARCHITECTURAL MASTERPIECE AND A METALLURGICAL TRIUMPH

JOIN HANDS

CATHEDRAL of ST. JOHN the DIVINE
NEW YORK CITY

Architects: Cram & Ferguson, Boston, Mass. General Contractor: Jacob & Youngs, Inc., New York City, succeeded by Edward Bell. Heating Contractor: Buerkel & Co., Inc., Boston, Mass. Sub-Contractor: Hermann & Grace Co., Brooklyn, N. Y.





HIDDEN behind the stately walls of the Cathedral of St. John the Divine, New York City, lie many tons of Toncan Iron Sheets forming the indirect heating ducts.

For such service, in large structures and small, Toncan Iron is unsurpassed. Specification writers, delving into the records of Toncan Iron performance, know this to be a fact. Building owners, figuring cost against years of service, quickly arrive at the same conclusion.

The reason is easy to find. Toncan Iron is not an ordinary metal, but the direct result of experienced alloying practice. It is an alloy of refined iron, copper and molybdenum—carefully processed in the open hearth furnace—subjected to special ingot practice—and rolled to shape with far more than usual care and inspection with just one thought in mind—to make it more resistant to rust than any other ferrous material except the stainless alloys.

That's why users willingly pay a premium for Toncan Iron and wisely consider it money well spent—because experience has proved that its longer life and the lessened repair and replacement expense that always follow its use make for real economy in building operation.

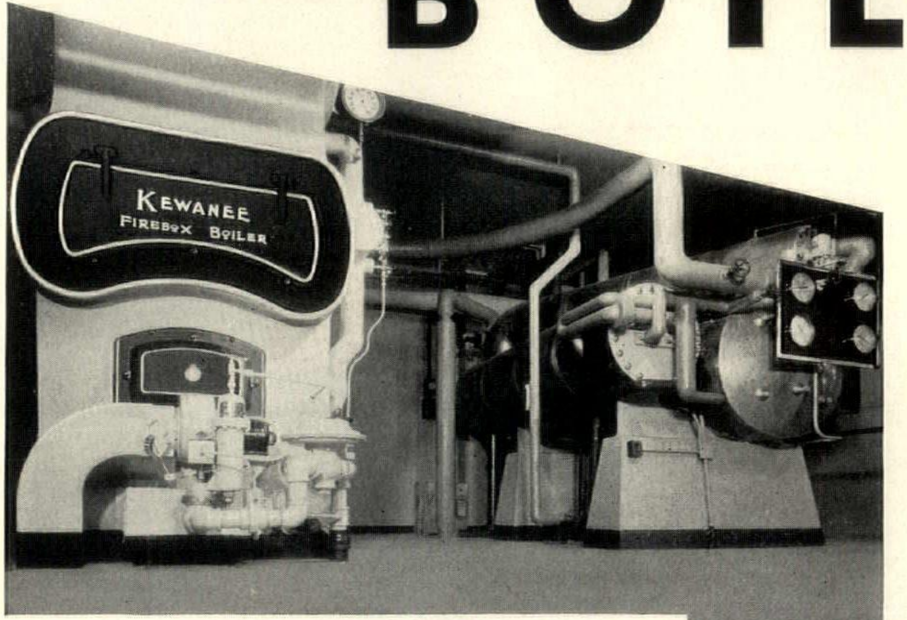
A copy of "The Path to Permanence" will bring you more complete information.

REG. U.S. PAT. OFF.
TONCAN
COPPER
MO·LYB·DEN·UM
IRON

REPUBLIC STEEL CORPORATION

GENERAL OFFICES R YOUNGSTOWN, OHIO

AIR CONDITIONING with
KEWANEE
BOILERS



The "heart" of every Air Conditioning System must be a good Boiler. The two air conditions contributing to our comfort in the greatest degree are Temperature and Humidity. The boiler is required—

To RAISE the temperature for heating and humidification.

To LOWER the temperature in cooling and dehumidification (as in the steam jet cooling equipment illustrated at the left).

So the boiler is the "Heart" of the system upon which efficient air conditioning service depends.

Kewanee Steel Boiler generating steam for steam jet air conditioning apparatus.

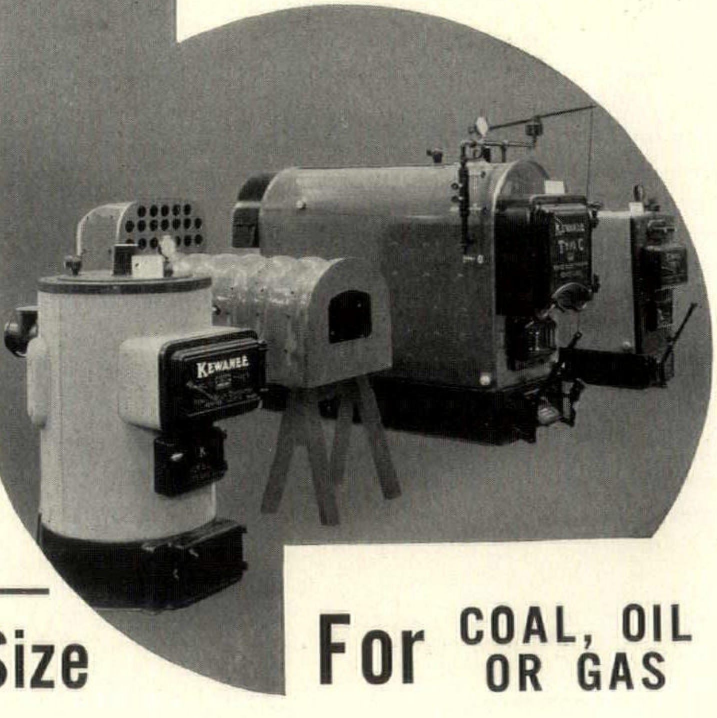
This is a gas burning boiler, specially insulated, generating high pressure steam in the same room which is being cooled.

There is a Kewanee the right size and type to insure trouble-free operation and complete satisfaction with the right kind of Air Conditioning System.

**KEWANEE
BOILER CORPORATION**

KEWANEE, ILLINOIS

BRANCHES IN SIXTY-ONE PRINCIPAL CITIES

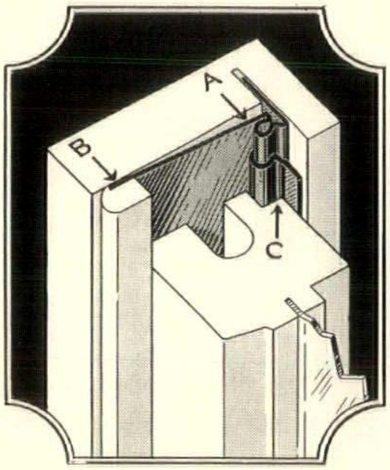


For Buildings of Every Size

For COAL, OIL OR GAS

There is No Need to GUESS about Infiltration Losses when you specify

MONARCH METAL WEATHERSTRIP



MONARCH 5 FEATURE
METAL WEATHERSTRIP

Maximum Certified Air Leakages take guesswork out of Heating, Cooling and Air Conditioning Calculations.

GUESSING at air infiltration means guessing at the size of heating, cooling and air conditioning equipment and guessing at results. The use of average values in calculations is inadequate. They class the worst with the best; they are poor substitutes for facts.

There is no guessing about air infiltration when you specify Monarch Metal Weatherstrip. For the performance of Monarch Metal Weatherstrip is accurately tested and published as *Maximum Certified Air Leakage.*

In the table at the right are Maximum Certified Air Leakage values for leading types of Monarch Metal Weatherstrips. These values may be relied upon in your calculations if you specify Monarch equipment. Do not use them for other makes of weatherstrip for Monarch performance is not matched by competitive equipment.

The amount of infiltration depends not only on wind pressure but upon the duration of that pressure. All records of average wind velocity necessarily include maximum winds of very short duration. Wind travel in miles per month or season is the most accurate gauge of infiltration. Monarch representatives will gladly give you local data on "Air Movement" and "Degree Miles." Used with the Maximum Certified Leakage of Monarch Metal Weatherstrip in cubic feet per foot of crack per mile of wind velocity these figures will show exactly what infiltration losses will occur. The fuel savings directly due to the use of Monarch products can also be found accurately.

Every inch of Monarch Metal Weatherstrip is installed by factory-trained representatives who spend at least one year gaining experience in this work under expert supervision. There is only one authorized representative in each territory; hence there is no divided responsibility. When you specify Monarch, you are assured of Certified performance.

MONARCH *versus* Plain Window

Wind Velocity Miles per Hour	Infiltration		% Infiltration Stopped by Monarch No. 400
	Plain Window C.F.H.	Monarch No. 400 C.F.H.	
5	30.9	2.43	92.14%
10	78.5	4.86	93.81%
15	124.5	7.29	94.15%
20	171.6	9.72	94.34%
25	220.3	12.15	94.48%
30	274.1	14.58	94.68%

Performance of Typical MONARCH Metal Weatherstrips

in cubic feet of air leakage per hour, per foot of crack, per mile wind velocity.

Monarch Type Number	For Application to	Type	Maximum Certified Leakage c.f.h. per foot crack mile wind
400	Double Hung Wood Sash	Interlocked	0.486
600	Inswinging Wood Casement	Spring Bronze	.690
800	Wood Doors	Spring Bronze	.655
806	Wood Doors	Spring Bronze	.655
5200	Metal Casements (Solid sects.)	Special Spring Bronze	.954

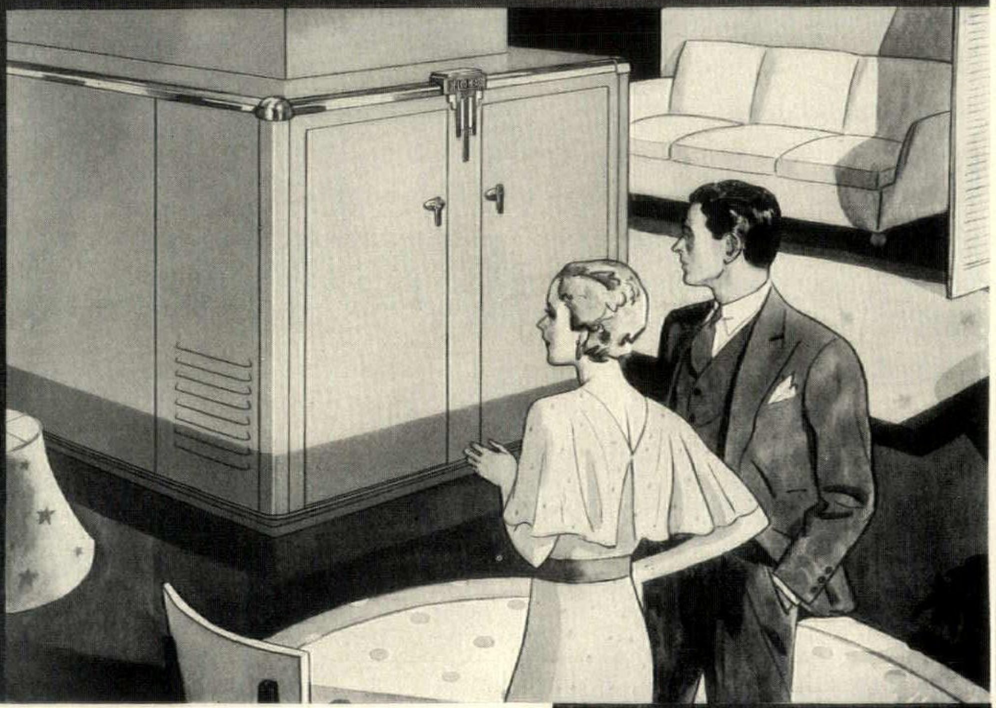
For test data by recognized authorities, local wind movement data, engineering services or name of nearest representative, write to

MONARCH METAL WEATHERSTRIP COMPANY

6333 ETZEL AVENUE, ST. LOUIS, MO.

NOW COMES *Air-Conditioned Heat*

FOR FALL, WINTER AND SPRING



DELCO-HEAT CONDITIONAIR

A PRODUCT OF GENERAL MOTORS

Today's biggest news is air conditioning. Everyone is conscious of it—everyone is enthusiastic about it—and everyone wants it.

And now comes the newest advancement in air conditioning . . . Delco-Heat Conditionair, a product of General Motors.

This new engineering achievement truly signalizes a new era in modern home comfort. It provides fresh, air-conditioned heat during the eight to nine heating months every year when air conditioning is needed most. It purifies the air—removes bacteria and dust; humidifies the air to just the right amount of moisture; automatically heats the air; circulates healthful, even temperatures to every room—with a complete change of air every 10 to 15 minutes.

Equally important, Delco-Heat Conditionair, with all its new-day air conditioning features, actually costs less to operate. Unit construction and the utilization of the famous Delco-Heat method of burning oil, are the reasons.

For new home construction or the modernization of old homes, Delco-Heat Conditionair is ideal. The complete unit is enclosed in one beautiful, compact cabinet—and it will go into any low ceiling basement without tearing down doors and partitions.

Let us send you complete details and specifications. The coupon below will bring you our new brochure and architect's file.

DELCO-HEAT CONDITIONAIR DOES THESE THINGS

1. Purifies the air.
2. Humidifies the air.
3. Heats the air automatically.
4. *Circulates* the air, and provides a *complete change* every 10 to 15 minutes.
5. Provides clean, healthful, *conditioned* heat all fall, winter and spring—and during the summer removes pollen, provides complete circulation of freshened, purified air.

Delco-Heat Conditionair

A PRODUCT OF GENERAL MOTORS

DELCO APPLIANCE CORPORATION,
Subsidiary of General Motors,
Dept. 11-N, Rochester, N. Y.
Please send me brochure and architect's file on the new Delco-Heat Conditionair.

Name....................................

Address....................................

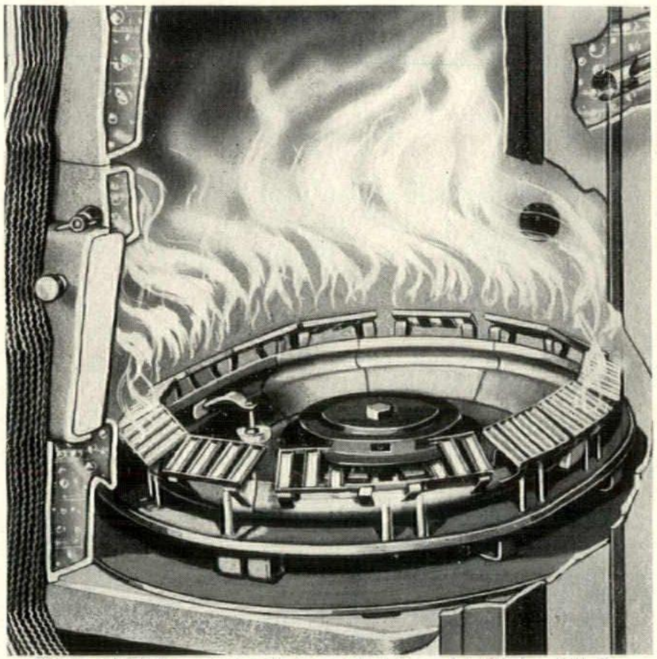
City......................*State*............

OTHER DELCO-HEAT PRODUCTS—*Harmonized Delco-Heat Boiler (steam, vapor, hot water) . . . Simplified Delco-Heat Oil Burner . . for domestic and commercial applications.*

TIMKEN *Silent Automatic* Heating

Provides a Complete Home Service

● Here is the one complete line of automatic heating equipment for the modern home. It includes the wall-flame conversion oil burner; pressure type oil burner; oilboiler, with built-in water heater; air conditioning oilfurnace, gravity oilfurnace and an automatic hot water heater that produces ample hot water at an exceptionally low cost. Nothing is so important, in designing and installing oil heating equipment as experience. Back of every Timken Silent Automatic installation are nine years' experience, with more than 100,000 American homes. To assure trouble-free automatic oil heating at its lowest cost, specify Timken Silent Automatic. The Timken Silent Automatic Company, 100-400 Clark Ave., Detroit, Mich.



The famed Timken rotary wall-flame principle used in Timken Oilboiler, Oilfurnace and Water Heater is the result of nine years' experience in over 100,000 American homes.

TIMKEN OILBOILER	CAPACITY (Total Connected Load)		Max. Oil Rate	Grade of Oil	Height of Water Line	Flue Size	Chimney Height Feet	Square Feet of Heating Surface
	Steam	Water						
A-8	600	960	11.0 lbs. 1 hr.	2	50⅛″	8″ x 8″	30	42.9
TA-125R	915	1460	13.8 lbs. 1 hr.	2	49¼″	8″ x 8″	30	54.7
TA-126R	1120	1790	16.9 lbs. 1 hr.	2	49¼″	8″ x 12″	30	67.1
TA-127R	1325	2120	20.0 lbs. 1 hr.	2	49¼″	8″ x 12″	35	79.5

	Capacity (Sq. Ft. E. D. Radiation)		Max. Oil Rate	Grade of Oil	Ignition	Oil Delivery	Power Requirement (Watts)	Refractory
	Steam	Water						
Model C Burner Wall Flame	2600	4200	50 lbs. 1 hr	2	Electric	Gravity	85	Chrome Steel
Model BM Burner Wall Flame	6500	10000	120 lbs. 1 hr.	3	Electric or Gas	Gravity	125	Multi-surface Tile
Model GA Burner Pressure Atomizing	1000	1600	22 lbs. 1 hr.	3	Electric	Pump	170	Fire Brick

TIMKEN AIR-CONDITIONING OILFURNACE	B. T. U. Capacity at Registers	Max. Oil Rate Lbs. Per Hour	Grade of Oil	Normal Air Delivery	Flue Size	Chimney Height	Number of Filter Units
TAF-231	100,000	8.5	2	1310 C. F. M.	8″	30′	4
TAF-232	125,000	10.6	2	1640 C. F. M.	8″	30′	4
TAF-271	150,000	12.7	2	1970 C. F. M.	9″	35′	5
TAF-272	175,000	14.8	2	2300 C. F. M.	9″	35′	5

TIMKEN OILFURNACE (GRAVITY)	B. T. U. Capacity at Registers	Max. Oil Rate	Grade of Oil	Normal Air Delivery	Flue Size	Chimney Height
TAG-23	100,000	9.2 lbs. 1 hr.	2	730 C. F. M.	8″	30′
TAG-27	130,000	14.8 lbs. 1 hr.	2	950 C. F. M.	9″	35′

Oilboilers: sectional cast iron boilers of special design. Oilfurnace: steel furnace with hot riveted and cold caulked seams, gas-tight. Furniture steel cabinet of two tone green enclosing all instruments and controls used on boiler and furnace units.

TIMKEN *Silent Automatic* OIL HEATING

Branches and dealers in principal cities. Ask for complete information and prices.

PERSONALS

• M. W. Kleinman of New York University, a pupil of Lloyd Morgan, was the winner of the National Competition for the 27th Paris Prize of the Society of Beaux-Arts Architects, awarded at a meeting of the Prize Committee on June 20th. The subject of the Competition was the design of an international athletic center and under the terms of the award Mr. Kleinman will spend 2½ years for study in Paris and for travel abroad on a stipend of $3,600. R. Ayers of Yale University and a pupil of Frederic C. Hirons was placed second. The Jury of Award was headed by Joseph H. Freedlander.

• Ralph T. Walker of Voorhees, Gmelin & Walker, architects, has been reelected President of the New York Chapter of the American Institute of Architects for the year 1934-35. Eric Kebbon was returned as Secretary, and Daniel P. Higgins continues as Treasurer of the organization.

• Joseph W. Radotinsky, formerly State Architect of Kansas, has resigned his position as State Architect and will devote his time to private practice at 702 Commercial National Bank Building, Kansas City. Manufacturers catalogs are requested.

• Childs & Smith have moved their offices to 430 North Michigan Avenue, Chicago.

• Benjamin H. Marshall and John A. Holabird, Chicago architects and Harvey W. Corbett and Ralph Walker of New York City have been chosen as the architectural members of a Jury for a bar competition being sponsored by the Brunswick-Balke-Collender Co.

• James F. Bly, Matthew W. del Gaudio, Arthur C. Holden, Harold Shreve and William Lescaze have been appointed as professional advisors to the New York Municipal Housing Authority.

• The Perkins and Boring Fellowship, student honor in the School of Architecture of Columbia University, has been awarded for 1934 to Paul B. Schechter of Jersey City, N. J. The Fellowship carries an award of $1,800 and Mr. Schechter will spend the next year abroad. The second honors were awarded to Herman M. Cohn of New York.

• Clifford O. Boyce announces formation of a new architectural office under the name of Clifford O. Boyce and Associates, Architects and Engineers, with offices at 561 Reading Road, Cincinnati. Mr. Boyce formerly practiced independently with offices in the Chamber of Commerce Building, Cincinnati. Manufacturers' samples and catalogs are desired.

• The Edward L. Ryerson Fellowship in Architecture was awarded to William H. Buderus of the University of Michigan. The Fellowship is sponsored by the Foundation for Architecture and Landscape Architecture at Lake Forest, Ill.

• The business of the firm of A. B. Chamberlain & E. J. Prondzinski is now being carried on under the name of Edmund J. Prondzinski, Architect, at 107 South 4th St., Minneapolis, Minn.

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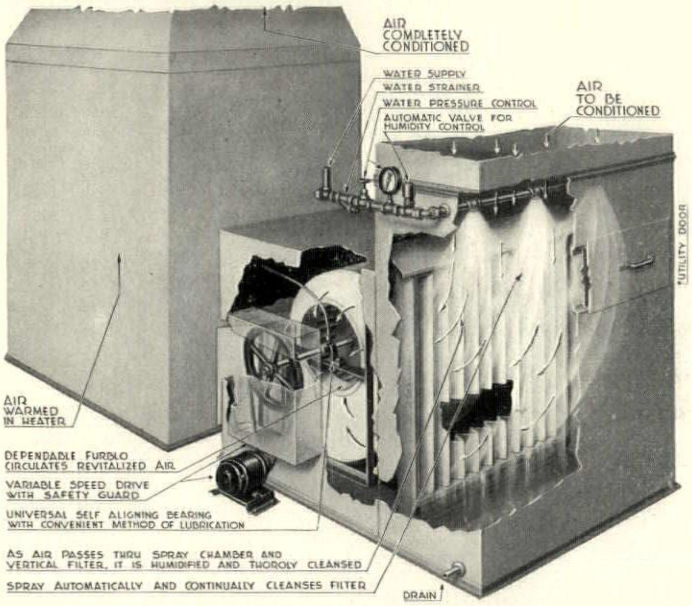
FAIRWEATHER
AIR CONDITIONER

You are specifying fool-proof operation and

PROVEN EFFICIENCY



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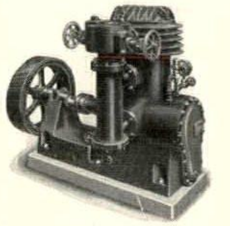

Frick Enclosed Freon Compressor Available in Sizes to Meet All Air Conditioning Installations.

Cools two dining rooms, seating 270 people, at an operating cost of ¾ cent per person per meal. The management writes, "Due to this cool and even temperature, we found that our late Spring and early Fall business increased about 25 per cent. Our Summer business increased about 50 per cent. Another agreeable surprise was the cost of operation, which ran slightly under what you estimated." A Frick plant will do as well for you. Get literature and prices now.

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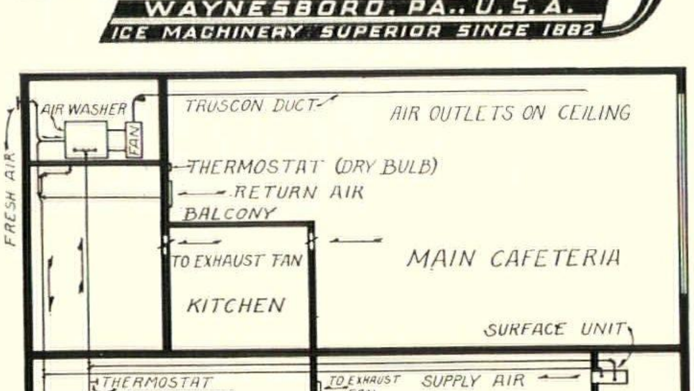


Elevation plan of Engleman's Cafeteria, showing layout of Cooling System installed by Olchoff Eng. Co., Frick Distributors at Kansas City.

- Howard Steitz announces removal of his office from 217 East Avenue to 10 Sumner Park, Rochester, New York.

- K. R. Darrah, a student at Rensselaer Polytechnic Institute, Troy, N. Y., won first prize in the Sixth Annual Bridge Design Competition held by the American Institute of Steel Construction. George Pistey, of the same school, won second prize.

- Yasuo Matsui and F. H. Dewey and Co., architects and engineers, announce the removal of their offices from 350 Fifth Avenue to 10 East 40th Street, New York.

- Carl W. Denney announces the removal of his office from 443 S. Catalina St., Los Angeles, to 2610 Hermosita Ave., Glendale, Cal.

- Samuel Z. Moskowitz announces the removal of his office from 63 Hazle Street to Meyer Building, Public Square, Wilkes-Barre, Pa. Manufacturers' catalogs and literature are desired.

- Coffin & Coffin, architects, announce the removal of their offices from 522 Fifth Avenue to 125 East 46th St., New York Ctiy.

- Dwight James Baum, New York architect, was honored last month when Chancellor Charles W. Flint of Syracuse University conferred upon him the degree of Doctor of Fine Arts.

- Edmond J. Ryan, architect, of Chateaugay, N. Y., was awarded the first prize of $100 in a Box Design Contest recently held by the Koh-I-Noor Pencil Company, Inc. The second prize winner was Louis Edwards, Detroit.

ANNOUNCEMENTS

- The Cranbrook Academy of Art at Bloomfield Hills, Michigan has issued a particularly attractive announcement book for the year 1934-35. Courses in architecture, sculpture, painting and ceramics are part of the curriculum. Eliel Saarinen is the President and Director of the Architectural Department. Inquiries regarding the school should be addressed to Richard P. Raseman, Executive Secretary.

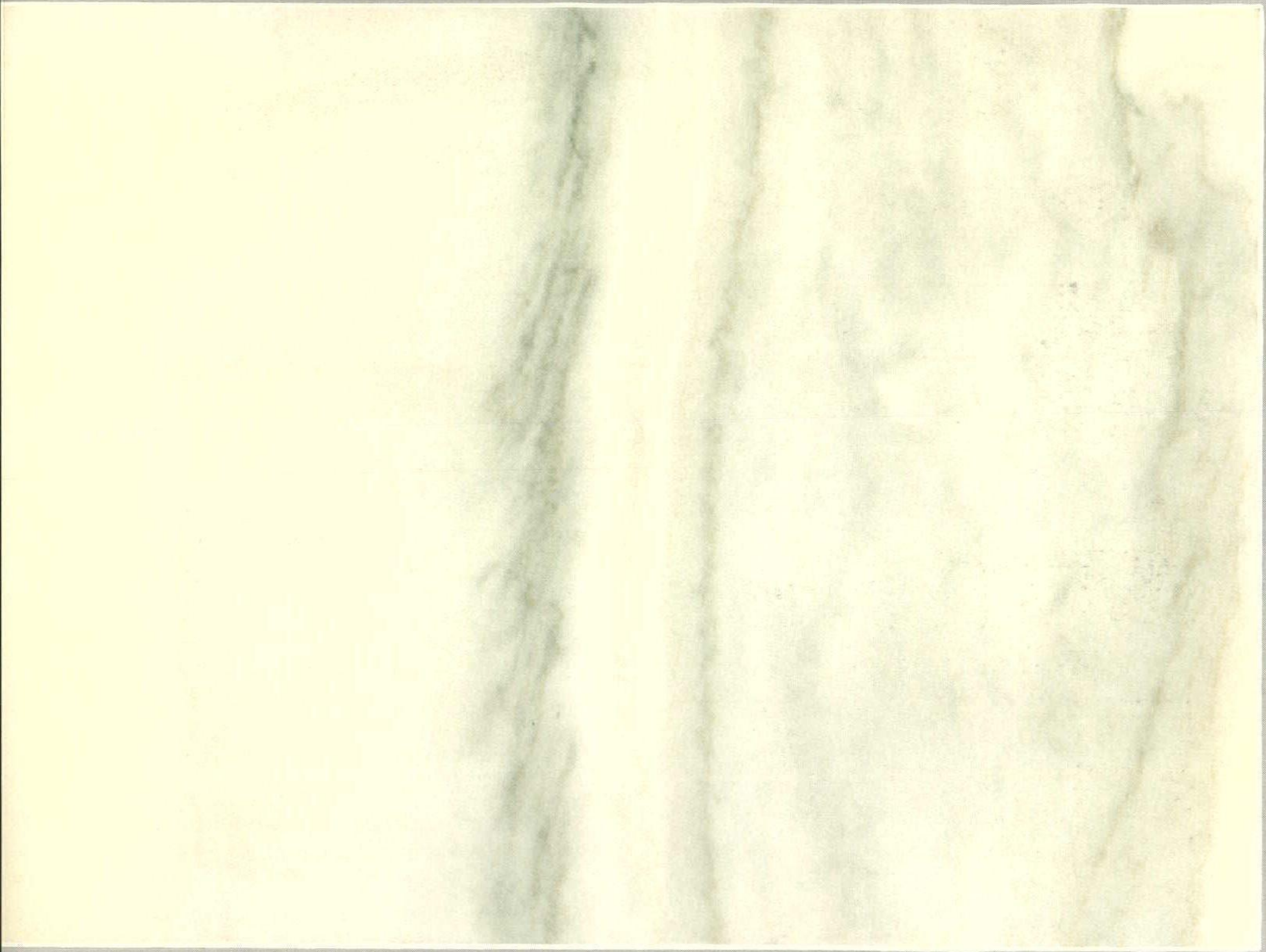
- Architects of western Massachusetts have formed an organization under the name of the Architectural Society of Western Massachusetts. Twenty architects are members of the newly formed society. House headquarters are at 22 Dwight St., Springfield, Mass. Harry M. Seabury is President and Henry J. Tessier is the Secretary-Treasurer.

- Columbia University School of Architecture will offer in the fall of 1934 a course in urbanism designed to meet the needs of architects, engineers, city planners and officials in charge of community projects. Dr. Carol Aronovici will be in charge.

- The Department of Architecture of the University of Washington is celebrating its twentieth anniversary this year. Carl F. Gould, first head of the department, will be among the speakers.

WESTLAND GREEN VEIN CREAM

Westland Green Vein Cream is taken from the Vermont Marble quarries at West Rutland, Rutland County, in the southern-central section of the state. It is one of the most delicately tinted of all Vermont Marbles, with shimmering traces of pale green, interlaced by emphatic veins of amber, running through a field of coral pink. It is adapted especially to interior use. Architects are invited to write for "Color Plates of Vermont Marble," which shows Westland Green Vein Cream and twenty-two other varieties in full color. Address: Vermont Marble Company, Proctor, Vt.



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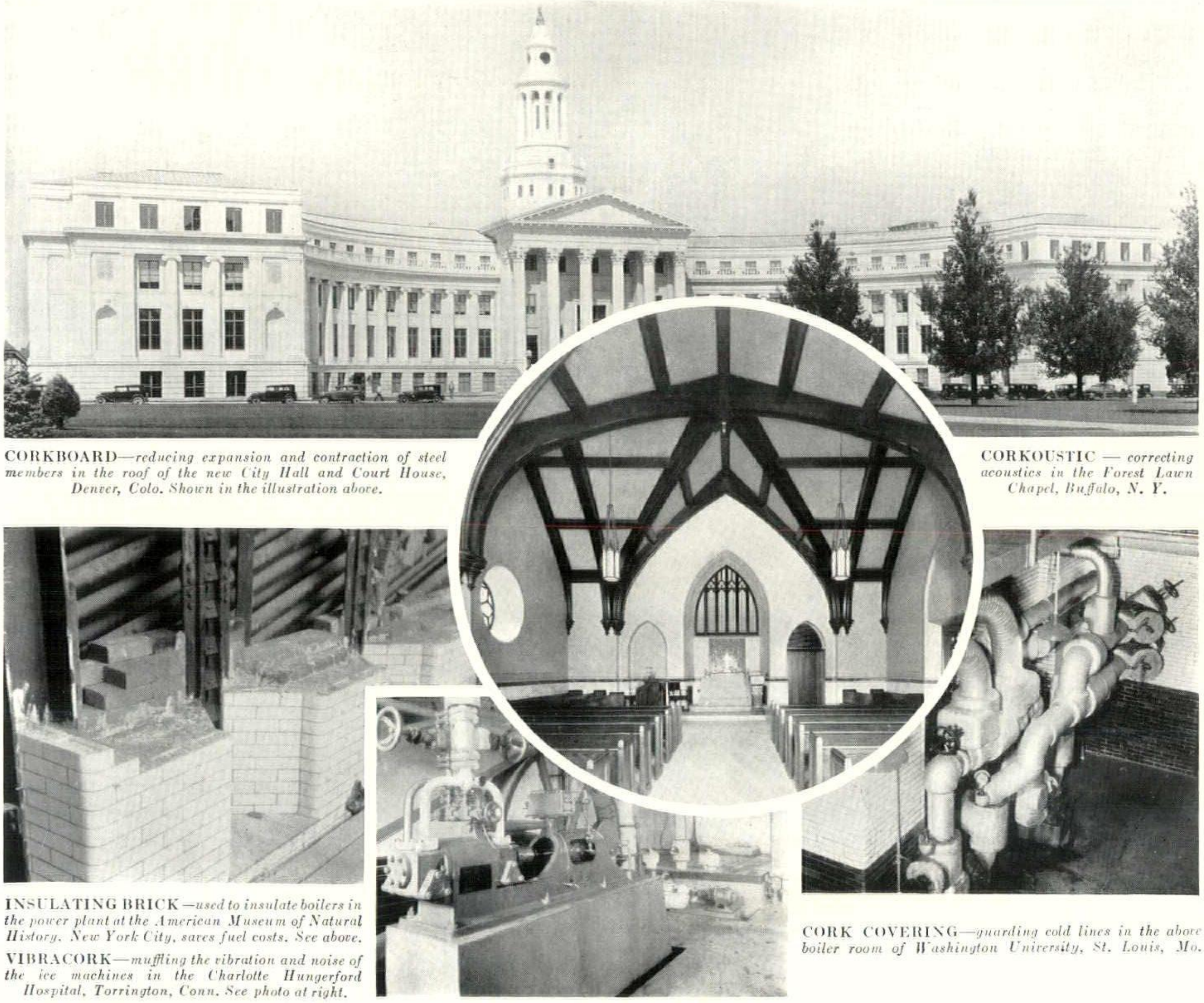

CORKBOARD—*reducing expansion and contraction of steel members in the roof of the new City Hall and Court House, Denver, Colo. Shown in the illustration above.*

CORKOUSTIC — *correcting acoustics in the Forest Lawn Chapel, Buffalo, N. Y.*

INSULATING BRICK—*used to insulate boilers in the power plant at the American Museum of Natural History, New York City, saves fuel costs. See above.*

VIBRACORK—*muffling the vibration and noise of the ice machines in the Charlotte Hungerford Hospital, Torrington, Conn. See photo at right.*

CORK COVERING—*guarding cold lines in the above boiler room of Washington University, St. Louis, Mo.*

THERE'S hardly a building in which one or more of Armstrong's Products cannot be used to advantage by architects and builders: in office and public buildings, schools, churches, institutions, residences, hotels, stores, and in many kinds of industrial buildings.

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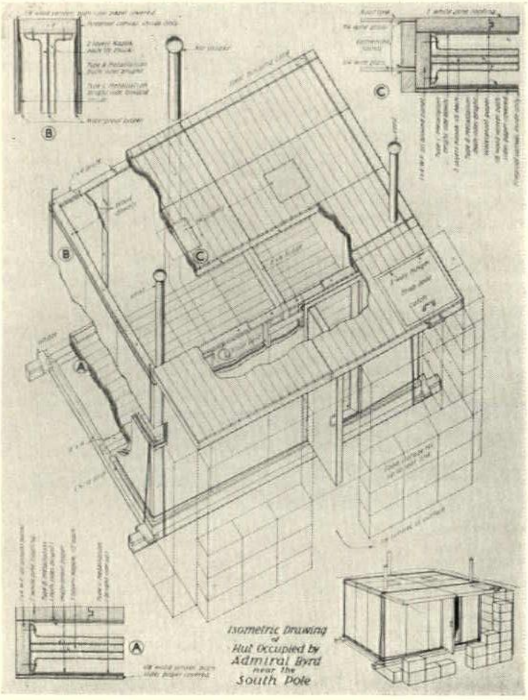
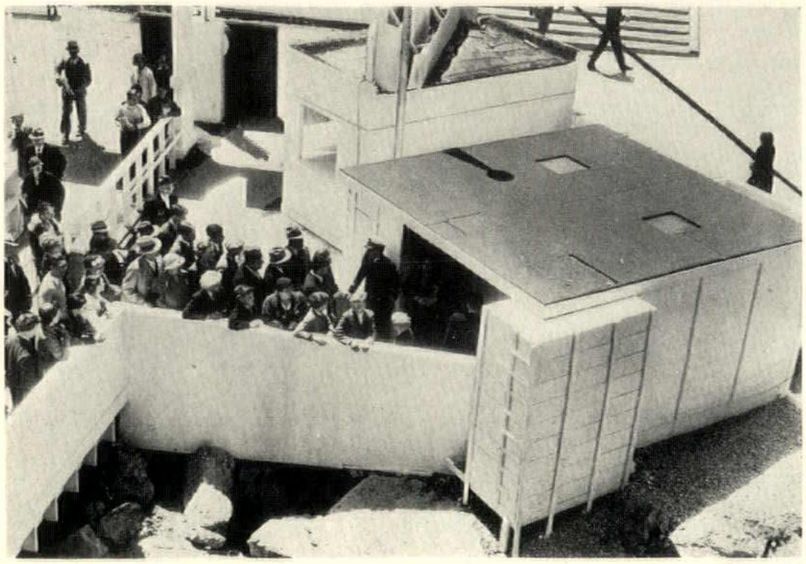


The Antarctic home of Admiral Richard E. Byrd has walls only 4¼ inches thick, but layers of building paper, kapok, plywood, canvas and bright metal insulation make them proof against outside temperatures of 100 degrees below zero. The hut, a replica of which is being shown at A Century of Progress, measures 9 by 13 feet and is constructed of white pine panels fastened together with wooden pins and wire



Trends and Topics of the Times

(*Continued from page* 41)

Secretary of the Treasury. The announcement of the Procurement Division is in line with the policy of employing private architects for public work, a procedure for which AMERICAN ARCHITECT has for many years been a strong advocate.

• Windbracing design for tall buildings is a question now under investigation by the American Institute of Steel Construction. A study of the subject will be made at Ohio State University where a series of tests have been planned at the Engineering Experiment Station.

• Dean E. R. Bossange of the New York University College of Fine Arts says, "Thanks to science the architect is liberated from many limitations and is more free to dream than ever before. He must have creative imagination and a broad viewpoint. He must be more conscious of community requirements and social conditions, of problems of transportation and circulation. But above all, he must be capable of sensing and idealizing the human need."—*From an article published in "Today."*

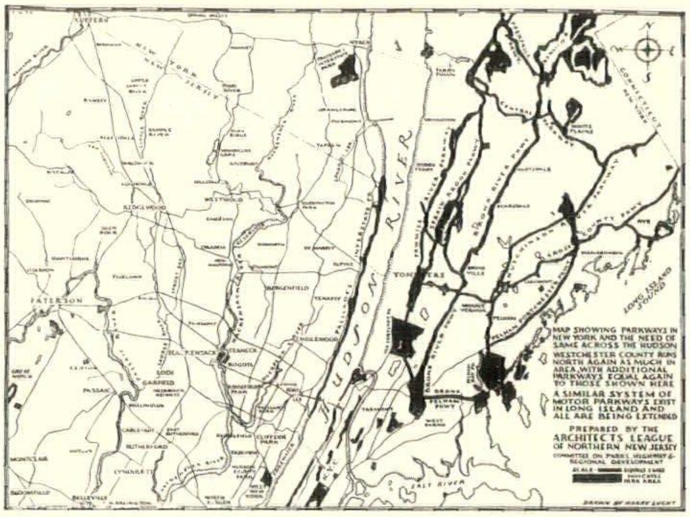
• "Winning a client or winning a girl is the same process. Talk to them both in their own language Professional pomposity will win neither a job nor a neck!"—*From "Quid Nunc," Architects' League of Northern New Jersey.*

• Traveling exhibits of small houses are part of a service sponsored by a group of Los Angeles architects in cooperation with the Architects' Building Material Exhibit. The service has proved successful in educating the public to a more comprehensive idea of the value of architectural service in the building of even a very small house.

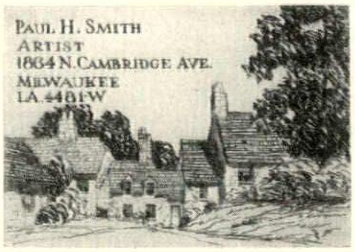
• Encouragement to architects can be found in the attitude of the Reconditioning Division of the Home Owners' Loan Corporation. Those in charge of this Division are publicly advocating that skilled architectural service be retained to assure full value of remodeling expenditures.

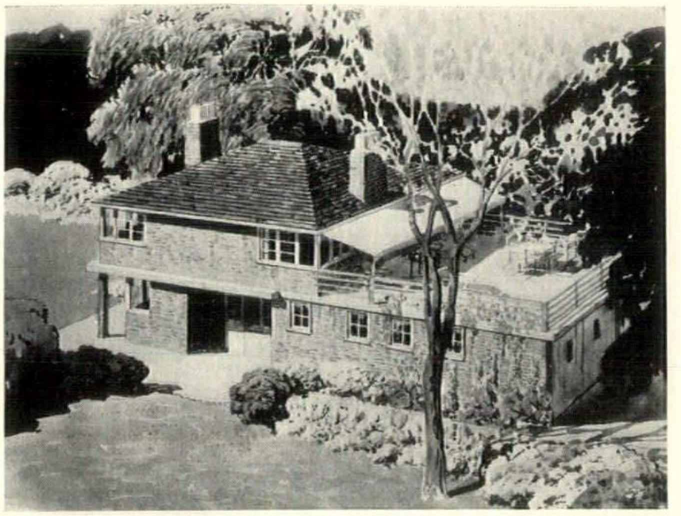
• Nails of paper, toughened by tremendous hydraulic pressure, have recently been announced by the Paper Foundation. Industry has long desired a nail that would not conduct electricity. Glass nails have proved too brittle, but the paper ones have the desired quality and are said to be so tough that they can be driven into a hardwood plank without bending.

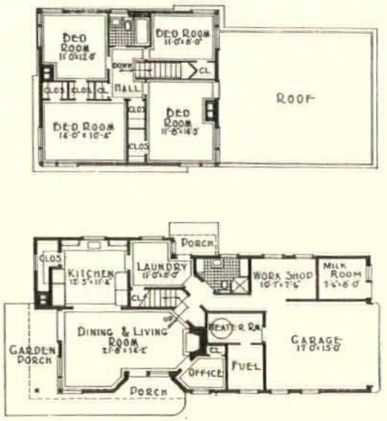
• New scientific wonders were confidently forecast by a group of engineers at a dinner recently held in Chicago. Among them were: generation of electric power from wind and from solar energy; motors run by sunlight; developments that will make electric refrigeration, air conditioning, and appliances for household tasks economically available for every home; home teletype by radio with facsimile transmission of printed matter and pictures through the air so that receivers turned on at night will provide in the morning a complete story of what flashed through the atmosphere; elimination of slums and the greater beautification of cities; elimination of needless noise; cheap modern homes for the masses at a total cost of $2000; houses more beautiful, permanent and varied in plan, erected within one week;



New Jersey architects are active in promoting development of county park systems. The map, prepared by Harry Lucht, was made for use of regional plan commissioners. Travel and art have become the main activities of Paul H. Smith since the depression. His card is an etching printed in sepia and measures about 2 by 3 inches


PAUL H. SMITH
ARTIST
1864 N. CAMBRIDGE AVE.
MILWAUKEE
LA 4481W





Costing less than $5,000 this 13-room, cellarless, fireproof farmhouse was designed by Henry K. Holsman of Chicago and will be exhibited at A Century of Progress. Sponsored by The Country Home, a farm magazine, the dwelling is built of reinforced brick-work, precast in large panels. Floors and roofs are concrete on steel pans. Heating can be hot air or steam as desired

a quick, cheap method of prefabricated "shell" construction for office buildings; and a host of other wonders long dreamed about and now on the road to solution. James Dalton, editor of "Motor" commenting upon the engineers' forecast aptly says, "When these greatest of skeptics tell what they actually are doing, they put tomorrow farther ahead of today than today is beyond yesterday."

• The article "Builders in Search of a Civilization" by Charles Harris Whitaker, published on page 42 of this issue is a synthesis of two chapters of Mr. Whitaker's book, "Rameses to Rockefeller: The Story of Architecture," shortly to be published by Random House, New York.

• The Time-Saver Table of AMERICAN ARCHITECT Reference Data, "Thermal Insulation of Buildings," published in the May issue was checked and then rechecked. Despite this we have discovered an error under Section VII. Per cent of heat transfer stopped by Type 2 of the bright aluminum foil insulations should have been 59% instead of 20% as given.

• There may be a publicity angle for architects in a recent Clean-up and Paint-up Drive in Cleveland, Ohio. 5,000 homes were visited. Requests were placed for 1891 jobs of painting and papering and 372 general renovating jobs. 52 owners wanted immediate furnace repairing done and 67 other families needed workmen on a permanent basis. With aggressive direction, architectural organizations might find a lot of work forthcoming from a similar house to house canvass.

• The Architectural Registration Law of Tennessee has been upheld by the Supreme Court. Justice Swiggart stated the opinion that the business of drawing plans and specifications for dwelling houses is a business which involves the public safety and health. Apparently this decision would make possible regulation of architectural practice under the police power of ordinary city governments.

• Visby—city of ruins and roses and walnut trees that were old when Columbus discovered America—is on the Isle of Gothland, off the coast of Sweden. The Gothlanders were a race of church builders to which the ruins of Visby are adequate testimony. Ruins and foundations indicate that there must have been at least twenty churches within the confines of the city. Today only one is in use. That the architects of the North were master builders is shown by the sturdy stone work comprising the ruins of St. Catherine's Cathedral which forms the subject of this month's frontispiece.

• Building ventilation is a subject long understood in principle and used by bees, according to Robert E. Martin, writing in *Popular Science Monthly*. A number of bees form a long line at the entrance of the hive. They beat the air with their wings keeping a current of air in motion until the proper temperature and humidity is felt in the interior.

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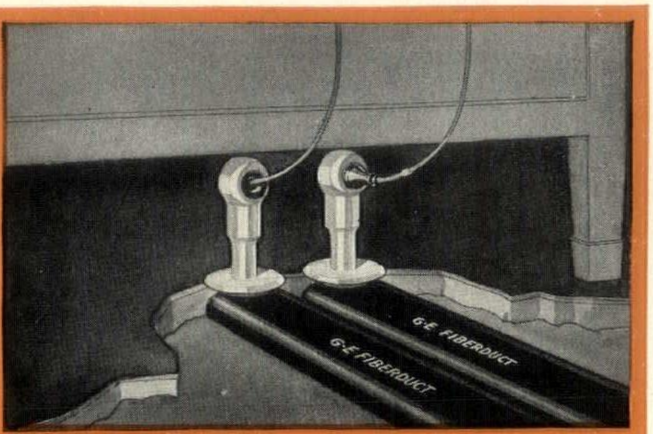
Provides adequate outlets for present and future needs . . . Easy and economical to install . . . The ideal underfloor wire-way system . . . Send for 24-page catalogue.



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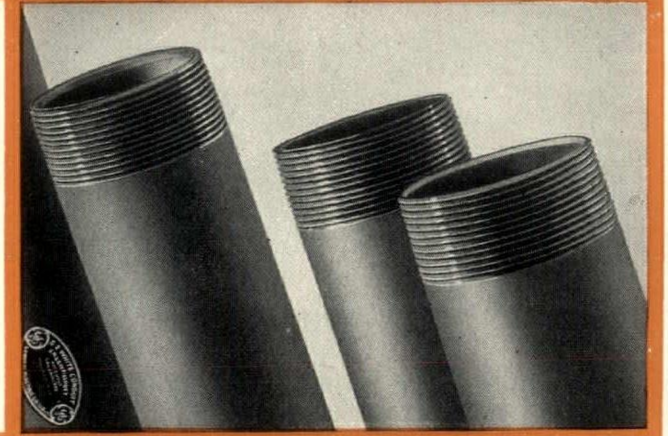

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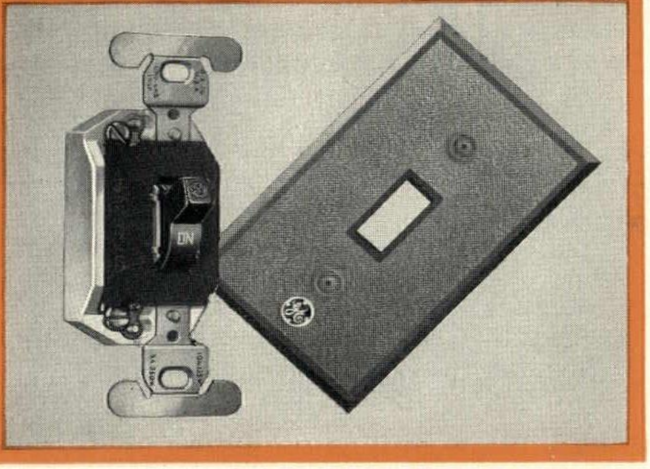

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For complete information on the products mentioned above, call your G-E Merchandise Distributor or write to Section CDF-107, Merchandise Department, General Electric Company, Bridgeport, Connecticut.

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• Fred F. French, New York real estate operator, in an address on Housing in Lower Manhattan says, "Our company, strangely enough, was the first business organization to recognize that profits could be earned negatively as well as positively in New York real estate—not only by constructing new buildings but by destroying, at the same time, whole areas of disgraceful and disgusting sores. These sores, for more than a century, have been festering in our very midst, festering with disease and, what is worse, perhaps, festering with crime."

• Individual remodeling operations do not pay in all instances, according to Arthur C. Holden of New York. This is particularly true as applied to city projects because of the fact that tawdry surroundings tend to reduce the value of individual improvements. In the city the group modernization idea is much to be preferred, Mr. Holden maintains, although individual alterations and reconditioning of a farm house is undoubtedly worth while due to the useful nature of the surrounding country.

AMERICAN ARCHITECT
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for Heating, Cooling and Air Conditioning Computations as published in this issue opposite page 88

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For receiving competitive bids on a comparable basis by requiring bidders to show their own load computations on these standard forms.

As job records and to check performance against specifications.

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Form 3.	**Total Loads. Winter and Summer Conditions**—Space for summarizing 33 rooms from Forms 1 and 2. Reverse used for determining required capacity of heating plant (boiler or furnace) humidifier, dehumidifier, refrigerating unit, fans, blowers, filters or air washers and annual fuel consumption	$.25	$2.00
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NEW CATALOGS . . .

Readers of AMERICAN ARCHITECT may secure without cost any or all of the manufacturers' catalogs described on this and the following page by mailing the prepaid post card printed below after writing the numbers of the catalogs wanted. Distribution of catalogs to draftsmen and students is optional with the manufacturers

STANDARD NEO-ANGLE BATH

409 ... In a 12-page booklet lithographed in color, Standard Sanitary Mfg. Company, Pittsburgh, presents its recently introduced Neo-Angle Bath. The features, advantages, uses and adaptability of this unit are graphically described. A group of bathroom plans suggests the varied arrangements to which this bath is adaptable.

FITZGIBBONS R-Z-U BOILERS

410 ... In a 24-page catalog Fitzgibbons Boiler Co., Inc., New York, presents its line of R-Z-U Firebox Boilers. General descriptions and illustrations, dimensions, specifications and ratings are given for the Hard Coal Type, the Smokeless Type, the Oil and Gas Type and the Stoker Type R-Z-U Boilers. Some typical installations are pictured.

THE GAS KITCHEN

411 ... The American Gas Association, New York, has issued a 36-page booklet on "The New Technique in Kitchen Work" which, while intended primarily for the consumer, contains data of interest to architects. Suggestions for modernizing old kitchens or planning new ones are described and illustrated. A Kitchen Planning Guide, having a floor plan form and small stickers representing kitchen units, provides a means of studying layouts. Illustrations and descriptions of the various gas appliances for cooking, refrigeration, hot water and house heating are included.

REYNOLDS METALLATION

412 ... Reynolds Metallation and Reynolds Metallated Ecod Fabric are presented in a new booklet issued by the Reynolds Metals Company, New York. Methods of application and the varied uses of these insulating materials are fully described and illustrated. The booklet is bound with an actual sample of Reynolds Metallation, and also contains small swatches.

GILBARCO AUTOMATIC OIL HEATING EQUIPMENT

413 ... A 24-page Architects and Engineers Manual has been issued by Gilbert & Barker Mfg. Company, Springfield, Mass. The manual contains complete information regarding "Gilbarco" Automatic Conditioned Warm Air Unit, Automatic Oil Heat Unit, and Flexible Flame Oil Burners, including installation data, specifications, dimensions, performance data, tank sizes, and fuel consumption. Filing size: A. I. A. File 30-G-1.

PHOTO-MURALS

414 ... The use of photographic wall is discussed in a 16-page booklet issued by Eastman Kodak Company, Rochester, N. Y. "Photo-Murals" are photographic enlargements, usually of large dimensions, used like wallpaper. Applications, typical installations, the possibilities of hand coloring, and cost range are included.

MODERN SPANDREL DESIGNS

415 ... Aluminum Company of America, Pittsburgh, has issued a 24-page booklet which contains a portfolio of spandrel designs executed in Alcoa Aluminum. Notes on design considerations, methods of anchoring, and the proper installation of spandrels are included. Filing size; A. I. A. File 15-J.

BURNHAM OIL BURNING BOILER

416 ... Burnham Boiler Corporation, Irvington, New York, has published a catalog illustrating and describing its new jacketed oil burning boiler for use with standard oil burners. Text is brief and presented in a non-technical manner. Many illustrations are in natural colors. A section is devoted to questions and answers which seek to anticipate the solutions to problems architects commonly encounter.

GALVANNEALED SHEETS AND ENDURO STEEL

Republic Steel Corporation, Youngstown, Ohio, has issued two new booklets:

417 ... Republic Galvannealed Sheets (Bulletin 120): 4-page folder containing description of characteristics, recommended applications, and tables of gauges and sizes in which these sheets are available.

418 ... Enduro 18-8 Stainless Steel (Bulletin 125): Presents latest data on Enduro 18-8 Stainless Steel and its four variations. Metallurgical and fabrication data, as well as a table of laboratory corrosion data, are given.

NATIONAL PREMIER STEEL BOILERS

National Radiator Corporation, Johnstown, Pa., offers three new folders:

419 ... Form 178—National Premier Steel Boiler—Hand-Fired: Contains complete information on the 25 and 31 series steel boilers for hand firing. Specifications and ratings are given. 4 pages.

420 ... Form 177: Similar to above. Devoted to stoker-fired boilers.

421 ... Form 176: Similar to Form 178. Devoted to oil-fired boilers.

SELECTION OF CABLE

422 ... An 80-page reference book (GEA-1837) on "How to Select Insulated Cable" has been published by the General Electric Company, Schenectady. It presents all information required in determining the cable best adapted for a particular building, including applications within buildings. Methods of selecting

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AMERICAN ARCHITECT July 1934
New York City

Please have the following catalogs reviewed in this issue sent to me.

Numbers ....

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● I also desire further information about the new products described in this month's "New Materials and Equipment." . . (See pages immediately following this insert)

Numbers ....

● I would like to have catalogs and information concerning the following products advertised in this issue. (See advertisers' list on following page) ....

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conductor size, types of insulation and finish, tables of current capacities, thickness, wire gauges and dimensions, sizes of shipping reels and a bibliography are also included.

CAPITOL BOILERS AND RADIATORS

New catalogs offered by United States Radiator Corporation, Detroit, include the following:

423 . . . Capitol Radiators: Contains data and illustrations on Capitol tubular, wall hung, wall, cabinet, and corner, angle and curved radiators. Dimensions, assembly diagrams and heating surface data are given.

424 . . . A series of five folders illustrating and describing Capitol Red Top and Black Top boilers. Ratings and dimensions are included.

JOINTITE CORK PRODUCTS

425 . . . Complete information on the uses of Jointite Cork Products for insulation purposes for refrigeration, soundproofing, heat prevention, heat conservation, vibration deadening and condensation prevention is contained in a 20-page catalog issued by Mundet Cork Corporation, New York. Data, specifications, tables and charts for each insulation use are given.

BRIGSTEEL SINKS

426 . . . In a series of single pages bound in a loose-leaf cover, Briggs Manufacturing Company, Detroit, presents its line of Brigsteel pressed metal sinks with porcelain finishes. Data include information on manufacturing methods, sizes, models, and fixtures. Several models are illustrated in natural color.

DUREZ MOLDING COMPOUNDS

427 . . . The advantages, limitations and applications of Durez Molding Compound, a synthetic resin plastic material, are discussed in an 8-page folder issued by General Plastics, Inc., North Tonawanda, N. Y. Illustrations show a wide range of products which employ this material.

COLORING COPPER, BRASS AND BRONZE

428 . . . An interesting monograph of 8 pages has just been prepared by the Copper & Brass Research Association, New York, on "Coloring Copper, Brass and Bronze." A new method for obtaining artificially the natural patina on copper is featured. The formulae are given for obtaining various color effects on copper and copper alloys, and also gives information on pickling solutions. A.I.A. File 15-B.

CURTIS LIGHTING

429 . . . Curtis Lighting, Inc., Chicago, has prepared a booklet, "Lighting Features of A Century of Progress," which presents an analysis of some of the problems connected with the lighting of exhibits and special features at the World's Fair. Many illustrations showing lighting of buildings, exhibits, etc., are included.

WESTINGHOUSE AIR CONDITIONING

430 . . . Air conditioning facts and installation data for architects are contained in publication SP 2007 issued by Westinghouse Electric & Mfg. Company, East Pittsburgh. This 24-page booklet contains illustrations and descriptions of typical installations, and sections devoted to various types of conditioning units, condensing units, the mobilaire unit, and to steam-jet vacuum-cooling.

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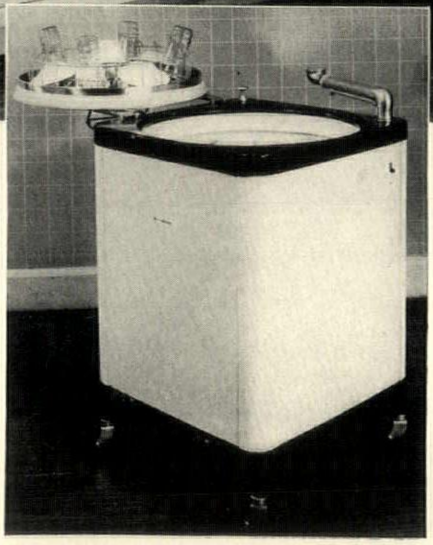


Westinghouse Dishwashers

314M The Westinghouse Electric & Mfg. Company, East Pittsburgh, has entered the electric dishwasher field with the introduction of one cabinet and three portable type machines. The cabinet-type model combines an electric dishwasher, sink basin, and work top in a compact steel cabinet, and requires only 48"x25" floor space. A mixing faucet and double sink strainer are standard equipment. The portable models can be had either round or square, and are finished in ivory lacquer with porcelain enamel covers. The entire line employs a washing process that uses ordinary soap chips and hot water. The dishes are washed in the suds for five minutes, double rinsed and thoroughly dried by evaporation. The interior of the dishwasher is self-cleaning.

G-E Air Conditioning Products

315M The General Electric Company, Schenectady, New York, announces a new and redesigned line of air conditioning products for domestic and commercial use. These units include portable room coolers, floor-mounted room coolers, wall-mounted room coolers, and suspended type store coolers; three new types of room air conditioners; and condensing units ranging from ½ to 20 horsepower in size.

Otis Personal Service Elevator

316M Otis Elevator Company, New York, has developed a personal service elevator especially designed for private homes. This new equipment is automatically controlled, works with a single push button and may be used in any residence equipped with standard alternating house current. It is designed for use in homes of three floors maximum and provides for a load of 650 pounds, at 35 feet per minute. The elevator is supported by a steel frame mounted on the basement floor, which relieves the building of unnecessary weight and reduces alteration expense. The car frame is steel; the elevator cars are of wood or steel in attractive designs or may be had unfinished for personal decoration. It is claimed that this elevator, completely installed, will cost no more than a better-class motor car.

Electrical Metallic Tubing

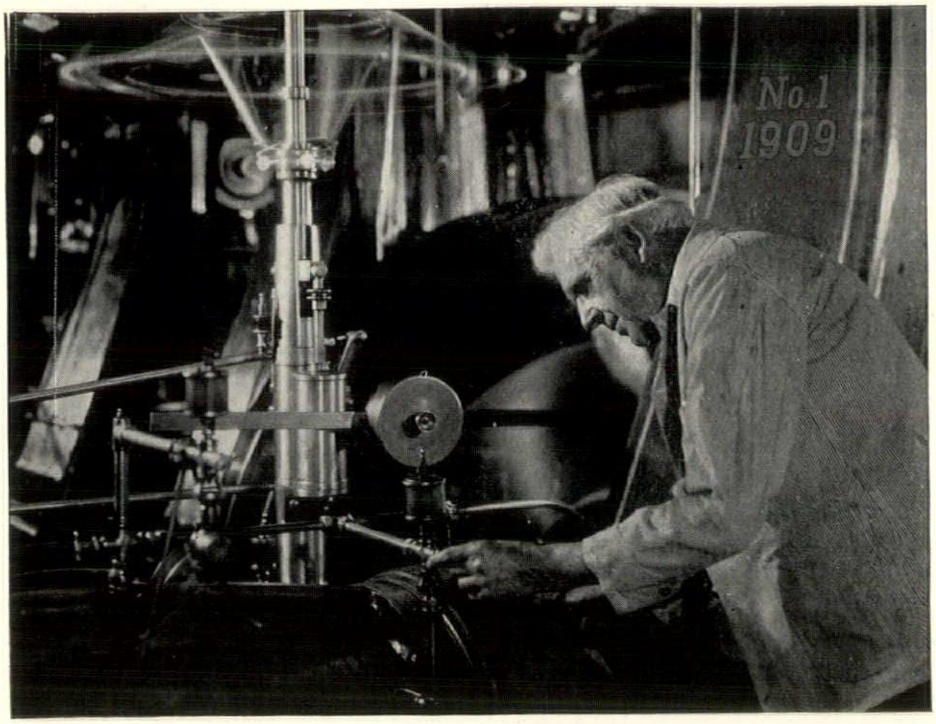
317M Steel and Tubes, Inc., Cleveland, have developed a new type of electrical metallic tubing that minimizes internal friction between conduit and cable. The inside of this tubing is processed, prior to forming and welding, so that the entire surface is covered with small, round, raised knobs resembling the tops of ball bearings. The cable travels over the tops of these knobs instead of being in continuous contact with the wall of the tubing. No threading is required.

Freon Compressors

318M A new line of enclosed-type Freon compressors, designed particularly for air conditioning work and ranging in size from 15 to 300 tons refrigerating capacity, is announced by the Frick Company, Waynesboro, Pa. Each machine is fitted with a force-feed lubricating system and is furnished with twin vertical cylinders, single acting. Either V-belts or direct synchronous motor drives are standard.

Metal Florduct

319M A new method of extending wiring across floor areas to free-standing furniture or other units, has been developed by National Electric Products Corporation, Pittsburgh. This electrical system, Metal Florduct, consists of an outlet extension cap and a run of Florduct—a raceway formed of two pieces, base and capping, standing 5/16 in. in height, with a gradual sloping ramp extending to the floor surface covering a width of 1½ in.;



When is the contract fulfilled?

Legally, when the parties to it have done everything they agreed to do. But the manufacturer whose name on a piece of machinery has stood for quality and dependability for a half century or more, knows that his product must meet an implied obligation long after the technicalities of the contract are forgotten. Year after year it must perform at high efficiency and with low maintenance expense . . . year after year it must provide dependable and trouble-free service . . . year after year, throughout a long life of usefulness it must fulfill the unwritten guarantee which its name carries with it.

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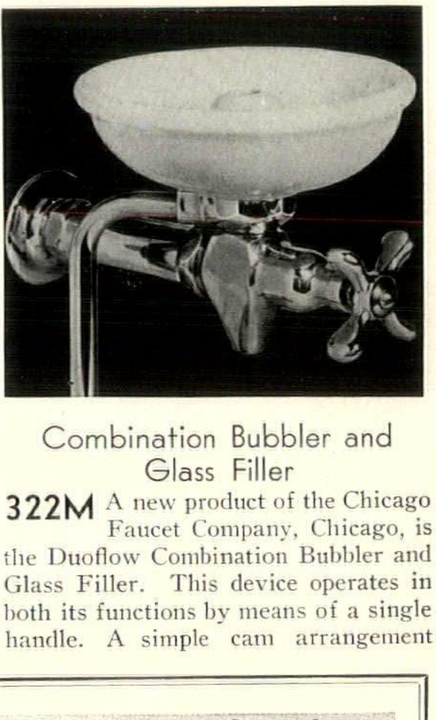
an internal adapter elbow to be used as a junction between Florduct and a baseboard wiring system; and a service fitting through which wires are extended at the end of the Florduct run.

Illinois Radiator Traps

320M An improved line of thermostatic radiator traps is announced by Illinois Engineering Company, Chicago, called the Series G Inboard Traps. A special duplex diaphragm thermostatic element, which assures true setting of the nitrilloy valve cone on the trap seat, is a feature the units.

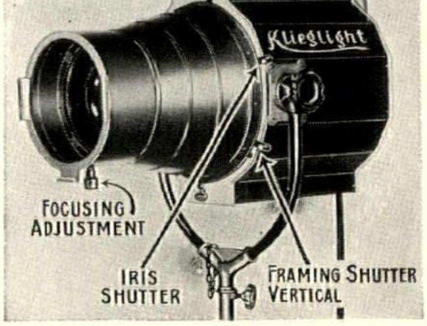
Dual Control Modustat

321M An individual thermostatic radiator valve which will either automatically maintain a desired local temperature or which may be controlled by hand setting, has been announced by Minneapolis-Honeywell Regulator Company, Minneapolis. This device is an improvement over the Modustat or automatic individual radiator valve made by this company.



Combination Bubbler and Glass Filler

322M A new product of the Chicago Faucet Company, Chicago, is the Duoflow Combination Bubbler and Glass Filler. This device operates in both its functions by means of a single handle. A simple cam arrangement



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UNIVERSAL ELECTRIC STAGE LIGHTING CO., INC.
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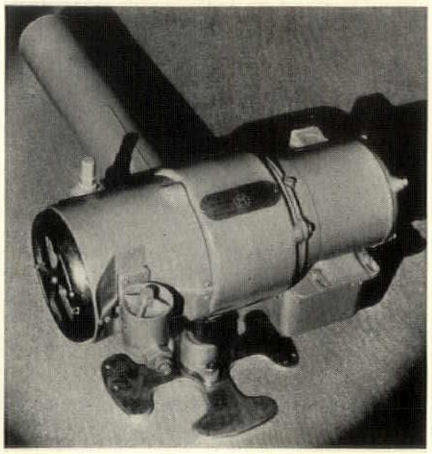
within the valve, easily removable or reversible, diverts the flow of water through either bubbler or glass filler as the handle is turned slightly in one direction or the other. The unit is adaptable to either city line connection or to water coolers.

Goodyear Rubber Flooring

323M A new rubber flooring manufactured in roll form, simplifying the installation of rubber floor covering in homes, is announced by The Goodyear Tire & Rubber Co., Inc. Akron, Ohio.

Compensating Heat Regulator

324M A new control device, called the Tritrol Regulator, which automatically varies the time of starting the heating system in the morning, and the time of shutting it down at night to compensate for changes in the outside temperature, has been introduced by Jas. P. Marsh Corporation, Chicago. During the day, this device maintains an intermittent flow of heat to the building, automatically adjusted by the weather. An even temperature is attained under all climatic conditions. The Tritrol Regulator is applicable to all types of heating systems.



Conversion Burner

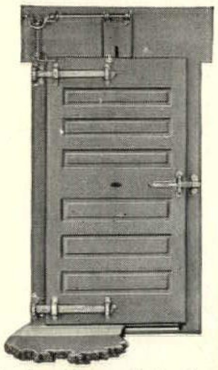
325M A low-price, pressure-atomizing type conversion oil burner, identified as the MW Emancipator, has been developed by the Heater Division of Motor Wheel Corporation, Lansing, Mich. Furnished in one model flexible enough for all domestic heating requirements, this burner has aluminum casings, a built-in silencer, radio interference eliminator, no exposed moving parts, and standard controls and accessories. It burns No. 3 oil, with a burner capacity of from 1.35 gals. to 4 gals. per hour.

Dualite Control for Freight Elevators

326M A new development in freight elevators, known as Dualite Control, has just been announced by the Otis Elevator Company. This is an improved type of constant-pressure, push-button control for slow-speed freight elevators. Operation from within the car is by means of an up or a down button. There is a single button at the landings for calling the car, and when this button is pressed the car moves either up or down to that floor, where it automatically stops.

Delco Heat Boiler

327M A completely automatic oil fuel heat boiler for homes and small commercial applications, operating with either steam or hot water systems, has been introduced by Delco Appliance Corporation, Rochester, New York. The boiler is of cast iron construction with extended surface fins to increase heating surface. Burner is of the mechanical pressure type with atomizing nozzle burning No. 3 oil. Entire unit is encased in a furniture-steel cabinet trimmed in chromium and finished in two tones of green.



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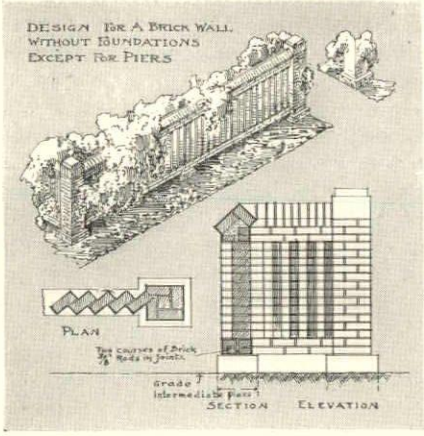
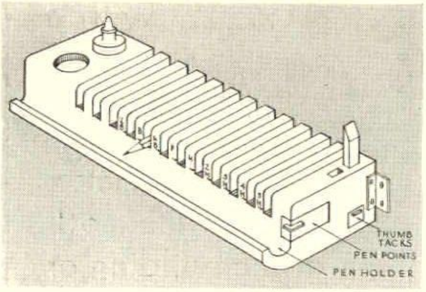


• BRICK GARDEN WALL

By James Ross
New York, N. Y.

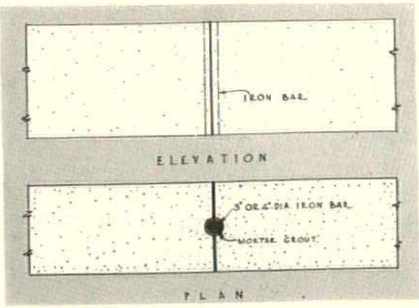
USE of reinforced brickwork for two lower courses makes possible the construction of a brick wall without foundations except under supporting piers. These are spaced as required and carried down below the frost line. The main portion of the wall requires only 1¾ bricks per running foot. The construction is solid and economical.



• DRAFTSMAN'S HANDY TRAY

By Aldo Bottazzi
Corona, Long Island, N. Y.

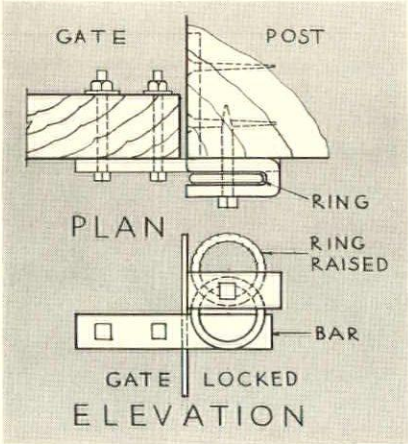
A CONVENIENT place for keeping various grades of pencils, ink, erasers, thumb tacks, etc. can be made easily by anyone reasonably handy with simple tools. The tray shown in the sketch was made from a 4"x12" piece of wood. Holders for ink bottles and space for pen and thumb tack drawers can be made with a large auger and sharp chisels. Fastened to the wall, the tray is an aid in keeping a drawing board free from annoying odds and ends.



• STONE JOINTS

By George Mann
Baltimore, Maryland

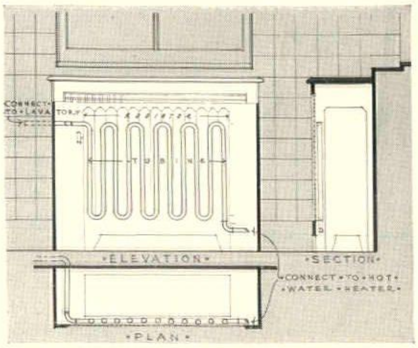
WHERE vertical joints occur at large, long, abutting stones in lintels or copings and when it is impossible to form a proper tie at top or bottom, a practical connection can easily be made by placing an iron bar in the middle of the joint. Properly grouted this method will develop a connection of high strength.



• SIMPLE LOCK FOR A GATE

By William L. Jackson
St. Louis, Missouri

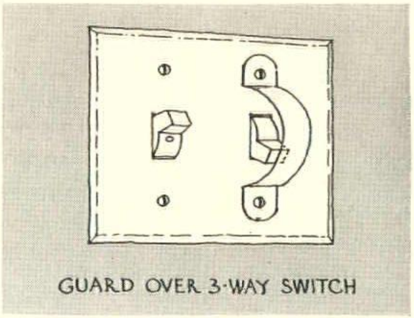
A STURDY gate lock can be made of two pieces of strap iron about 1 inch wide and ¼ inch thick, an iron ring and a stout bolt. The sketch shows the method of assembly. The upper strap is bolted to the face of the post, bent around the corner and doubled back upon itself to receive the ring and bolt. The bottom strap, bolted to the gate, is a straight bar. The device can easily be made by a local blacksmith at little cost.



• BATHROOM HEATING UNIT

By Domenic Thomas Russillo
Providence, Rhode Island

TO provide temporary bathroom heat an experiment with copper tubing connected with the domestic hot water supply has proved successful. The tubing, bent as shown in the sketch, was placed in front of the usual radiator. When connected with the faucet of the lavatory, the tubing will radiate sufficient heat from running hot water to take the chill from the room. A shut-off valve should be installed on the side nearest the hot water heater.

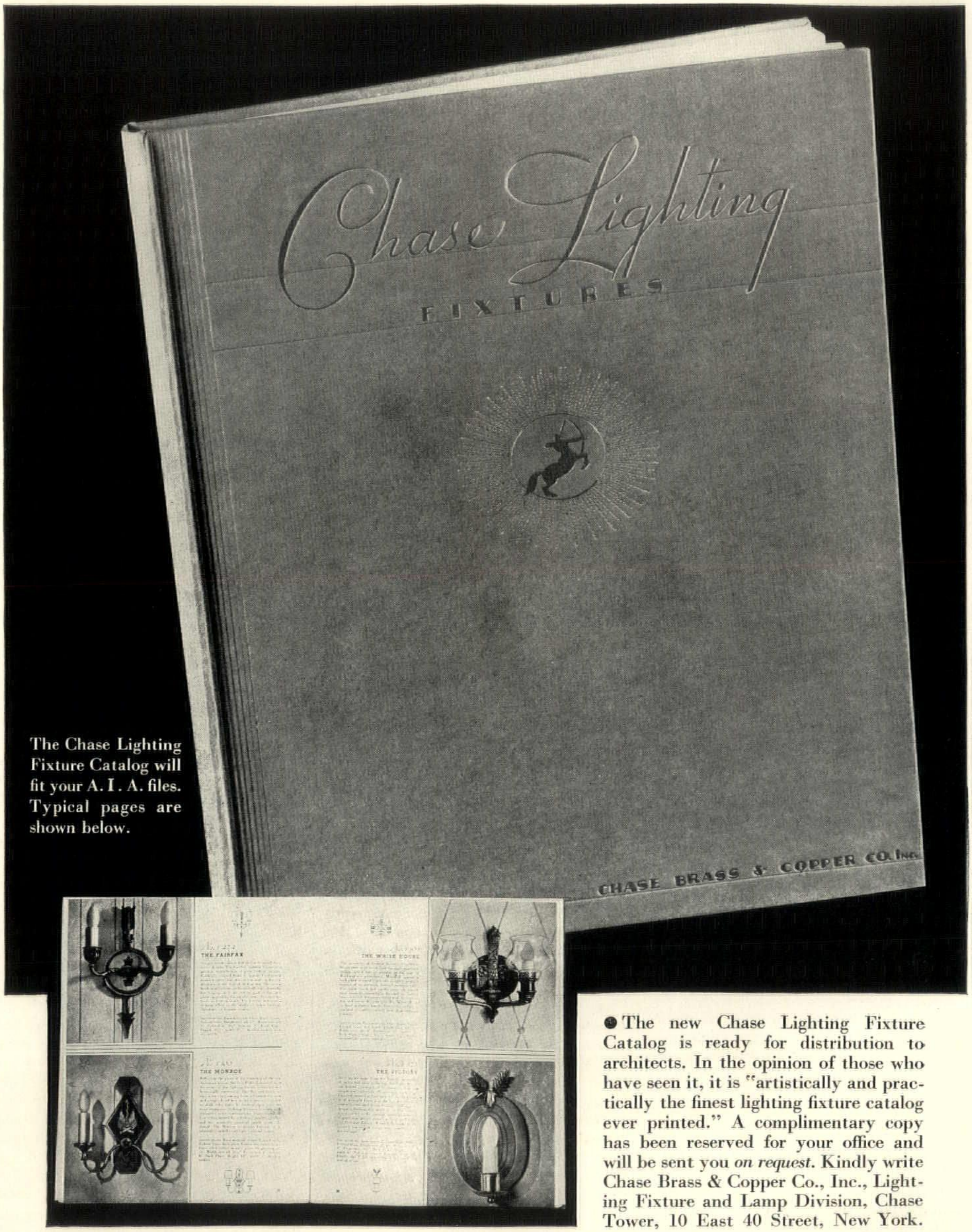


• THREE-WAY SWITCH GUARD

By C. A. McGrew
Crafton, Pennsylvania

A BRASS guard over a three-way switch prevents turning lights on by mistake, but does not interfere with operation of the switch. It can be made from a discarded brass switch plate. As shown in the sketch, the strip is ⅝ of an inch wide, about 4 inches long and is bent to a radius about ¼ of an inch greater than that of the switch lever. Sharp bends were made by holding the strip in a vise. Standard plate screws hold the guard in position.

American Architect will pay $5 for each suggestion published on this page



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CHASE LIGHTING

FIXTURES *and* **LAMPS**

The Readers Have a Word to Say

• UNCLASSIFIED COSTS

Editor, AMERICAN ARCHITECT:

IN a recent article published in the May AMERICAN ARCHITECT (Small House Architecture on a Business Basis) the case for the architectural firm which obtains thirty or so small house commissions per year is stated most encouragingly. This bustling state of business is, however, not particularly typical of the average office today, except, perhaps, for those architects who have some connection with real estate or building enterprises per se. The architects who receive less than thirty commissions a year undoubtedly get a large percentage of their jobs from clients who desire to employ them quite as much for their putative ability in design as for their business acumen.

In estimating the cost of such service, when care is taken to fulfill the clients' legitimate expectations, certain items will appear which call for the expenditure of time and effort, but which cannot well be included in the normal professional fee (for instance, ten per cent for houses costing up to $10,000.) Possibly the architect, when considering the cash value of such unchargeable items, may have a better opinion of his profit-making capabilities if he enters them under the appropriate headings in his ledger as follows:

1. Time spent in advising strict adherence to the limited budget during process of construction, and/or time spent in advising the increase of that budget after careful consideration.

Enter under heading of Disbursements for Education (Clients'.)

2. Effort put forth during accompanied supervision visits (there are always a large number of these in small house work) in engaging the clients in cheerful conversations as well as steering them past builders' hazards while making vigorous mental notes for later intimate discussions with the contractors.

Enter under Disbursements for Advancement (Architect's, mental and physical.)

3. Sketches made in surplus of the number a small job can carry economically in order to ensure a meeting of minds on questions of detail before working drawings can safely be issued.

List under Disbursements for Advertising and count on at least ten per cent of them being admired by the clients' meter readers or their elderly relatives.

4. Time spent in overcoming surprising and illogical complexes, both visual and plastic, of the clients.

Fifty per cent of this charge may be eliminated by attention to item 3, the rest must be entered under the heading of item 1, subtitle, Psycho-aesthetic-therapy.

5. Effort put forth during the progress of the work in disabusing clients of the idea which most of their well-wishers will have built up for them in advance; namely that architects have unsound theories of construction, mysterious prejudices in design and imperfect ideas of the practical functions of a small house.

This item cannot be classified properly in any system of cost accounting, but is always enormously gratifying to the architect and should be entered under the heading of Profit and Loss, if any.

If the foregoing items are added to the usual cost sheets on the job and the appropriate sums are entered carefully, there is no doubt that the practice of architecture in the field of small domestic work may be made to show a most satisfactory profit.—*Elisabeth Coit, A. I. A., New York, N. Y.*

• BETTER REGISTRATION LAWS

Editor, AMERICAN ARCHITECT:

I BELIEVE your prediction correct that "the small house field ($5,000-$9,000) will be a major source of building business for years to come." But who shall do the architectural work is an open question with precedence seeming to favor the builder.

Generally speaking, the builder architect has had two very formidable arguments to present in his favor: first, that plans will be of little or no expense, and second, the more weighty argument, that financing within limitations will be done by him. The architect's refutation to these arguments is principally a reference to the superiority of his work with a question whether the builder is not over-charging for construction work due to the lack of proper competitive bids.

I am a firm believer that State registration laws for architects would do much to eliminate the unsatisfactory conditions, provided that such laws are properly written to serve the purposes intended. Unfortunately they are too often poorly constructed and permit of conflicting interpretations, such as our Ohio law. This is not sufficiently clear in its protective clauses to encourage local Building Departments to construe the law favorably to the profession, as was intended by the State legislature at the time of its passage.

The small city of Norwood (contiguous to Cincinnati) cannot be too highly commended for a recent action of its council passing a law supplementary to the State law, so written as to refuse building permits on plans prepared by other than registered architects for construction work in excess of a $4,000 valuation.—*Louis G. Dittoe, Architect, Cincinnati, Ohio.*

• NATIONAL ORGANIZATION FOR BUILDING

Editor, AMERICAN ARCHITECT:

THE precarious condition of our profession and the construction industry in general is too well realized to need extended words. A national body should be formed and should be so constituted that its efforts would be expended toward a well organized industry. There is not one of the great industries so lacking in organization and unity of purpose as that of building.

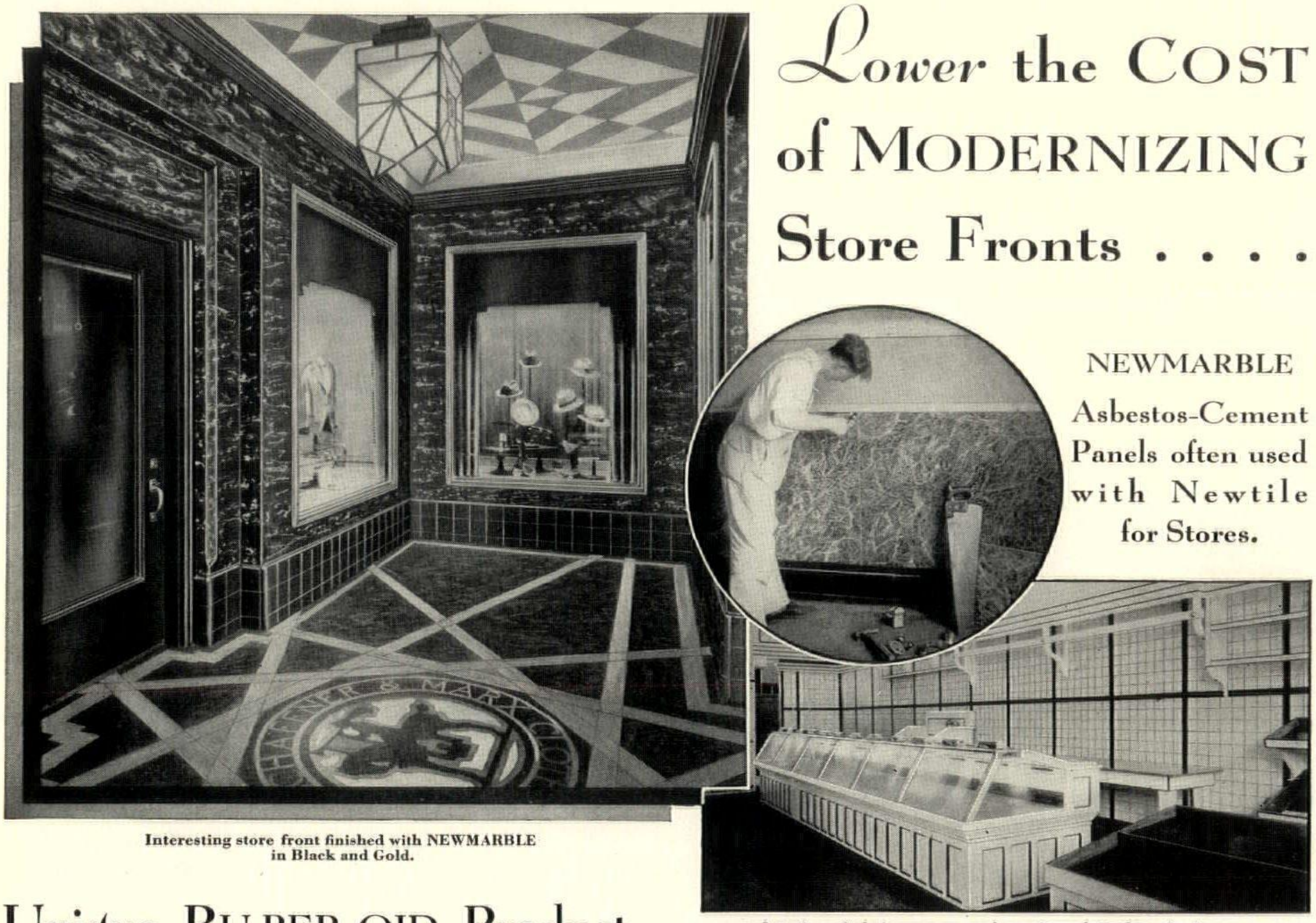
One of the chief aims of such a body would be, of course, the creation of an orderly and honest system of financing which would regain the confidence of the financing public and keep us out of the clutches of mortgage money sharks.

Perhaps the National Construction Council (if that is the exact name) is the best channel for such efforts. Maybe a new body should be formed. At any rate, the architectural profession should have a greater hand in shaping the industry.

The best definition of "Architecture" that I know is "Architecture is Construction practiced as a Fine Art." Architects have always rested with the "fine art" and separated themselves from the rest of the definition. The NRA Code for the Construction Industry considers architects as a component part of that industry. Very well, let's go to it. Segregating ourselves merely retards ourselves and recovery. —*Harry R. Warren, Architect, New York, N. Y.*

NEWMARBLE Asbestos-Cement Panels

Lower the COST of MODERNIZING Store Fronts . . . .



Interesting store front finished with NEWMARBLE in Black and Gold.

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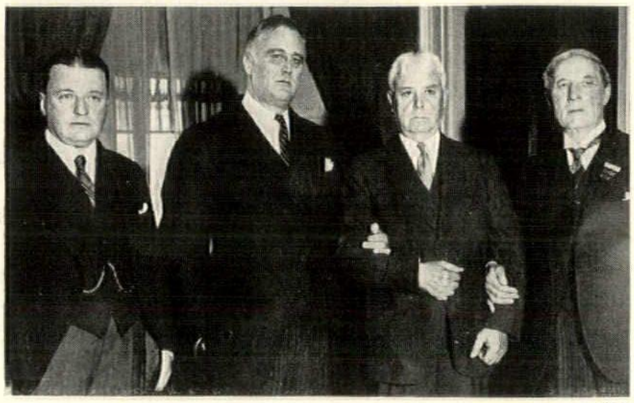
SEE 1934 SWEET'S ARCHITECTURAL CATALOGUES

The Sixty-Sixth Convention of the A.I.A.

(*Continued from page* 12)

questions relating to the building industry of which every architect is so essential a part.

What colorful verbal duelling took place was centered about the question of the architect's participation in work of the Federal building program and his recognition by official Washington as a professional man essential to the science of building. From the New York chapter came an emphatic resolution expressing dissatisfaction with the Federal building program and censuring those responsible for the executive direction and policies of the P. W. A. It was defeated; and in its place was passed a resolution of a milder tone, directing the Board of Directors to inform President Roosevelt of the national need for architectural service and to present him with a paper—ably composed by Electus D. Litchfield—outlining the architects' position, their capabilities,and their nonrecogntion as valuable technicians by executives of the Administration.



ACME

President Roosevelt formally presented the Institute's Gold Medal to Ragnar Ostberg of Sweden. Left to right: W. Bostrom, Swedish Minister to the United States; President Roosevelt; E. J. Russell, president of the A. I. A., and Ragnar Ostberg

In some measure this resolution paralleled that offered by the Committee of Public Works. Wind was effectively spilled from the sails of both resolutions by announcement that the Procurement Division, the Assistant Director of Public Works and the Supervising Architect had all agreed on a policy of employing private architects on all projects costing over $60,000.

Less dramatic convention actions were hidden under several excellent committee reports and their importance dimmed in the popular eye by a prosaic lack of discussion and perfunctory voting on resolution after resolution. The Committee on Standard Accounting was barely mentioned at the convention. Yet the work it has accomplished by preparing a manual of standard accounting practice for architects is of first rank importance. The manual is in the process of publication. It will be available shortly to all architects. If generally adopted, it cannot help but prove an effective method of determining a just series of charges for architectural services based upon known costs, thus removing at one blow the greatest hindrance to any satisfactory codification of architectural practices.

Of equal potential importance was the report of the Committee on Education of which Charles Butler is chairman. It presented a plan for preparation of candidates for architectural practice, linking an educational program—supervised by a "mentor" during the advanced stages—with registration examinations given under direction of the National Council of Registration Boards. Followed to a logical conclusion, such procedure would, in time, eliminate unfair competition for the architect by eliminating incompetence from architectural ranks. In addition it would tend to raise the standard of architectural practices and would, by centralizing approval of a candidate's qualifications, coordinate now conflicting professional requirements and develop high technical standards comparable with those of the legal and medical professions.

In the sense that resolutions indicate the temper but not necessarily the action of any meeting, the convention concerned itself with important problems of economics. Collectively, delegates recognized the need for greater and more practical cooperation with financial organizations; they endorsed legislation tending to improve and strengthen the system of building finance and decided that a committee should be formed to promote such legislation. They recognized the national need for basic surveys and for planning programs and pledged the assistance of the Institute in creating sound planning projects, properly staffed, officially directed and certified and restricted so as not to constitute unfair professional competition as regards scope and fees.

In particular the convention recognized the importance of adequate standards of materials and building methods in the erection of Federal buildings and resolved against extravagance but for " . . combining utility, minimum maintenance expense and good construction which will make them a sound investment and worthy examples of good architecture . . "

Delegates were gratified at the results of the Historic American Buildings Survey; they approved the efforts thus far of the Architects' Code Committee and approved also the proposal that the fine arts be recognized by allotment of part of the appropriation for future public buildings. The Board of Directors had previously prepared a number of changes in the by-laws which were voted affirmatively. Most of them had to do with expansion of the Institute's membership and the reduction of initiation fees and annual dues.

A notable occasion was the presentation by President Roosevelt of the Institutes' Medal of Honor to Ragnar Ostberg, famed Swedish architect, for the design of the City Hall at Stockholm. Apparently there was little sight-seeing this year, though a number of delegates and guests accepted invitations to visit the Williamsburg restoration project under the guidance of William G. Perry of Perry, Shaw & Hepburn, architects for the restoration.

Election results follow:

OFFICERS:

President—Ernest John Russell, St. Louis, Mo.
First Vice president—Charles D. Maginnis, Boston, Mass.
Second Vice president—M. H. Furbringer, Memphis, Tenn.
Secretary—Frank C. Baldwin, Washington, D. C.
Treasurer—Edwin Bergstrom, Los Angeles, Cal.

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Director, New England Division—Hubert G. Ripley, Boston, Mass.
Director, New York Division—Stephen F. Voorhees, New York, N. Y.
Director, Central States Division—Gerrit J. DeGelleke, Milwaukee, Wis.

To meet technical requirements, the Convention also elected the following Directors, who had been elected by the Board on account of the omission of the 1933 Convention:

Director, Gulf States Division—Ralph H. Cameron, San Antonio, Tex.
Director, Sierra Nevada Division—David J. Witmer, Los Angeles, Cal.

FELLOWS:

Name	*Chapter*
Abraham H. Albertson	Washington State
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Walter Dabney Blair	New York
Cornelius V. R. Bogert	New Jersey
Thomas Harlan Ellett	New York
Albert J. Evers	Northern California
Clement W. Fairweather	New Jersey
William E. Fisher	Colorado
Leon N. Gillette	New York
Carl F. Gould	Washington State
Mellen C. Greeley	Florida North
John Frederick Harbeson	Philadelphia
John A. Holabird	Chicago
Raymond M. Hood	New York
Ely Jacques Kahn	New York
Miller I. Kast	Southern Pennsylvania
William F. Lamb	New York
Victor Andre Matteson	Chicago
Frederick H. Meyer	Northern California
David J. Myers	Washington State
James Gamble Rogers	New York
Thomas Leslie Rose	Wisconsin
John Strubing Schwacke	Philadelphia
Albert Simons	South Carolina
Clarence S. Stein	New York
Nat Gaillard Walker	Florida Central
William T. Warren	Alabama
George H. Williamson	Colorado
David J. Witmer	Southern California
Henry Wright	New York
George Young, Jr.	Central New York

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Archer M. Huntington, New York, N. Y.
John Henry Nash, San Francisco, Cal.
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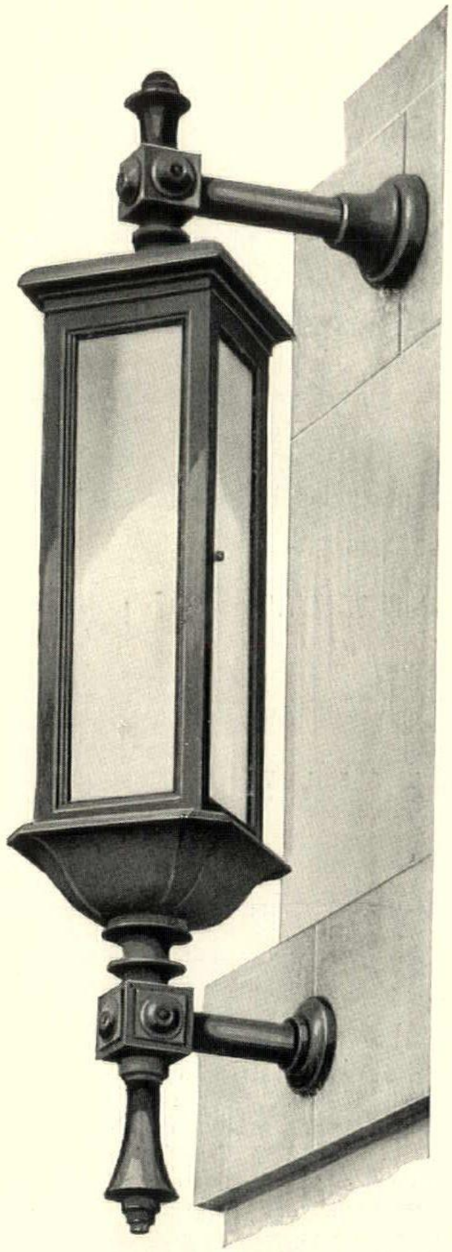
Mrs. Harry Payne Whitney, New York, N. Y.

400 Designs



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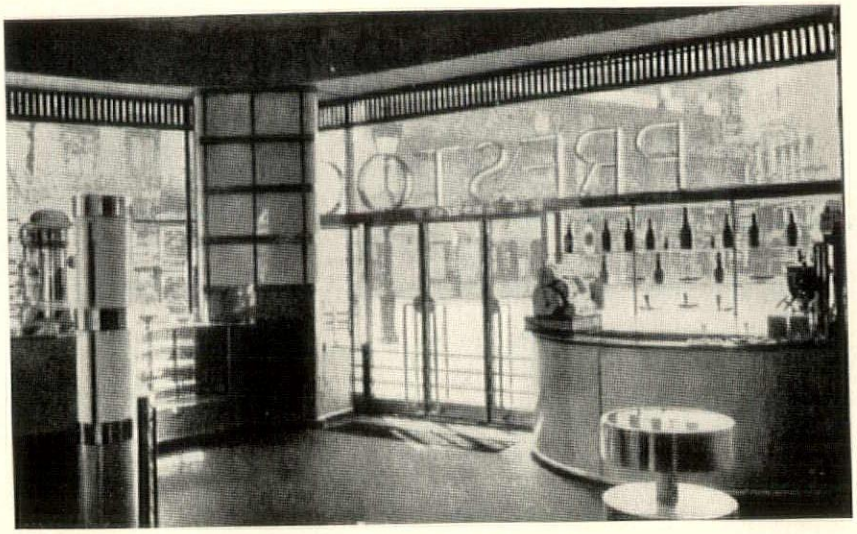
Left, illustration from "The Folger Shakespeare Library"
Below, a store interior, one of the illustrations in "Ladenbau"



ARCHITECTURE
ALLIED ARTS

BOOKS

ENGINEERING
BUSINESS ECONOMICS

THE FOLGER SHAKESPEARE LIBRARY

By Joseph Quincy Adams and Paul Philippe Cret. Published by the Folger Shakespeare Library, Washington, D. C. Illustrated. 72 pages; size 8½ x 10 15/16; price $2.50, postage extra.

EXTENSIVELY publicized in architectural magazines and hailed as an innovation the Folger Shakespeare Library in Washington is one of the outstanding architectural showplaces of the Capital. This volume is a compilation of 36 full page plates, excellently illustrated, of the building's architectural design. As such it constitutes a monograph which most architectural practitioners will want. In addition the book contains an essay descriptive of the Folger Library collections and a description of the building itself by Paul Philippe Cret, the architect.

THE STORY OF ENGLAND'S ARCHITECTURE

By Thomas E. Tallmadge. Published by W. W. Norton & Co., Inc., New York, N. Y. Illustrated; indexed; 363 pages; size 5⅞ x 8⅞; price $4.00.

APPARENTLY there has been no comprehensive volume which has told the story of English architecture from the Roman and Saxon ruins to the present day. It has been Mr. Tallmadge's purpose to tell such a story in this book. In very completely indexed and attractively illustrated pages he has done this and in addition has included short sketches of England's most famous architects, also much interesting material regarding the social history of each period. To architects Mr. Tallmadge is well known as a Fellow of the American Institute of Architects and the author of an earlier companion volume, "The Story of Architecture in America." His present book has been designed not only for the architectural student, but also for the travelling layman.

SCHÖNE RAUME, 2nd VOLUME

Published by Julius Hoffmann, Paulinenstrasse 44, Stuttgart, Germany. Illustrated. 104 pages; size 9 x 11 3/16; price RM 6.50.

THOSE who have admired the clean-cut interiors published in the foremost of the German architectural publications will find this latest publication of Julius Hoffmann more than interesting. Principally it consists of general interior views which strongly tend toward the most modern of up-to-date designs. The captions are written in German, but the excellent photographs together with plans and details make captions unnecessary to the average architect. The book should prove a practical inspiration to problems of contemporary interiors.

LADENBAU

By Adolf Schuhmacher. Published by Julius Hoffmann, Paulinenstrasse 44, Stuttgart, Germany. Illustrated. 165 pages; size 9 x 11 7/16; price RM 17.50.

IN these days of remodeling and unusual commercial display a book of store front photographs and details should prove a valuable addition to the libraries of architects everywhere. Such a book is Ladenbau. With the thoroughness characteristic of German publishers, the volume includes a great deal more material than its 165 pages would imply. Photographs are comparatively small, but the explanatory structural and design details are clear and large in scale. Illustrations indicate the wide scope of design possibilities, planning limitations and structural possibilities. To architects who read German the text will prove of additional interest. The value of the book lies primarily in the unusual completeness of its illustrated matter.

LOW COST HOUSING AND SLUM CLEARANCE

Published by School of Law, Duke University, Durham, N. C. 256 pages; size 7½ x 10⅝; price 60c—paper.

THIS subject fills an entire issue of a quarterly review published by the Duke University Law School and entitled "Law and Contemporary Problems." It treats of the housing problem from the standpoint of its social and economic implications; and though the thirteen articles which comprise this symposium have been designed for the particular interest of the lawyer and layman, architects can gain much value from them. The articles have been written by such housing authorities as Mrs. Edith Elmer Wood, Carol Aronovici, Herbert U. Nelson, Earle S. Draper and others.

SAFEGUARDING INDUSTRY AGAINST THE PILFERING OF IDEAS

By Henry Creange. Published by George Grady Press, 445 W. 41st St., New York, N. Y. 65 pages; size 8 1/16 x 10 11/16; price $1.50.

THOUGH work of architects does not come directly under the heading of industrial design, many of them have had experiences by which their ideas have been pirated by unauthorized commercial interests. This volume outlines a plan for wiping out such design piracy and since it discusses basic problems leading to the protection of all types of design it should prove more than mildly interesting to every architect who has considered the possibilities of copyrighting or otherwise protecting the products of his imagination.

CONSTRUCTION COSTS 1934 EDITION—

Published by Engineering News-Record, 330 West 42nd St., New York, N. Y., Indexed; 96 pages; size 9 x 12; price $1.00—paper.

THIS latest edition of the Engineering News-Record's yearly cost analysis includes a survey of several basic commodities influencing construction costs and gives also a complete cost range of original basic data covering a period of twenty-three years. For some time the cost indices of the Engineering News-Record have been looked upon as one of the standards of the construction industry and architects will find the present volume valuable as a general book of cost trends.

THE PLANNING AND CONSTRUCTION OF SCHOOL BUILDINGS, THIRTY-THIRD YEARBOOK, PART I, OF THE NATIONAL SOCIETY FOR THE STUDY OF EDUCATION

Edited by Guy Montrose Whipple. Published by the Public School Publishing Company, Bloomington, Ill. 337 pages; size 6 x 9; price—cloth, $2.50, paper, $1.75.

MOST architects are familiar with the excellent research work that has originated in the National Society for the Study of Education. The present volume, the first of two parts devoted to a study of education and educational plants, is the product of a committee of the National Society for the Study of Education under the chairmanship of Dr. N. L. Engelhardt. The book includes a number of reports which expose the many sided problems of the planning and construction of modern schools. Although every bit of the committee's work has been attacked to achieve the most practical of solutions, there has been obviously an attempt to consider the school planned in the light of an educational ideal. In combination, therefore, the reports comprising the volume point toward the future improvement of school buildings in every department of their planning, design and construction.

ALL THE WAYS OF BUILDING

By L. Lamprey. Published by The MacMillan Co., 60 Fifth Ave., New York City; Illustrated; Indexed; 298 pages; size 7 x 9½; price $3.50.

ALTHOUGH there appears to be nothing childish in this author's treatment of her subject, the book is a children's story of architecture. The text primarily concerns a discussion of man as a builder and, since it is intended for twelve-years-olds, the chapters constitute stories of how people planned and constructed their buildings all over the world. It is profusely illustrated.

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The National Housing Act

(*Continued from page* 11)

economic liabilities, to direct the movement in such ways as to have the best ultimate effect upon community development.

How soon a widespread demand for new dwellings will be felt, cannot be judged with accuracy from any existing data. Undoubtedly in many communities shortages of certain classes of dwelling are already evident. Where this is true, the type of financing required by the Act should permit new construction to proceed. Where a demand for new dwellings is not evident, at least the instrumentality will exist for their secure and economical financing when the need appears. On the whole, the probable market will be for houses and apartments for people of modest means. They should be buildings of substantial construction and simple, direct design, planned for the people who will use them and not cut down from the extravagant and fanciful layouts of well-to-do. They should, where possible, be planned in groups so that the landscape may be utilized to increase the attractiveness of the architecture, and so that the stability of a harmonious neighborhood can be added to the security of the mortgage system. All this requires of the architect a new point of view from that prevailing a few years ago. It makes new demands upon his skill and offers a new challenge and appeal to his imagination.

The market thus envisaged is one based upon need and utility rather than upon speculative profit. It is one considerably amplified as to the percentage of the total population it may hope to reach. It is a market which may be definitely related to principles of economic town growth. It is thus one which demands professional service of high character and which should offer a reasonable reward to architects who can understand its problems and who can adapt themselves to the conditions which it may impose.

DEATHS

• Cass Gilbert died suddenly in Brockenhurst, England, May 17th. He was 74 years old. He was born in Zanesville, Ohio, and after studying in the public schools of St. Paul, Minnesota and the Massachusetts Institute of Technology, he entered the office of McKim, Mead & White. He returned to St. Paul, opened his own office and gained national recognition by winning a competition for the design of the Minnesota State Capitol. At the turn of the twentieth century he won the competition for the U. S. Customs House in New York and moved east to establish a permanent residence.

Mr. Gilbert reached an eminence in the architectural profession equalled by few. His works are confined to no particular locality. They include many large public buildings through the country, some of the most notable being the Detroit Public Library, the Treasury Annex and the United States Chamber of Commerce Building, Washington, the Army Supply Base, Brooklyn, N. Y., the State Capitol of West Virginia, the New York Life Insurance Building, which replaced

(*Continued on page* 143)

What Good Housekeeping is telling home owners in a bulletin on remodeling

THE VALUE OF THE ARCHITECT

WHAT HE GIVES YOU
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THE "before" and "after" remodeling and renovating suggestions we publish in this folder merely indicate what can be done to make a good house more charming, more livable, more valuable.

There can be no one pattern for modernizing a house. Each house is individual. Each family has different ideas of comfort and convenience. Each modernization scheme should be individually, professionally studied.

The wise thing to do is to consult an architect. Since the American Institute of Architects is cooperating in the Good Housekeeping national remodeling movement, one of its members in your locality will be glad to advise you as to the most practical and economical way to achieve the results you desire. As the work progresses, he can supply you with the information required under the rules of the contest.

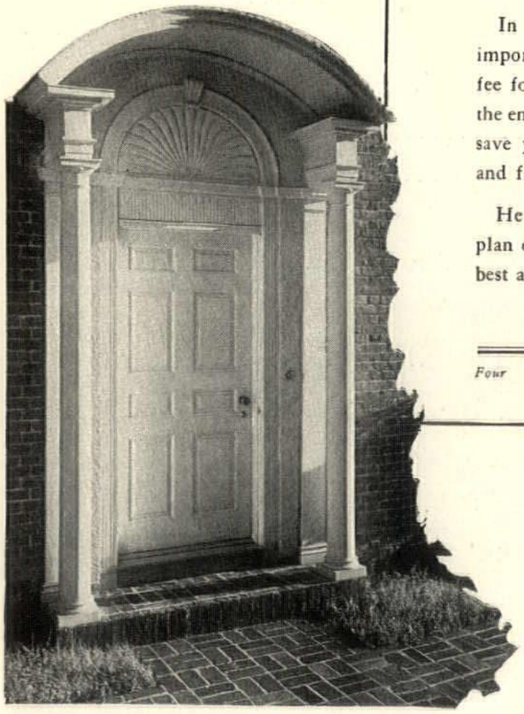
In these days, remodeling has become an important part of the architect's work. His fee for his services is a moderate portion of the entire expenditure, and his experience will save you—by assuring you against mistakes and faulty material—the cost of his services.

He knows the desirable variations in the plan of a house. He knows how to plan the best arrangement and size of rooms. He can make valuable suggestions, as to how to make use of your attic, or how to change your dark basement into a well-lighted recreation room. He can advise you how best to accomplish your wish for more closet space or for an efficiently arranged kitchen and laundry; to make provision for good light and air.

He knows what modern materials can best be joined to the materials in your house in the work of renovation; he knows types and dimensions of all the different materials and fixtures that will enter into the work. He can inform you as to the latest approved equipment for lighting, heating, air conditioning, etc. His counsel will save you money and assure you satisfaction in the selection of building materials, plumbing, hardware, and other modern fixtures and supplies.

The architect, moreover, will advise you as to which of the several possible methods of modernizing is best for the property and for your pocketbook. He can appraise the value of your property and advise what you should spend to make a profit on your investment if you should sell the house. If you intend to secure a loan for your improvements, the judgment of the architect will carry weight with your bankers.

Four



If you would like a copy of the bulletin in which this appears, send for a copy of "Homes the Nation Will Honor". Address Good Housekeeping Bulletin Service, 57th Street at 8th Avenue, New York City

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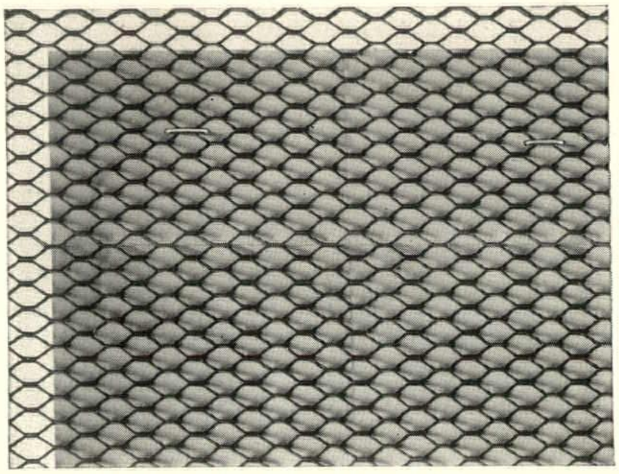

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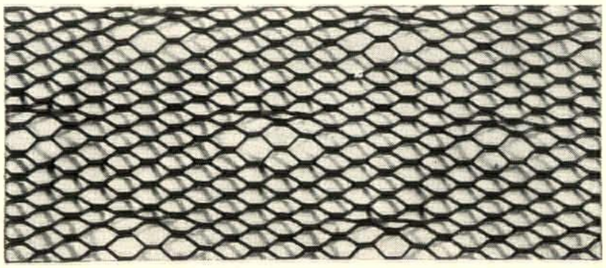

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INDEX TO ADVERTISERS

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the old Madison Square Garden, and the Woolworth Building. This last, completed in 1913, stamped him as a pioneer in the field of tall building design. Mr. Gilbert was prominently identified with professional activities. He was Chairman of the Council of Fine Arts under President Theodore Roosevelt and a member of the Commission of Fine Arts under Presidents Taft and Wilson. He was a founder and one-time president of the Architectural League of New York, a president and fellow of the American Institute of Architects, a member of the American Academy of Arts and Letters and for seven consecutive years had been the president of the National Academy of Design.

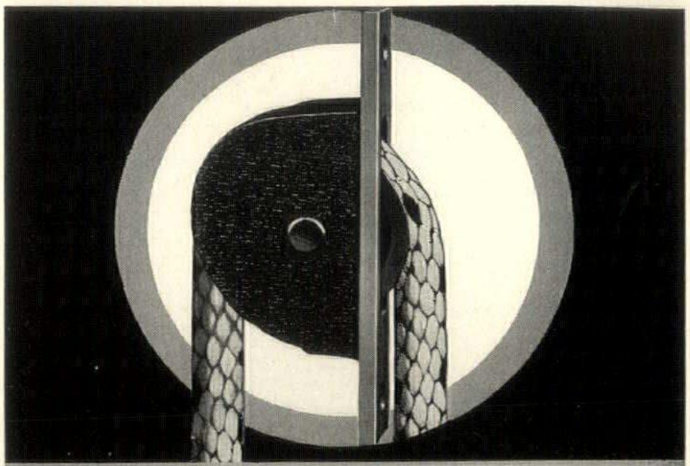
• Robert Perry Rodgers died June 4th at Havre De Grace, Maryland. Mr. Rodgers, who was 39 years old, graduated from Harvard University and after the World War studied architecture in Europe and this country, later forming a partnership with Alfred Easton Poor. Together they won the competition for the design of the Wright Memorial at Kitty Hawk, N. C. Individually and as a member of the firm Mr. Rodgers was architect for many residences and various public buildings. He was a member of the American Institute of Architects.

• Miss Alice Mary Simpson, Assistant Secretary of the Architectural League of New York, died May 16th at her New York home. Miss Simpson, who was 64 years old, became associated with the Architectural League in the earliest days of its organization while she was studying painting in the New York Art Students' League. Ever since that time she had been active in all the League activities as well as the cultural life of New York. At the Annual Meeting of the League on May 3rd of this year Miss Simpson was awarded the Allied Arts Prize known as the President's Medal, in recognition of her services. Among other recipients of the Medal have been George W. Goethals, Joseph Urban and Julian Clarence Levi.

• Frank P. Allen, one of the oldest practicing architects in Michigan, died at Grand Rapids on March 16, 1934. Mr. Allen, who was 77 years old, was a partner in the film of Frank P. Allen & Son for many years. The firm has done many important buildings throughout Michigan. Mr. Allen was a member of the American Institute of Architects and a member of the Michigan Society of Architects.

• Earl Hallenbeck died at his home in Syracuse, New York, on June 2nd. Mr. Hallenbeck was 58 years old and had been a member of the College of Liberal Arts of Syracuse University for 32 years. He attended Syracuse University in the late 1890's and afterwards worked as an architect in New York City for several years.

• John A. Rogers died at Daytona Beach, Florida, June 2nd at the age of 63. In addition to being an architect, Mr. Rogers was well known as a painter and etcher and had formerly practiced his profession in Chicago, Illinois. He was a brother of James Gamble Rogers.



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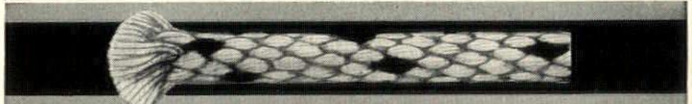

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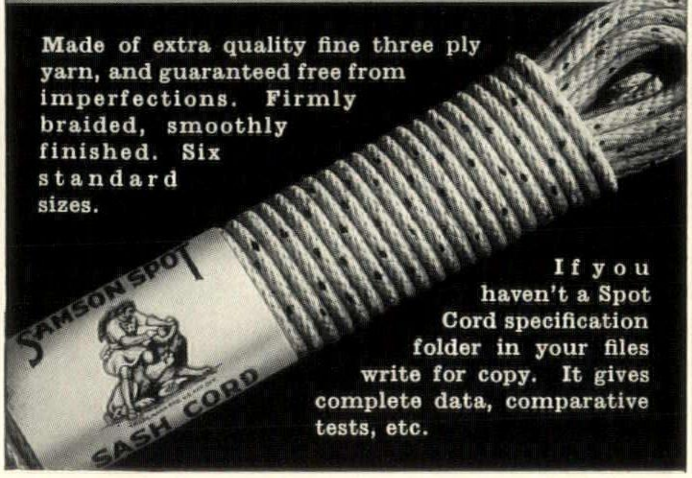

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