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INCLUDING "BUILDING MONEY"

DECEMBER, 1935

ALL HOUSE REFERENCE NUMBER • CONSTRUCTION • MATERIALS • EQUIPMENT

The Air Conditioning

STEEL WINDOW is here

It reduces heat loss through windows approximately 60 per cent.*

It eliminates condensation and frost under all ordinary conditions.

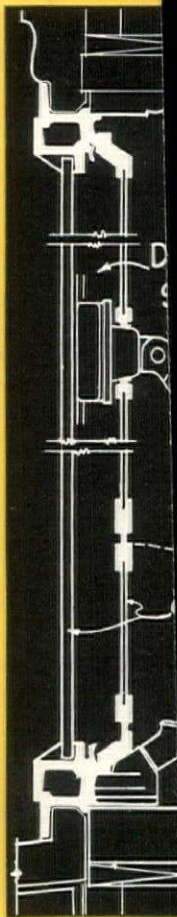
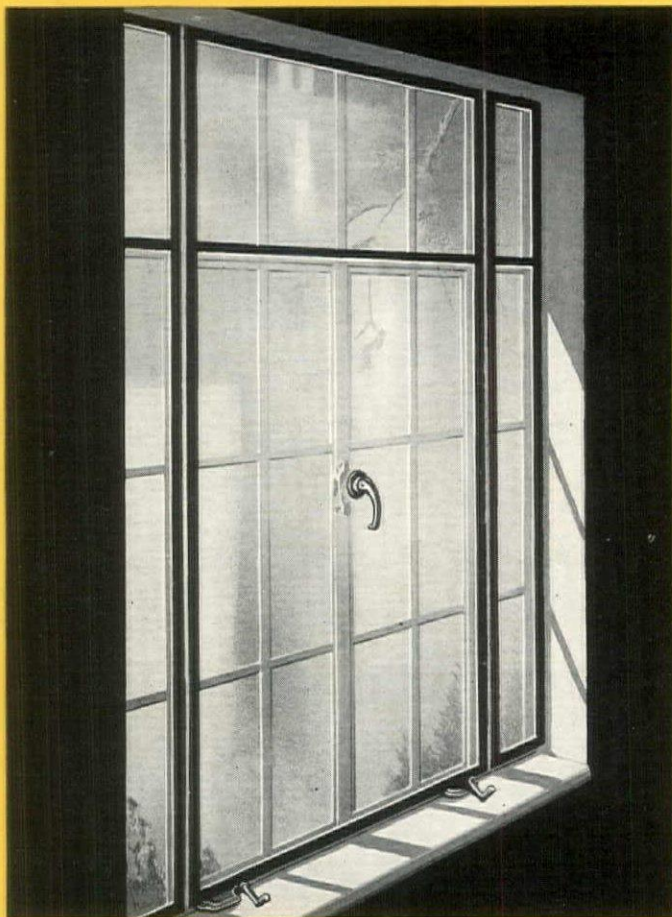
It saves fuel:—sometimes actually reduces the cost of heating equipment.

It reduces the load on the air conditioning system.

It is applicable to all standard types of Fenestra Screened Fenwrought Casements equipped with Roto-Adjusters.

It is removable to permit occasional cleansing of the inner glass surfaces.

It is attached to the inside face of the casement—easy to put on—easy to take off—preserves the attractive appearance of the window—all noteworthy advantages over storm windows.



Drawing above shows fixed-light "Air Conditioning" Window.
Vertical Section shows type with tilt-in sill ventilator.

*Heat loss through double windows is 60 per cent less than the heat loss through single windows according to figures indicated by the "Guide" of the American Society of Heating and Ventilating Engineers.

Double windows also solve the major problems that develop when humidity inside the building is high and temperatures outside are low.

To provide these advantages in a practical unit, easily handled, Fenestra offers "Air Conditioning" Windows rigidly attached, to Fenwrought Casements and baffled against heat transmission. With the casement closed and the "Air Conditioning" Window in place, insulation is provided equivalent to a fixed, double window with dead air space between the two frames.

If desired, Air Conditioning types can be supplied

with tilt-in sill ventilators which provide moderate ventilation when the casement swing leaves.

If you are interested in receiving further details or prices, sign and return the coupon. No obligation is implied.

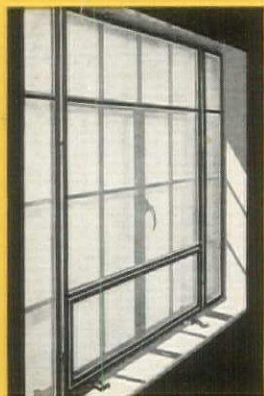
Detroit Steel Products Co.,
2252 E. Grand Blvd., Detroit, Mich.

Please send me details and prices of
Fenestra "Air Conditioning" Windows for
Type Fenwrought Casements with Roto-Adjusters.

Name

Address

Town State



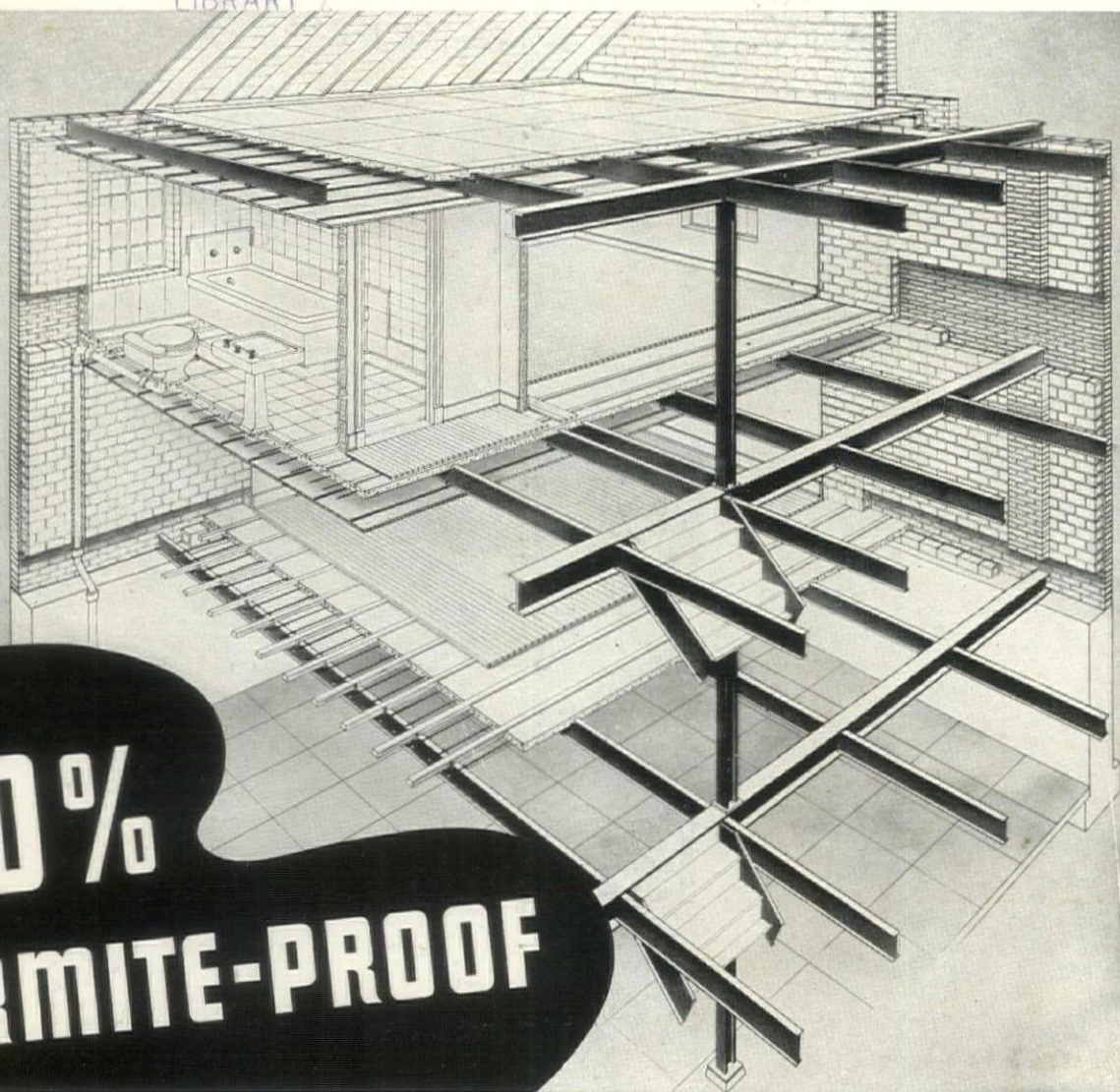
Casement and
sill vent closed.



Casement and
sill vent open (Exterior)

DETROIT STEEL PRODUCTS COMPANY
2252 EAST GRAND BLVD., DETROIT, MICHIGAN

Fenestra



**100%
TERMITE-PROOF**

One of the many important advantages of J&L Junior Beam Floors

When you specify J & L Junior Beam steel and concrete floors in modern homes, you eliminate any possibility of damage by termites because such floors are completely and permanently termite-proof. In addition, they have important structural advantages which make for economy in both first cost and upkeep. These floors are rigid, shrink-proof and vibration-free which means no plaster cracks, no twisted door frames, no parting of floors, no gaps beneath baseboards, nor any other undesirable conditions that may result from floor shrinkage. They are termite-resistant, simple in design, economical to use and easy to install.

Because of these important advantages, J & L Junior Beam floors have been installed in more than 4,000 modern homes in all parts of the country. They are also being specified widely by architects for churches, schools, apartment buildings, hotels and many other types of light occupancy buildings.

For complete information on Junior Beam Floors, send for descriptive bulletin.

**J&L
STEEL**

JONES & LAUGHLIN STEEL CORPORATION

AMERICAN IRON AND STEEL WORKS
JONES & LAUGHLIN BUILDING, PITTSBURGH, PENNSYLVANIA

Sale Offices: Atlanta Boston Buffalo Chicago Cincinnati Cleveland Dallas Denver Detroit Erie Los Angeles
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Warehouses: CHICAGO CINCINNATI DETROIT MEMPHIS NEW ORLEANS NEW YORK (Long Island City) PITTSBURGH
* Operated by National Bridge Works Division of Jones & Laughlin Steel Service, Inc.

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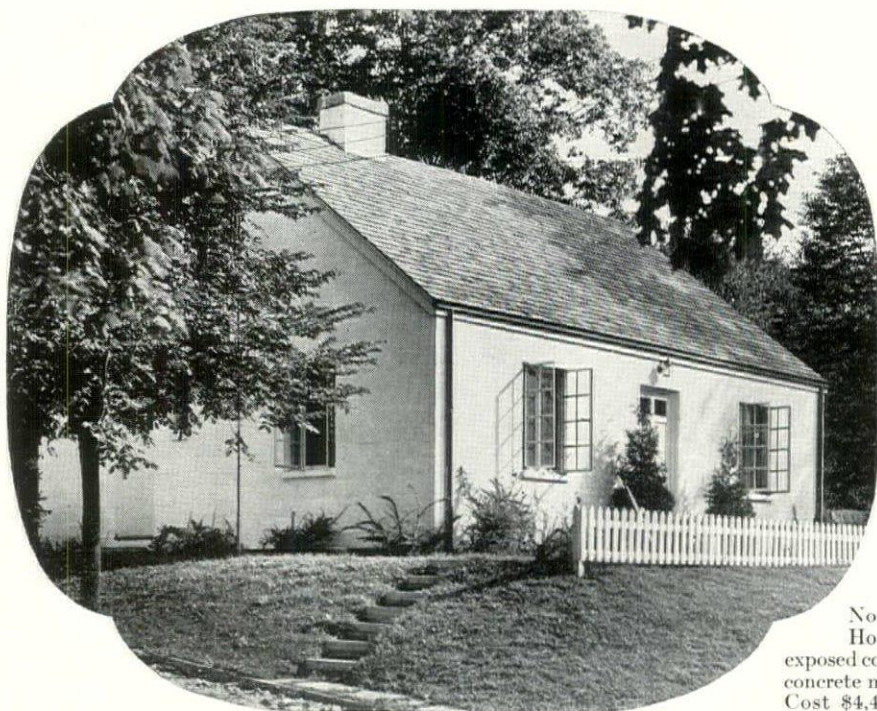
OTHER J&L CONSTRUCTION PRODUCTS

Steel Pipes . . . Bars for Concrete Reinforcement . . . Assembled Road Bar Mats . . . Standard Structural Shapes . . . Light Weight Channels . . . Tie Wire . . . Nails . . . Steel Piling . . . Fabricated Structural Work.



SEND FOR THIS FREE BOOKLET!

It explains and illustrates the many advantages of J & L Junior Beam Floors.



No. 54 of October *Forum's* 100 Best Homes. Concrete floors with exposed concrete beam ceilings. Cind concrete masonry walls painted white. Cost \$4,400. Bedford Hills, N. Y. C. Everett Burbank, Architect.

ARCHITECTS ARE BLAZING NEW TRAILS WITH CONCRETE

Everywhere you see evidence that architects are "thinking" in concrete as never before. Demonstration and exhibition homes show it. Many of the prize winners in recent competitions were designed with an eye to the modern beauty and sound values obtainable with concrete.

What the public thinks is shown by its enthusiastic acceptance of these homes.

Here's what concrete means to you:

Its versatility frees you from conventional design limitations; gives your ingenuity full play. Concrete lends itself equally well to modern design, or Cape Cod cottage. Permits precise specification of color and surface texture.

Here's what concrete means to your clients:

Recent engineering developments have greatly reduced cost of reinforced concrete and concrete ashlar walls. Rigid firesafe concrete floors are now so eco-

nomical that they can be specified in *all* the houses you build.

Concrete is low in first cost even for small homes—incomparably low in cost per year of occupancy because concrete endures.

You can promise maintenance-wary prospects that concrete homes cost little for upkeep—not merely for a few years, but for *decades!* That they're safe from the hazard of fire. That they weather the attacks of termites, time, storm and decay. That they're cool in summer and economical to heat in winter.

If you're not entirely familiar with all the newest developments in concrete construction for homes, write us for the facts. It's a great creative material that will give you new joy in your job.

CONCRETE *Ashlar or reinforced concrete walls with concrete floors and firesafe roof*
Builds the Carefree Home

PORTLAND CEMENT ASSOCIATION

Room 2712, 33 W. Grand Ave., Chicago, Ill.

Please send literature on subjects checked:

- ☐ Fireproof house design; ☐ Concrete residence floors; ☐ Concrete ashlar walls; ☐ Facts about concrete masonry; ☐ Reinforced concrete houses, construction details; ☐ Portland cement stucco; ☐ Quality concrete making.

Name.....

Address.....

THE MONTH IN BUILDING

VOLUME. Setting a new post-Depression record for the fifth time this year, the Department of Labor's October permit figure for 770 cities totaled \$34,373,000 for residential work, \$30,427,000 for new residential, and for additions, alterations and repairs \$22,345,000, totaling \$83,145,000.

More significant than the figures themselves was the fact that residential construction increased \$10,000,000 in October over September. In past years, a slump would have been normal. To many observers the increase foretold a steady climb throughout 1936, possibly reaching a monthly average somewhere around \$150,000,000.

Up till now, PWA housing has not bulked large in the total. Permits throughout the first ten months of 1935 for \$12,360,000 break down as follows:

VALUE OF PWA HOUSING INCLUDED IN BUILDING PERMIT FIGURES

1935	Amount
March.....	\$2,169,000
April.....	1,984,000
June.....	2,863,000
July.....	2,441,000
October.....	2,903,000

ALSO SHORTAGE. Time was, less than a year ago, when 4,500 names were listed on the help wanted roll of the Architect's Emergency Committee of New York. Last month Committee Chairman William E. Smith reported that the 4,500 had been reduced to 0. But as an indication of returned prosperity, the figures meant nothing, for the great bulk of the once-idled draftsmen are at work for one or the other of the several Government agencies temporarily engaged in building and related activities. As soon as work relief ends, but those few who have genuine jobs with private architects will once again be at leisure."

Of the original 4,500, private industry has provided jobs for only 1,200, the rest coming from relief agencies. A deplorable fact is that many architects have taken advantage of the low rate paid by the U. S. to keep men at wages far below the old scale.

HOLC UPHEAVAL. For the first time in two years, the Home Owners Loan Corporation caught its breath last month. Filled on the already over-taxed personnel of the Federal Home Loan Bank Board two and a half years ago, the job of running the HOLC has dwarfed all other activities of the FHLB and handicapped the effective

working of the Bank System. To right the wrongs produced by HOLC pressure, an upheaval occurred in the agencies controlled by the Board last month. The System was given a governor in Preston Delano, who had been general manager of the HOLC. Charles A. Jones was hoisted into the position of general manager of the

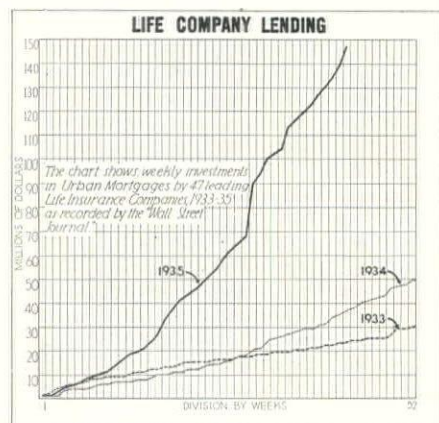


General Manager Jones

HOLC and Nugent Fallon was made general manager of savings and loan insurance.

The shifts led some to believe and dread that the HOLC was preparing for a long life. Many feel that when Congress returns, it will legislate for a permanent home relief bureau. There is, however, no sympathy for such a move within the HOLC, and private lenders will fight it tooth and nail.

LIFE LENDING. None of the trustee lending institutions has been so aggressive in returning to mortgage lending as the life insurance companies. Following an almost



complete stoppage of new loans during the past few years, life company mortgage loans had by last month swept to thrice

their value for the whole of 1934, or five times that for '33 (see chart).

Most of the insurance companies have changed their loan plans and have reduced their interest rates. The long term amortized loan for residential work is the typical rather than the unusual loan now being made by almost all insurance firms. Whereas the average rate of interest for the past few years has hovered around 6 per cent, it is now definitely below 5½ per cent.

Preference for home loans was asserting itself even over the old life company standby, central business property. In evidence, Milwaukee's Northwestern Mutual (sixth biggest), which has always loaned exclusively on commercial properties and farms, last month was making its first home loans in history.

OFFICE BUILDING VACANCY.

Since January 1, 1935 office building vacancies have been slowly dwindling. From an average vacancy of 27.57 per cent at that time, the percentage dropped to 26.00 for May 1, 1935. The October 1 figure for this year was 24.51 per cent which, though still a long way from the normal vacancy of 10 per cent, was most encouraging to commercial property owners. The figures for the last twelve years, as reported by the National Association of Building Owners and Managers, are:

Survey Date	Total Space Square Feet	Vacant Square Feet	Vacant Per Cent
Oct. 1, 1924	67,927,928	6,691,616	9.85
Oct. 1, 1925	111,121,685	10,205,312	9.18
Oct. 1, 1926	119,163,372	12,023,529	10.09
Oct. 1, 1927	111,730,525	12,147,902	10.87
Oct. 1, 1928	130,403,075	15,493,178	11.88
Oct. 1, 1929	140,141,074	16,192,510	11.55
Oct. 1, 1930	166,998,875	23,236,010	13.92
Oct. 1, 1931	177,879,232	32,617,176	18.34
Oct. 1, 1932	173,011,431	41,112,274	23.76
Oct. 1, 1933	178,234,794	47,957,798	26.91
Oct. 1, 1934	180,012,225	48,462,160	26.92
Oct. 1, 1935	189,741,704	46,498,614	24.51

VERTICAL UNION.

The internal scrapping among building trades is frequently as damaging to labor employers as the disputes between employers and employees. Many observers, without and within the American Federation of Labor, regard the setting up of a vertical union covering all building trades as the simplest way to end the recurring rifts among the trades. Though no such action is anticipated for several years, the alternative solution—reduction in the number of unions—would help end the bickering.

A sarcastic summary of the situation in the trades was made by the New York Building Trades Employers' Association

in a recent issue of its admittedly biased though no less entertaining bulletin, *News and Opinion*:

"The building construction industry is the Utopia of the crafts unions and only a man of long and vast experience in the field can begin to know all the myriad regulations, decisions, claims and agreements which are in existence. There are such peculiarities as the requirement that one union can drill holes up to $\frac{3}{8}$ of an inch, but $\frac{1}{2}$ -inch holes have to be bored by another union. Putting up a plain baseboard is one union's work. However, if the same board for the same purpose has a certain groove in it another union claims this erection. A shield fixed to a radiator is the work of a steamfitter. If it is not attached to the radiator it must be erected by sheet metal workers. Flat face tile laid in mortar is a bricklayer's job, laid in asphalt it is a roofer's task. These are but a few of a volume of examples which can illustrate the crazy-quilt nature of the crafts union structure in the building trades. We have yet to come to the insistence that only six-foot carpenters can drive eight-penny nails and that black paint is the exclusive work of one-arm painters, but such regulations may be in the making.

"A single vertical union of the building trades for skilled workers and another for unskilled workers would solve many difficulties. Such unions, however, are out of consideration for the present but eventually some vertical arrangement must come as the worn, cumbersome machinery of crafts-unionism in the building trades breaks down because of its weight.

"A more immediate and practical answer for the unions can be found, and it is high time for arriving at a solution. There should be no more than ten separate unions with whom the contractor need deal."

MORTGAGEE UNITY. Although they all lend money for building, the trustee institutions of the U. S. are scarcely on speaking terms. Furthest outside the pale of friendly feeling are the building and loan associations—11,000 of them—who are frequently thorns in the sides of other lenders. What should have brought them together, but didn't, was the threat of Federal usurpation of some of their functions. Each played a lone hand in trying to make terms with Washington, and only the building and loan associations had the political strength to be effective.

Not for the first time, but for the time with any ray of hope, a plan is afoot to bring about some measure of cooperative action between them. Faced with lowering interest rates, threats of further Federal lending, as well as the normal common problems of their business, four big groups—the savings banks, insurance companies, trust companies, and building and loans—may soon sit down together to talk over matters which patently concern them all. For the first half dozen sessions they may

do nothing but talk. But if they wipe away even part of the suspicious attitude which exists between them, they will have accomplished much.

ROCKEFELLER BUILDS AGAIN.

When he is in town, John D. Rockefeller Jr. lives on West 54th Street, just off Fifth Avenue, a good stone's throw from his commercial monument—Rockefeller Center. Because it has proved a convenient place for him to live, he concluded it would be convenient for other executives with space in his office buildings. And a conclusion with Mr. Rockefeller is just one step short of performance. Two new apartment houses opposite his own house on 54th Street, and running through to 55th Street will be ready for occupancy next Fall.

As architects, Wallace K. Harrison and J. André Foulhoux, both of whom had a hand in Rockefeller Center, have been retained. Affable but close-mouthed Charles O. Heydt, Rockefeller realty chief, would not talk specifically about the apartment group, but it was rumored with some certainty that the buildings would be air conditioned, and that glass brick bays for dinettes would run from sidewalk to roof.

What excited New York more than anything else was the possibility that Mr. Rockefeller was just beginning operations in that territory, and that eventually he would buy his way clean through to Central Park.

CANADIAN EMULATION.

When Canada adopts the counterpart of a U. S. law, it can be safely said that such a law has received a final stamp of approval. Thus might the authors of the National Housing Act have more than casually received the news when Canada passed its recent Dominion Housing Act. For while the new Canadian law does not exactly ape the NHA by stimulating housebuilding through a Government guarantee, it adopts many of the law's best features.

Greatest likeness between the two is in the emphasis they place on stimulating home construction through regular financial channels. Like the NHA, the DHA provides for the designation of approved lending institutions, seeks to promote 80 per cent loans, and their amortization over a 20-year period. The amortization payments are to include interest and taxes as they do in what has proved perhaps the most successful feature of the law in this country. An important difference is that through the supplying of Government funds at 3 per cent, an overall effective maximum interest rate of 5 per cent is to be maintained. Ten million dollars has been set aside as the amount thus to be spent. In addition, the Canadian law sets up no field appraisal staffs, and substitutes the writing of each mortgage jointly by the lending institution and His Majesty the King for our more complicated mutual mortgage machinery.

PUBLIC HOUSING. If Senator Ickes has his way (see page 638) next will witness a merger of Rexford Tugwell's Resettlement Administration and Ickes' PWA Housing Division. Until happens both organizations will continue as they have during the past months in the headlines. Though most printed news has centered around the announced work of the Resettlement Administration has been much more about within the industry itself. Emigrants were traveling the country over looking the best small houses that have been so far within the Tugwelltown price range. The trips were disappointing, from nothing more concrete developed than the conclusion that nowhere as yet has the \$5,000 house been successfully produced.

TEN-YEAR PLAN. Out of a series of informal dinners given by Raymond Moley to business leaders to cement relations between them and the Administration came the Committee for Economic Recovery. And out of the committee's work last month came a studied proposal to boost U. S. home production to an average of 750,000 for the next ten years. With personnel drawn from about 50 respectable businesses, within and without the building industry, the committee is headed by S. Freed, wealthy taxicab operator.

Of the twelve recommendations made in the report to the President, two were singled out as the root of the plan. The first was the reduction nationally of mortgage interest rates to $4\frac{1}{2}$ per cent, and second was the adoption of a sliding scale of down payments ranging from 5 to 20 per cent of the property value, dependent upon the cost. The minimum percentage of down payments as proposed was:

HOMES SELLING	PER CENT
Up to \$2,500	5.0
From \$2,500 to \$3,500	7.5
From \$3,500 to \$4,500	10.0
From \$4,500 to \$5,000	12.5
From \$5,000 to \$6,500	15.0
From \$6,500 to \$7,500	17.5
Over \$7,500	20.0

Presumably this new loan plan would be substituted for the one now sponsored by the Federal Housing Administration. And in conjunction with it, the mortgage insurance premium would be cut to $\frac{1}{4}$ of 1 per cent, and the service charge (now $\frac{1}{2}$ of 1 per cent) eliminated entirely.

The committee's program further stipulated the necessity of limiting the sale of Federally built and financed housing to families with an income of \$1,000 or less, the assumption that such a limitation would remove the dread of U. S. competition.

Other significant paragraphs from the voluminous report favored:

The education of the public to the advantages of saving through Federal savings and loan associations.

The transfer of home promotion to the Department of Commerce.

Of course you're interested
in the new

FORMED METAL PLUMBING WARE

NOT just new but definitely superior as well, formed metal plumbing ware is the outcome of the collaboration of three great industries. *Steel* developed the flawless sheets demanded by the deep draws involved. *Metal stamping* devised the giant presses, the accurate dies which form the sheets into light, graceful, strong tubs, sinks and lavatories. *Ceramics* created the improved wet-process, acid-resist-

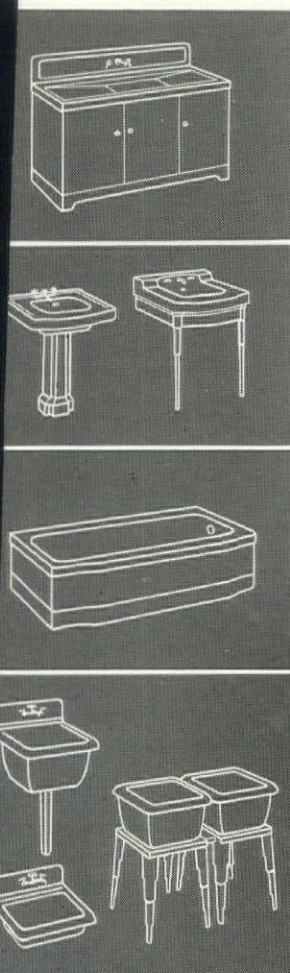
ing porcelain enamel which beautifies this modern ware.

Small wonder that these should usher in a product of rich promise for the architect. Formed metal plumbing ware excels in strength, yet cuts weight to nearly one-third, making it easier to install. And the porcelain enamel on this new ware is smoother, easier to keep clean, and retains its higher lustre much longer than less advanced finishes.

Your clients will quickly approve this new and better kind of plumbing ware. Its variety of rich, appealing colors and combinations; its acid-resisting porcelain enamel at no extra cost; its graceful modern styling; its genuine Armco INGOT IRON base—all these things assure acceptance—and satisfaction.

Write for complete information about formed metal plumbing ware porcelain enameled on the well known Armco INGOT IRON.

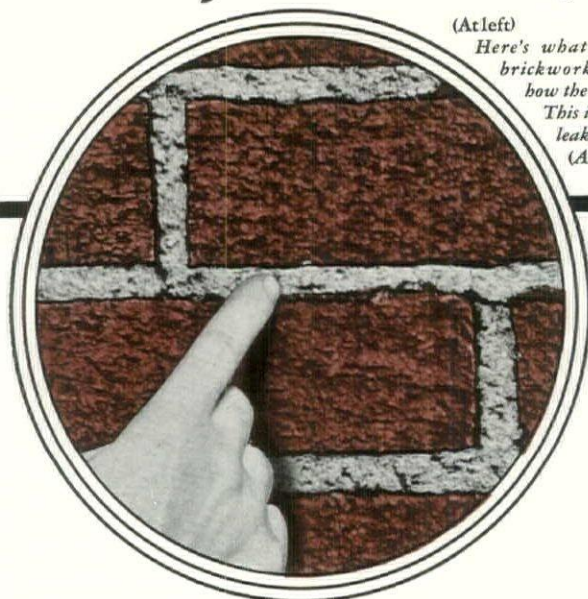
THE AMERICAN ROLLING MILL COMPANY
Executive Offices • Middletown, Ohio



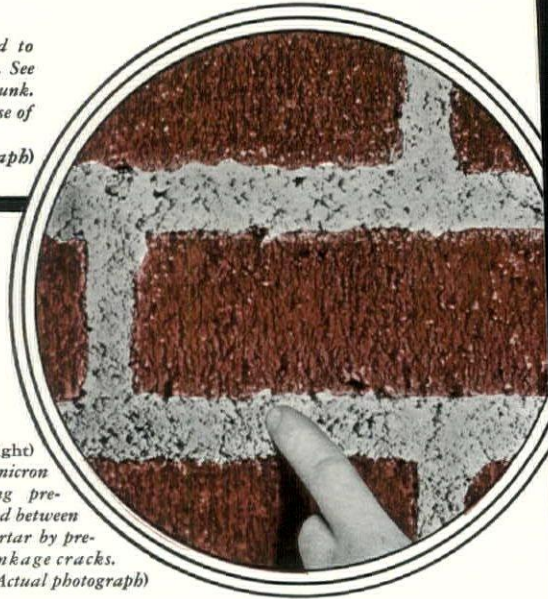
ARMCO INGOT IRON
THE WORLD'S STANDARD ENAMELING IRON

EXPLODED!

The age-old theory that brick walls MUST LEAK



(At left)
Here's what has happened to
brickwork for centuries. See
how the mortar has shrunk.
This is the REAL cause of
leaky masonry.
(Actual photograph)



(At right)
Here's how Omicron
Mortarproofing pre-
serves the bond between
brick and mortar by pre-
venting shrinkage cracks.
(Actual photograph)

Today, Omicron Mortarproofing Prevents Leaky Masonry by Eliminating the Cause . . .

● As every architect knows, the troublesome shrinkage in mortar occurs during the first 24 hours. It happens before any substantial bond has been effected with the brick.

During this critical period, Omicron Mortarproofing, an exclusive development of Master Builders, reduces shrinkage by more than half—thus it preserves and strengthens the bond—either with an ordinary mix or with patented masonry mortars.

This is not merely a claim, but a definite statement of fact based on broad experience in building important structures for the U. S. Military Academy at

West Point, Universities of Georgia and Tennessee, Baltimore City Hospital, Hiram Walker Distilleries Company, E. I. DuPont de Nemours, Carborundum Company and innumerable other cases.

The marked value of Mortarproofing has also been definitely and positively confirmed by impartial, independent tests made at the laboratories of Columbia University. The results of these tests with complete data on this revolutionary product will be sent to any architect upon request. Or, if preferred, Master Builders will gladly arrange for a convincing practical demonstration under your own local conditions.



The Palatial New Hershey Inn at Hershey, Pa.

Three years ago, the first building in which Omicron Mortarproofing was specified for the Hershey Products Company was built in Hershey, Pa. So successful were the results that the great Hershey Company now standardizes on Mortar-

proofing. To date, over 3,500,000 bricks have been laid for Hershey in Mortarproofed mortar. It was Mr. Paul Witmer of the Hershey Company who suggested the name "Brickwork Insurance," so generally used for this amazing product.

THE MASTER BUILDERS COMPANY
Cleveland, Ohio

STREAMLINE COPPER PIPE AND FITTINGS

THE PERMANENT, ULTRA-MODERN PIPING SYSTEM FOR PLUMBING, HEATING *and* AIR CONDITIONING

STREAMLINE Fitting is the original solder type fitting, introduced and manufactured by the Mueller Brass Co., Port Huron, Michigan. It incorporates many advantageous features not found in any other solder type fitting previously. It has proved to be the revolutionary advance of the age in the development of plumbing and heating and for many industrial uses.

STREAMLINE Fitting is not connected either by threading or flaring but by soldering. The outer surface of the copper pipe and the inner surface of the STREAMLINE fitting are cleaned with wire cloth, and solder flux is then applied to the cleaned surfaces to eliminate oxidation when the assembled joint is heated. The joint is then sufficiently heated with a blow torch and the soldering operation is performed by feeding wire or stick solder through the feed hole in the fitting.

Liquefied solder is carried around the entire surface between the pipe and fitting by capillary attraction, and becomes immediately visible as a bright line at the outer edge between pipe and fittings, thus affording unfailing visual evidence that a leak-proof, bonded joint has been completed. No previous tinning is ever necessary.

See following
pages

STREAMLINE Fittings are furnished in sizes from $\frac{1}{4}$ " to 12" inclusive with a full range of reducing sizes. STREAMLINE Copper Pipe is furnished in government types K, L and M in both hard and soft tempers.

Send for
Catalog F

STREAMLINE
PIPE AND FITTINGS
PORT HURON, CO. MICHIGAN
DIVISION OF MUELLER BRASS CO.

STREAMLINE ALONE HAS THE SOLDER FEED

HOLE, GROOVE AND TAPER



.. these are patented features and cannot be incorporated in any other **SOLDER-TYPE FITTINGS.**

THERE are several exclusive mechanical features utilized in the construction of STREAMLINE Fittings which all have a very important function when connecting the copper pipe.

The solder feed hole, through which the solder is introduced, enters directly into an internal feed channel. The feed channel is located equidistantly between the internal shoulder against which the pipe rests and the outer edge of the fitting. When solder is introduced it is distributed by capillarity from the feed channel and distributed evenly and thoroughly between the bonding surfaces, traveling inward to the shoulder and outward to the edge of the fitting where it appears as a continuous solder ring around the full circumference of the pipe.

This ring, and feed hole completely filled with solder, constitute positive proof to the operator that the joint is permanently leak-proof. An actual pressure test is not necessary.

The tapered ends, since they are the thinner sections of the fitting, hasten the cooling of the solder at these points and facilitate the completion of the joint.

Note This Particular Feature

The solder may be fed from any position, whether the feed hole is located at the top, side or bottom. Owing to the never failing phenomena of capillarity, the solder will flow up, down or laterally with equal facility.

STREAMLINE COPPER PIPE AND FITTINGS

For New Construction

● Even though you have already planned to use "ordinary" pipe and fittings, you can change to STREAMLINE Fittings and Copper Pipe. The additional cost is slight in comparison to the cost of the building . . . and the protection is PERFECT. With STREAMLINE Fittings and Copper Pipe inside the walls you need have no fear of pipe failure, damage to walls, ceilings and furnishings, expensive repairs and inconvenience. Procure the life-long protection of STREAMLINE Fittings and Copper Pipe . . . the cost is surprisingly low.

Remember, too, that no matter how modern and expensive the bathroom and kitchen fixtures may be, they can be rendered practically useless by a faulty plumbing system. A building, like a human being, is only as young as its arteries.

For Remodeling . . .

● If your building at present, is equipped with the rustable type of pipe and fittings, it is probably beginning to give trouble. If not now, it is inevitable, that in a comparatively short time, it will. The pipe will clog, rust, leak, and deliver impure and rust-stained water. Why not for safety's sake and your own satisfaction, have the present worn-out system replaced now with STREAMLINE Fittings and Copper Pipe . . . have it done BEFORE the damage hap-

pens. Don't make the mistake of replacing the worn-out plumbing or heating system with another system of rustable pipe and fittings that will again, in a few short years, begin to give you trouble. Put in a STREAMLINE copper system—your complete protection against pipe hazards and future repair bills.

This Matter of Cost is Important

● STREAMLINE Fittings and Copper Pipe in certain installations may cost more than ordinary threaded iron pipe and fittings—but the possible extra cost is so little, considering the trouble-free service it gives, that it is relatively unimportant. For instance: In the average six to eight room house costing from \$5000 to \$8000, the extra cost of a STREAMLINE installation would range from about \$15.00 to possibly as much as \$30.00, in some instances, depending of course, on the extent of the plumbing and heating system.

Universally Used

● STREAMLINE Copper Pipe and Fittings are being successfully used in hundreds of different industrial applications. Their installation insures an absolutely tight connection in electric refrigeration work, gas, oil, air and vacuum lines or for the handling of liquids of lowest specific gravity, such as gasoline, butane, etc. which readily seep through threaded connections. Freedom from vibration, freedom from clogging, and their tremendous strength and resistance make them particularly advantageous in industrial and commercial structures. They are being extensively used in paper mills, power plants, filtration plants, radio stations, vinegar mills, marine work, breweries, distilleries, etc.

With all its structural and economical advantages, the greatest value of a STREAMLINE installation is that its joints are perfectly bonded and absolutely tight, so that it cannot clog or rust and will outlast the building in which it is installed.

VISUAL PROOF

● When the plumber or steamfitter makes a joint with a STREAMLINE Fitting and Copper Pipe he can tell at a glance that the joint is leak-proof and permanently tight, by the appearance of the solder as a complete ring at the end of the fitting. It is his visual evidence of work well done.



**STREAMLINE
PIPE AND FITTINGS**
PORT HURON, CO. MICHIGAN
DIVISION OF MUELLER BRASS CO.

Realtor

- Realtors are finding that an installation of STREAMLINE Copper Pipe and Fittings is the ultra modern sales lever for renting or selling either new or reconditioned property. It is fast replacing rustable materials because it gives the home or building owner a lifetime of trouble-free service. It is the strongest insurance against rust, leaking and clogged pipes, damaged furnishings and expensive repair bills. Additional equipment, if necessary, may be installed for future expansion easily, quickly and with a minimum of interruption. STREAMLINE has only one cost and that is its first one.

Operative Builder

- "Keep down overhead" is the slogan of the operative builder. STREAMLINE solves his constant worry of future costs by its permanence, economical installation and conservation of valuable space. Remember, too, copper pipe transfers the heating element (steam or hot water) from the point of generation (boiler) to the radiators quicker and with less drop in temperature. The joint is permanently tight. Vibration, expansion or contraction cannot loosen the perfect bond between pipe and fittings. Leaks, clogged pipes and rusty water are entirely eliminated.

Building Contractor

- The building contractor necessarily constructs in an attempt to provide the finest service and materials at the lowest cost in keeping with good workmanship. Remember that although the piping may actually be installed by a sub or plumbing contractor, the responsibility of satisfactory service rests squarely upon the shoulders of the building contractor. It is important, therefore, to insist that all sub-

contractors under the general contract use materials will relieve you of all worry of a possible "comeback" on your own interests, be sure that your bids from the plumbing contractor include STREAMLINE Copper Pipe and Fittings. STREAMLINE not only maintains but actually builds your reputation. Experience, too, has shown that a worker's familiarity with STREAMLINE materials soon points the way to many economies in labor and material costs such as greater ease and rapidity of installation and reduction of corresponding pipe sizes. The contractor's job of checking and testing is facilitated by STREAMLINE'S valuable VISUAL INSPECTION FEATURE.

Architect and Engineer

- During the last five years architects have specified and used STREAMLINE Copper Pipe and Fittings successfully in every type of building construction and in thousands of installations throughout the United States and Canada. STREAMLINE Fittings and Copper Pipe are revolutionizing plumbing and heating installations—in their method of connection, which eliminates costly heavy wall pipe—in their long life—and last, but not least, in the fact that they place a non-rusting, non-clogging piping system within the reach of the ordinary investor. A STREAMLINE INSTALLATION COSTS LITTLE IF ANY MORE THAN ONE OF CORRODIBLE MATERIALS.

Absolute safety in concealed work, maximum efficiency in heat transference, conservation of valuable space and freedom from the harmful effects of vibration are but a few of the many advantages of this product.

May we send you a list of recent prominent STREAMLINE installations with the names of the specifying architects?

Consider STREAMLINE in your next specification.

STREAMLINE products including fittings are manufactured under one or more of the following United States patent numbers: 1,770,852; 1,776,502; 1,783,088; 1,801,171; 1,866,857; 1,870,651; 1,881,943; 1,890,998; 1,895,426; 1,916,989; 1,918,715; 1,921,584; 1,931,666; 1,933,915; 1,938,194; 1,963,421; 1,964,474; 1,974,963; 1,986,010; 1,995,006; 2,001,538.

STREAMLINE COPPER PIPE and FITTINGS

**STREAMLINE
PIPE AND FITTINGS**
PORT HURON, CO. MICHIGAN
DIVISION OF MUELLER BRASS CO.

LETTERS

SMALL HOUSES

October, 1935, Issue)

vs. Old Financing

[our] attempted comparison of a present FHA financing plan with a typical old financing plan is based upon a false premise and is a ridiculous inaccuracy. This comparison uses a \$5,000 property as an example. Under the so-called old plan, the lender made a 10 per cent down payment in the amount of \$500. The author attempts to convince the reader that a \$2,500 first mortgage is written for a term of only three years and has to be repaid at each maturity at a 3 per cent renewal fee, thus piling up a total of \$450 in renewal fees. The fact is, a vast majority of recognized lending institutions of this country have been making 10 to 15 year mortgage loans for a long period of time. Even in cases where loans were written for a shorter term, no self-respecting mortgage banker ever charged renewal fees as high as 1 per cent per annum or 3 per cent for three years.

Under the so-called new FHA plan, the lender in the October issue of THE ARCHITECTURAL FORUM presumes that the home buyer will make a 20 per cent down payment, or \$1,000. Obviously, the larger the down payment, the less the interest charges on the unpaid balance. Hence by establishing the down payment at \$500 in the old case and at \$1,000 in the new case, the \$500 differential is not subject to interest charges. In this case the author has unfairly padded the old plan with 6 per cent annual interest on an extra \$500, thus creating a \$30 additional annual interest charge or a total overcharge amounting to \$600 for the 20-year term.

Any disinterested observer will wonder where the home buyer, under the new plan, will find his \$1,000 down payment. Apparently, in the good old days, when wages and income were much higher than present, said home buyer was only able willing to make down payment of half at amount.

Without disturbing or criticizing said author's schedule of the total cost of the new FHA plan, we make the following corrections in his schedule of the old plan:

Down payment of 20%	\$1,000.00
Interest at 6% on \$2,500 first mortgage, term 10 years, renewed once at maturity, over 20 years, \$150.00	3,000.00
Renewal fee, once at end of 10 years at 2%	50.00
Interest and amortization on 5-year second mortgage of \$1,500 at 6% (yearly principal payment \$300, interest \$90) \$270.00	1,770.00
Balance paid or due at end of 20 years	2,500.00
	\$8,320.00

Thus, the \$8,320 total under the old plan is slightly more than the \$8,115 total under the new FHA plan.

GEORGE H. PATTERSON

Secretary

Mortgage Bankers Association of America
Chicago, Ill.

Subscriber Patterson and other complainants are correct in their statement that some forms of mortgage loans were cheaper than the present FHA type. For comparison THE FORUM took neither the best nor the worst type of old lending plan but simply the most common method of financing. THE FORUM doubts that a "vast majority" of U. S. lending institutions, except building and loan associations, were making ten and fifteen-year first mortgage loans. As evidence that the FHA is helping to change the thinking of mortgage bankers, a change which would have come more slowly had there been no FHA, is the universal recognition of the superiority of long-term, periodically amortized loans.—ED.

Cubage

Forum:

Did you have one method of computing the cubage for all the houses shown in your October issue, or did each architect submit with his own material, his cubage?

T. H. PROVINCE

Head of the Department of Architecture
University of Illinois
Urbana, Ill.

Cubage from the architects.—ED.

\$981 vs. \$982

Forum:

Will you kindly hand this little photograph of my 10th-of-the-month hide-out at Palm Springs to those distinguished economists, brilliant bookkeepers and Scotch pipers Kocher and Frey (No. 61, October House Number). It's really a shame to waste a Malibu Beach opus like that on Long Island, wherever that is.

You will set me down for one of those impossible Californiacs when I say that for something right off the fire in dollar and cents results, Cook and Fry have nothing on Me, Schindler, Neutra, etc.

Construction Lineout

Cost \$981 (one up on you, K and F!)

Dobe by Immanuele Garcia and Innocente Duarte

Built-in cream separator and lawn mower by Sears and Roebuck.

Glass—1 sash, shown in picture.

Roofing—none needed.

Plumbing—semi-annual, Montgomery Ward.

Planting—smoke tree, shown in picture, by Hernando Cabillo, 1543. Our cactus doesn't show.

Bath—sunbathing only—in the pitipatio.

Iron Work—Fire dogs and poker we picked up in Death Valley last winter. We, too, were going to have a fashionable iron stairs up to a sundeck, but we've just had to omit the roof to get in under that pesky \$982.



PURCELL HOUSE

One up on Kocher & Frey

Well my face has never been so red—but the above is sufficient to show any unbiased A.I.A. that for real Building Money we can go farther and fare worse out here in the greasewood than is possible amongst "the banks and breaks of Bradstreet and Doom." Let A. Lawrence and Albert F. declare themselves, let Northport speak forth. Were these Maria Teresa dollars from Abwis Abwawa or did the Boy Scouts and the CCC's supply the labor?

WILLIAM GRAY PURCELL

P.S. Persiflage aside, that vacation house is a real contribution to the current needs, both spiritual and fiscal. It's like the first jump in the lake after a long winter. The best item in your S.H. Reference Number.

Portland, Ore.

Annual

Forum:

... An annual issue of this sort would be a permanent contribution to the improvement of small house design.

JAMES GAMBLE ROGERS, II

Winter Park, Fla.

Do other subscribers agree?—ED.

Criticism

Forum:

... I wish to congratulate you on the issue, it being, I believe, the most useful professional publication I have ever received. I would especially refer to the innovation of editorial criticism in connection with the publication of a project. There may be some who will resent this, but I feel personally that the criticism, especially if adverse, is extremely helpful. I would suggest that this policy be continued.

MILTON L. GRIGG

Charlottesville, Va.



The ELKAY "CUSTOM BUILT" Stainless Steel Sink is the Last Refinement in the New American Kitchen

Never before has there been such a great demand for modern kitchen equipment as today. The modern housewife demands efficiency in her kitchen just as her husband demands efficiency in his business and factory.

Sensing this demand, ELKAY has designed the new and modern "All American" Stainless Steel Sink. It has everything—Appearance, Beauty, Utility, Attractiveness, Cleanliness, Convenience and Space Economy. Sink made of the finest quality heavy gauge Stainless Steel or Monel Metal, sound deadened and insulated. Can be arranged with or without electric dish washer. It is furnished with a strainer. All corners in sink bowls are rounded for sanitation and to facilitate cleaning. Drain boards are pitched to sink bowls to insure proper drainage. Here's the last word in efficient kitchen equipment—the latest refinement for the New American Kitchen.

Write today for detailed information, illustrated catalogs and prices of Stainless Steel Kitchen Sinks, ELKAY Shower Stalls, and other ELKAY specialties.

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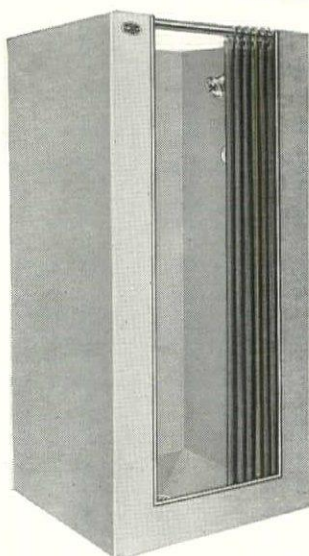
4703 ARTHINGTON STREET
CHICAGO, ILLINOIS



A typical modern ELKAY installation with stainless Steel Sink. All ELKAY Sinks are "custom built."



LK-60-S



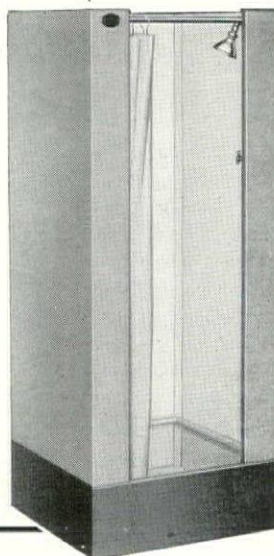
THE ARISTOCRAT
INTEGRAL UNIT TYPE

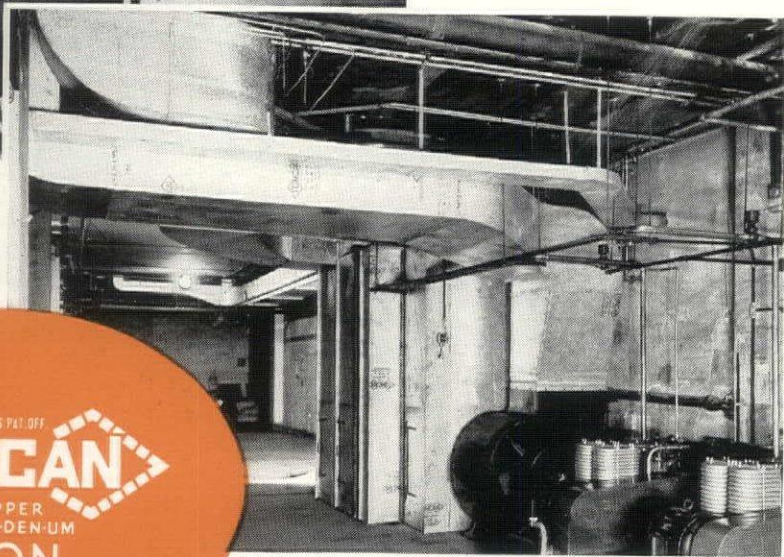
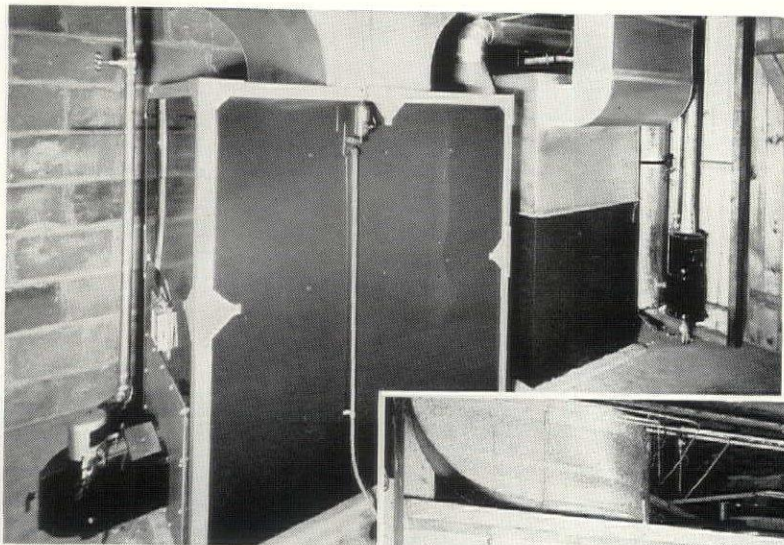
with the high standard they had set for this home. It has beauty, style and durability. ELKAY Shower Stalls are sturdily constructed of high quality heavy gauge copper bearing steel. They are sanitary, leak-proof and watertight. Among other exclusive ELKAY features are Flush type curtain rod flanges and Universal Strainers for caulking two-inch lead, iron or soil pipe.

THE AMBASSADOR
KNOCK-DOWN TYPE

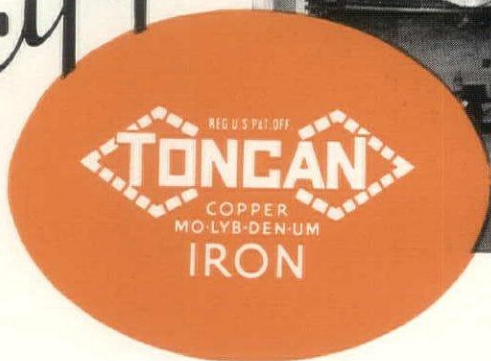
ELKAY *are the Preferred* **SHOWER STALLS** *for the* **New American Homes**

When the Dayton, Ohio Real Estate Board planned their "HOME OF TODAY," they selected the ELKAY ARISTOCRAT Shower Stall in keeping





Specify



FOR AIR CONDITIONING DUCTS

The selection of trustworthy sheet metal for air conditioning ducts is a serious matter. The building owner realizes this fact better than architects and engineers who have seen the expensive results of misplaced confidence in cheap materials. Republic metallurgists have labored for years to reduce the ravages of rust. The result is Toncan Iron, a sheet material that is now proving its worth in ducts in every type of building everywhere.

There is no secret about its composition. It is an alloy of refined open hearth iron, copper and molybdenum. It has a record of 27 years in every type of service. It has stood the test of time exposed to weather, moist, heated air, steam and chemical fumes. It imposes no hardship on the sheet metal contractor, because it fabricates more easily than most sheet metals. In fact, many contractors prefer to use it even

when it isn't specified, because it cuts their production costs. And it always pleases the building owner, because it reduces replacement expense and costs less per year of service.

Sweet's Catalog File will tell you more about this money-saving, good-will-building material, or, if you'll write us, we'll be glad to send you complete descriptive literature.



Republic Steel
CORPORATION
GENERAL OFFICES... YOUNGSTOWN, OHIO

FORUM OF EVENT

CONDITIONED AIR

NEXT month (Jan. 27-31) will focus the sometimes distraught attention of the building industry upon air conditioning as the Fourth International Heating and Ventilating Exposition opens in Chicago. Grouped in the new International Amphitheater will be the country's latest quirks in heating and ventilating, in cooling air, filtering air, manufacturing temperature, humidity. One point exhibitors at the show were prepared to agree upon: air conditioning is no longer a novelty or an expensive luxury; it is fast approaching the commonplace in all new construction. To back up these statements the exhibitors could point to

Hershey, Pa. the Lebanon Valley town of 2,500 where Chocolate Manufacturer Milton Snavely Hershey has built a model town for his workers. Latest Hershey addition, now being built according to plans by D. Paul Witmer of Hershey Lumber Products, is a three-story windowless office, completely air conditioned. The air system will have a capacity of 135 tons of refrigeration a day, the fan, grille and duct system will circulate 90,000 cu.ft. per minute. The roof will be a dead level concrete deck holding two and a half inches of water to act as an insulator. Extraordinarily enthusiastic about the new building, its controlled atmosphere and scientific lighting, Hershey executives did not lose sight of the fact that workers in windowless offices are still likely to want to know what the outside weather is like. Accordingly in every office will be placed a small brass panel with red, white and green lights set into it. Hershey workers, by glancing at the panel, will know that the weather is clear if the white light shines, cloudy if the white and green, rainy if the red, etc.

Toledo, Ohio. Pride of the Owens-Illinois Glass Co. is its glass brick. Last month Owens-Illinois announced that it was building a research laboratory entirely of glass brick. Like the Hershey office, the laboratory will be windowless but natural light will be diffused through the bricks. The Owens-Illinois roof will be insulated with glass wool and the air conditioning system will use glass wool as filters. The building will have two stories. On completion it will be fully reported in THE ARCHITECTURAL FORUM.

Dearborn, Mich. Henry Ford's Dearborn Inn has one hundred guest rooms, one hundred concealed ducts to each of the rooms. Control of the cooling system is in twelve zone units and temperature varies according to the position and intensity of the

sun. An outdoor spray pool cools the circulating water and returns it to the system at 750 gallons per minute. The management's chief trouble with new guests is persuading them not to open their bedroom



MR. FORD'S INN
Guests must not open the windows

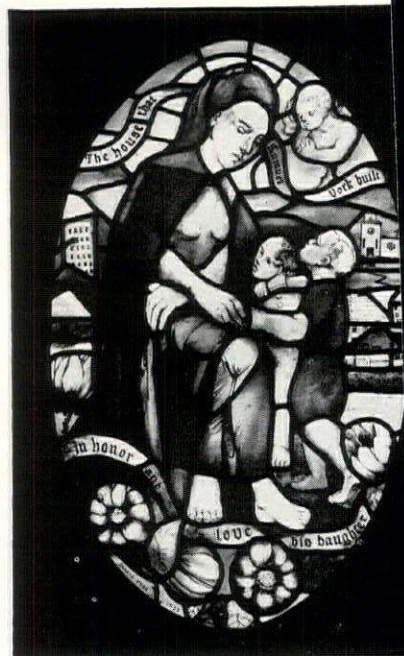
windows. But that the system is a commercial advantage is indicated by a continued occupancy varying between 90 and 100 per cent.

Another Ford project now under way is a new park at the entrance of the famed River Rouge plant. Designed as a reception center for guests the park will be dominated by a Bedford limestone replica of the Ford Century of Progress rotunda which will contain a theater, exhibition space. Feature of the park will be the "Roads of the World," a strip which will reproduce 23 kinds of road construction from ancient Chinese and the Appian Way to corduroy roads and concrete. Able Marshall L. Johnson of Ravinia, Ill., is the landscape architect.

STAINED GLASS FOR HOMES

PRUDENTIUS, the early Christian poet, records that in 373 he saw a church with windows of colored glass, "brilliant as colors of flowers in spring." A commentator today would still find most stained and colored glass in churches. But many an able glass designer has lately been attempting to spread the use of stained glass. Latest recruit to these is a young Scranton, Pa., girl who in Munich, Germany, has been creating stained glass windows for homes, hopes to persuade U. S. architects and home owners to adopt them here. Proud is Miss Gladys York that her glass is "pure, hand-quality stained glass, in no sense to be confused with manufactured colored glasses." For approximately \$150 Miss York will design a window, 3 x 1½ ft., and treat the subject in any manner or style that the client wishes. Although an ecclesiastical manner generally tempts most of Miss York's clients, she can and

has produced modern designs. The windows may fit easily into huge but their creator prefers them in particular in subdivision homes where made-to-order stained glass windows will be the only distinctly individual in the house. Typical of the York is a symbolic window she recently completed for a Munich family and which month she was exhibiting in the Hills, Long Island, Community (see cut). The design here suggests Madonna or the mother, two children



STAINED GLASS WINDOW
The home becomes personal

angel representing a child long dead, a background of the hills and coal fields whence issued the family's income. The mother also suggests mourning for deceased husband, Samuel, whose name appears in the legend chosen by the family. The window is approximately 3 ft., 3 in. x 2 ft., 3 in.

DETROIT ARTISAN GUILD

OUTSIDE Detroit is Cranbrook and the U. S. art world knows Cranbrook for Sten W. J. Jacobsson, Stockholm born and Carl Milles. But Cranbrook is Detroit's only claim to lusty artistic faculty. A small, sturdy organization called the Artisan Guild has been attracting increasing attention as its students turn out sculpture, painting and ceramics that manage to show individuality while carrying the unmistakable earmarks of a common, defined school. Prime mover of the Artisan Guild is Sten W. J. Jacobsson, Stockholm born and a onetime student in his native land, France and Germany. Before he established

(Continued on page 52)

THE CORRECT SOLUTION TO THE SEEPAGE WATER PROBLEM

MODEL 33

Made in 1 size only
Maximum Capacity
1400 Gals. per Hour
Retail Price
\$39.50 f.o.b. Detroit



AUTOMATIC ELECTRIC SUMP PUMPS

Copper and Bronze Throughout



The architect who is confronted with the problem of removing seepage water and keeping a basement dry, will find one of these Penberthy Pumps to be the logical solution. Ruggedly constructed of copper and bronze throughout, they are thoroughly dependable, compact and easy to install. They are carried in stock for immediate delivery by plumbing wholesalers everywhere.

PENBERTHY INJECTOR COMPANY

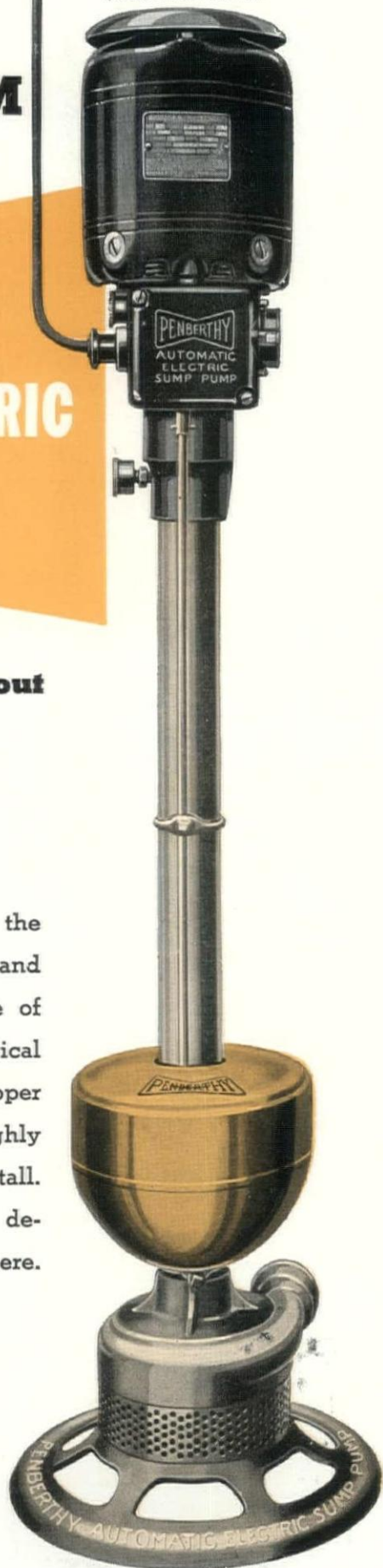
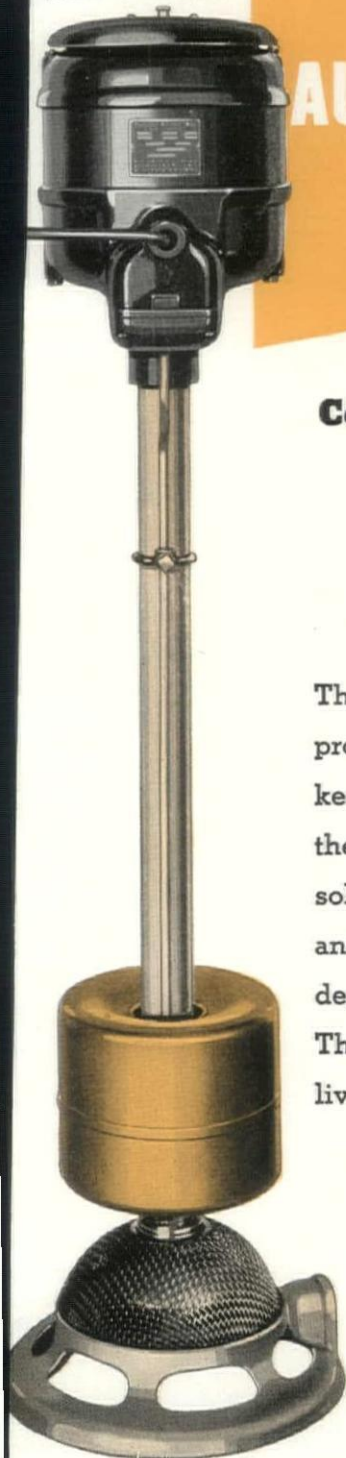
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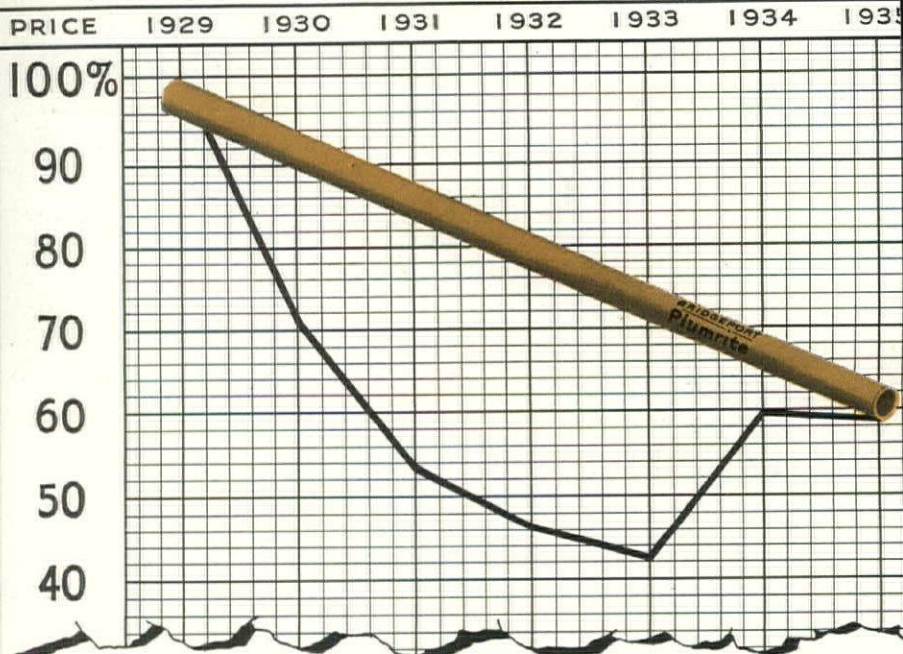
BRASS PIPE... COPPER WATER TUBE.

Look at the Prices!



"Bridgeport"
TRADE MARK

TREND OF BRASS PIPE PRICES 1929 to 1935



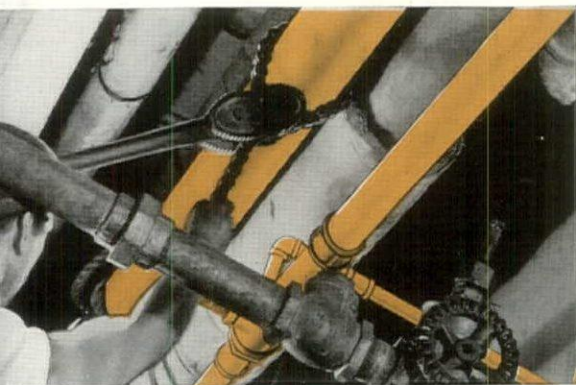
Today's Outstanding Bargains in Building Materials

COMPARED with the prices of six years ago, some building materials, such as cement and lumber, are about the same now as then.

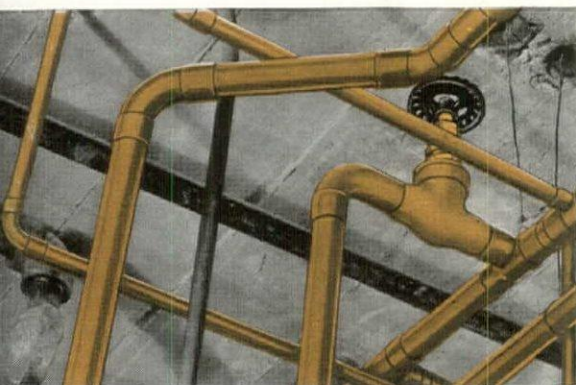
But owing to the abnormally low price of ingot copper, brass pipe and copper water tubing are now selling at much lower figures than 1929 levels.

Today, architects and builders can figure on doing the job right—without being open to “high-cost” criticism. They can logically choose the long life and corrosion-proof service of brass and copper. Brass, industry’s No. 1 material, should be specified where utmost strength and durability are essential, especially for larger buildings . . . and copper tubing when economy dictates.

Bridgeport Plumrite Brass Pipe and Copper Water Tube are builders of good will and satisfaction on jobs of every type. Write for complete data and these two booklets: “Water Pipe Sizes,” and “Bridgeport Copper Water Tube.”



BRIDGEPORT BRASS OR COPPER PIPE—for installations requiring the utmost in strength and permanence.



BRIDGEPORT COPPER WATER TUBE—highly economical and serviceable—rustproof, easy to install.

Plumrite 85%, and Copper Pipe
—for corrosive and artesian well
waters, and under-ground service.



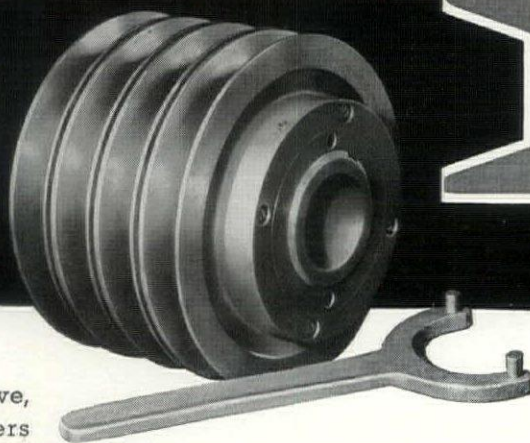
BRIDGEPORT

BRIDGEPORT BRASS COMPANY . . . Estab. 1865 . . . BRIDGEPORT, CONNECTICUT

Cross-section of Vari-Pitch Sheave and Texrope Belt adjusted for maximum diameter—high speed.

Cross-section of Vari-Pitch Sheave and Texrope Belt adjusted for minimum diameter—low speed.

THE NEW Vari-Pitch TEXROPE SHEAVE



● The new Vari-Pitch Texrope Sheave, now offered by the Allis-Chalmers Mfg. Co., represents a vitally important development in power transmission. ● By a simple adjustment, which takes but a few moments, the diameter of this new sheave can be altered so as to give a variation in speed of from 15 to 25 per cent per sheave; if both sheaves are of this type a 30 to 50 per cent variation in speed is possible. This permits you to take advantage of higher speed cutting tools; it permits you to experiment with different speeds to ascertain at just what speed your machines show the greatest efficiency; it permits you to make

different products, some of which require higher speeds and some lower — and do all this without dismantling and buying new drives, but simply by taking a few moments to make the desired adjustment. ● Vari-Pitch Texrope Sheaves are for manual and automatic adjustment. The manual type is recommended for applications that require occasional changes of speed. For applications that require frequent changes the entirely automatic type is recommended in which speed can be instantly varied to full range while the drive is in operation.

TEXROPE

DRIVES

ORIGINATED BY



ALLIS-CHALMERS

ALLIS-CHALMERS MANUFACTURING COMPANY • MILWAUKEE, WISCONSIN

...on to Chicago

...on to Prosperity



EVERY other year brings this opportunity to advance the welfare of all whose interests are affected by the latest developments in the design, production, sale, installation, use and maintenance of materials, equipment, instruments, tools and supplies for heating, cooling, humidification, dehumidification, cleaning and moving of indoor air for domestic, business, industrial or public use to promote health, comfort and efficiency.

Comprehensive exhibits by leading manufacturers of inestimable value to every forward-moving man and organization in the profession, trade and industry.

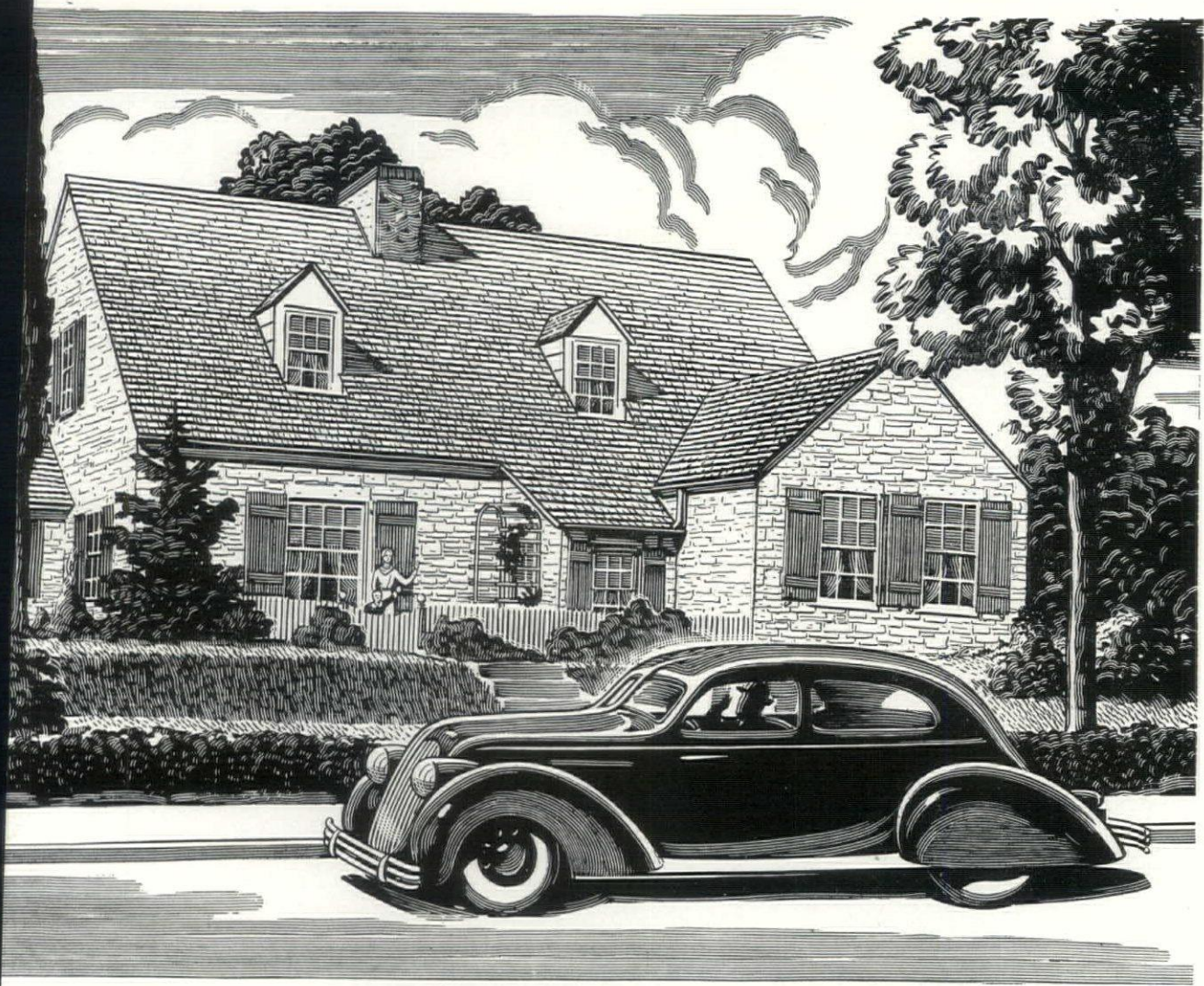
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MANAGEMENT, INTERNATIONAL EXPOSITION

THE AIR CONDITIONING EXPOSITION
**FOURTH INTERNATIONAL
HEATING & VENTILATING EXPOSITION**



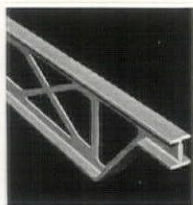
SOMETHING BETTER

A 1920-model automobile would be hard to sell today at any price. The motoring public have grown accustomed to something better. They are thinking in terms of riding facilities, smoothness and power that no car possessed fifteen years ago.

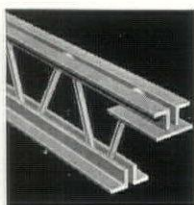
Likewise, the man who invests in a new home today expects something better than a dwelling of the type that only a few years ago was accepted as the last word. He's interested in fire-safety, conditioned air, and other advances that add so much to comfort and livableness.

Kalman Steel Joists are an important aid to the architect in providing a really

modern home for his client. Combined with concrete floor slab and plaster ceiling, these joists make a home virtually fire-safe. They greatly facilitate the installation of air-conditioning. They provide a rigid, substantial, non-shrinking, termite-proof floor structure that makes any home a sounder investment, less likely to require costly repairs, less subject to swift obsolescence.



KALMAN JOIST



MACMAR JOIST

In spite of all they contribute to the safety, livableness and permanent value of a home, the use of Kalman Joists adds only slightly if at all to the building cost. They can, of course, be applied to a dwelling of any size and any type of architecture.

KALMAN BUILDING STEEL

KALMAN STEEL CORPORATION
Subsidiary of Bethlehem Steel Corporation
GENERAL OFFICES: BETHLEHEM, PA.



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AMERICAN
SHEET AND TIN PLATE COMPANY
PITTSBURGH
APOLLO BEST BLOOM

AMERICAN
SHEET AND TIN PLATE COMPANY
PITTSBURGH
APOLLO BEST BLOOM

AMERICAN
SHEET AND TIN PLATE COMPANY
PITTSBURGH
APOLLO BEST BLOOM

SPECIALLY ADAPTED TO ARCHITECTURAL AND BUILDING FIELDS

*M*ANY of the advancements of modern construction and equipment would be either more difficult and costly, or actually impossible without the use of SHEET STEEL. Air-conditioning is one such development, added to already large uses for heating and ventilating installations.

Other extended uses for sheet metals include roofing, siding, cornices, skylights, door frames, metal lath, window frames, panel sheets, material for mouldings, trim, ducts, and similar uses. This Company offers high grade sheets and light plates of dimensions, gauges and finishes for all known uses. Supplied in Black and Galvanized Sheets, KEYSTONE Rust Resisting Copper Steel Sheets, Tin and Terne Plates; and U S S STAINLESS Steel Sheets, etc. Write for information and latest literature.

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United States Steel  *Corporation Subsidiaries*



Drawn for Revere Copper and Brass Incorporated by Edward P. Couser

Call to Meeting

of Paul Revere's first copper and brass assignments to recast the bell for the Old North Church, the church where the warning lanterns in the belfry started Revere on his memorable ride to Lexington. When the bell was finished, its tone was so wonderfully clear and true that similar orders came thick and fast. In all, 396 bells were cast for various New England churches; seventy-five of these are known to be still in use. But Revere bells, brass cannon, copper spikes and rivets were soon supplemented by a still greater achievement.

In 1801, Revere mastered the secret for rolling copper, a process never before accomplished in America. Copper sheets from his new mill soon protected the hull of the famous frigate "Old Ironsides," the roof of the Boston

State House, and many other public and private buildings up and down the coast.

Paul Revere's ability as a copper and brass manufacturer, inventor, and industrialist is still serving America. Through succeeding generations, the original firm of Paul Revere & Son has grown and consolidated to the present nationwide organization of Revere Copper and Brass Incorporated.

The Revere heritage of leadership in discovering new applications for copper and brass has also been continued. For example, to meet today's building needs, Revere fabricates Copper Water Tube, Brass Pipe, Sheet Copper and Leadtex, Flashings, Architectural Bronze Panel Sheets, Herculoy for storage tanks, and others. Copper, the oldest known metal, will help rebuild America.



We are happy to take this opportunity to wish you a very Merry Christmas and a Bright and Prosperous New Year.

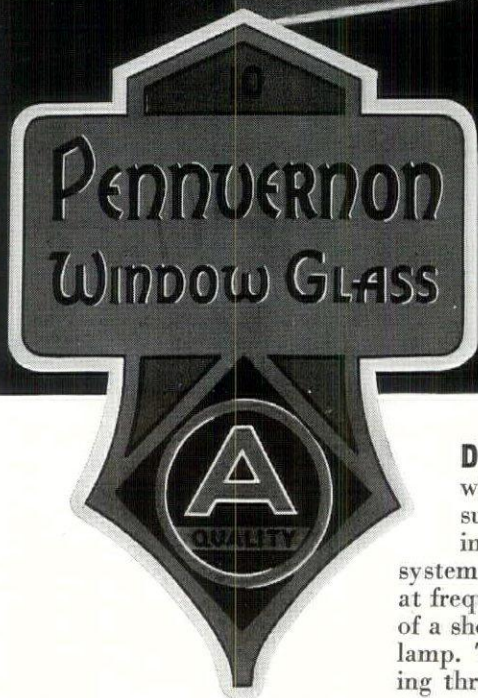
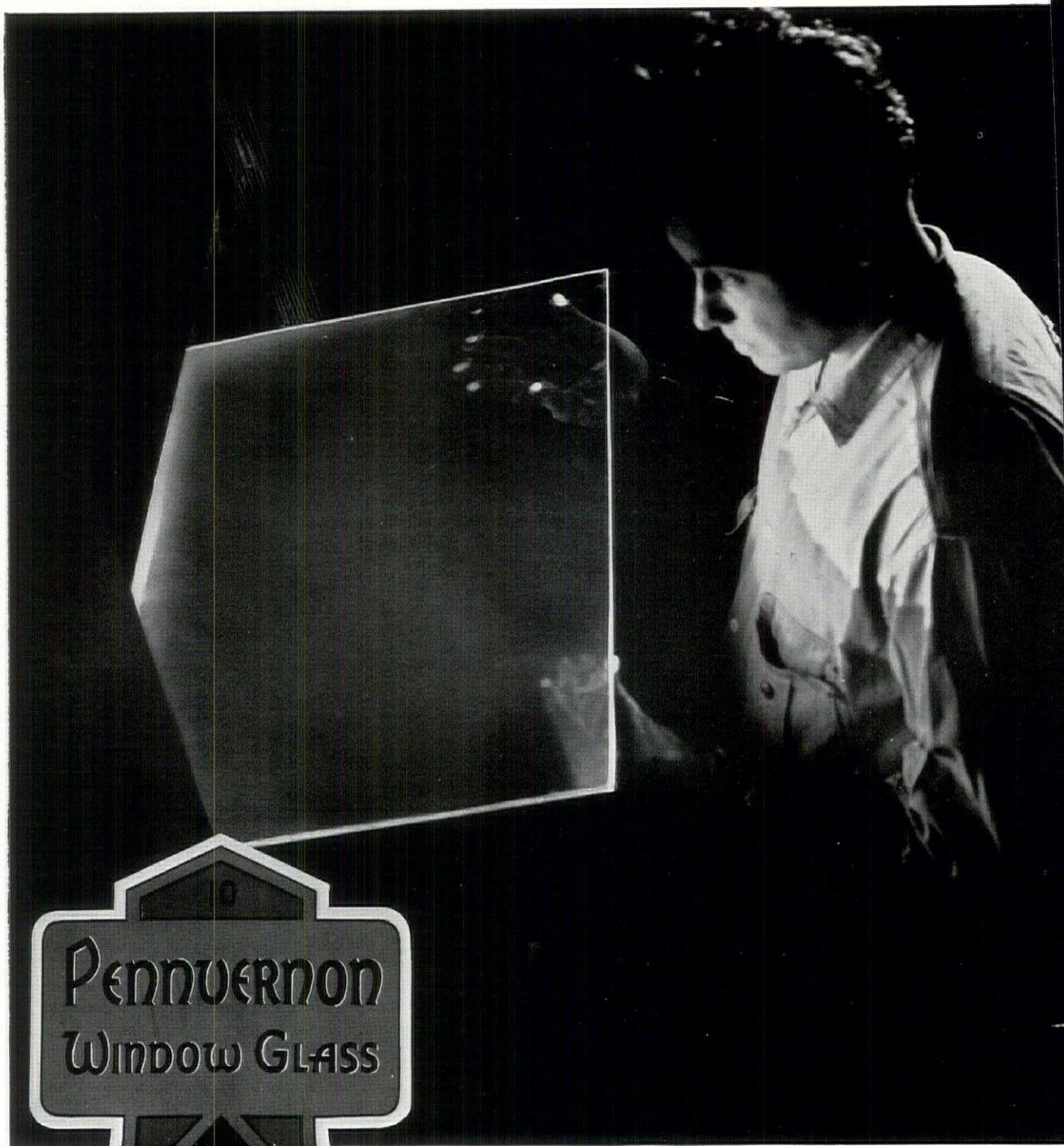
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Specify "PennuERNON"..not just "window gla



DEFECTS CAN'T ESCAPE discovery when this PennuERNON Craftsman subjects PennuERNON Glass to edge inspection! As part of a regular system of checking PennuERNON quality, at frequent intervals he inserts one edge of a sheet of glass into his mercury vapor lamp. There, violet illumination, spreading through the glass edges, mercilessly exposes all seeds and other imperfections.

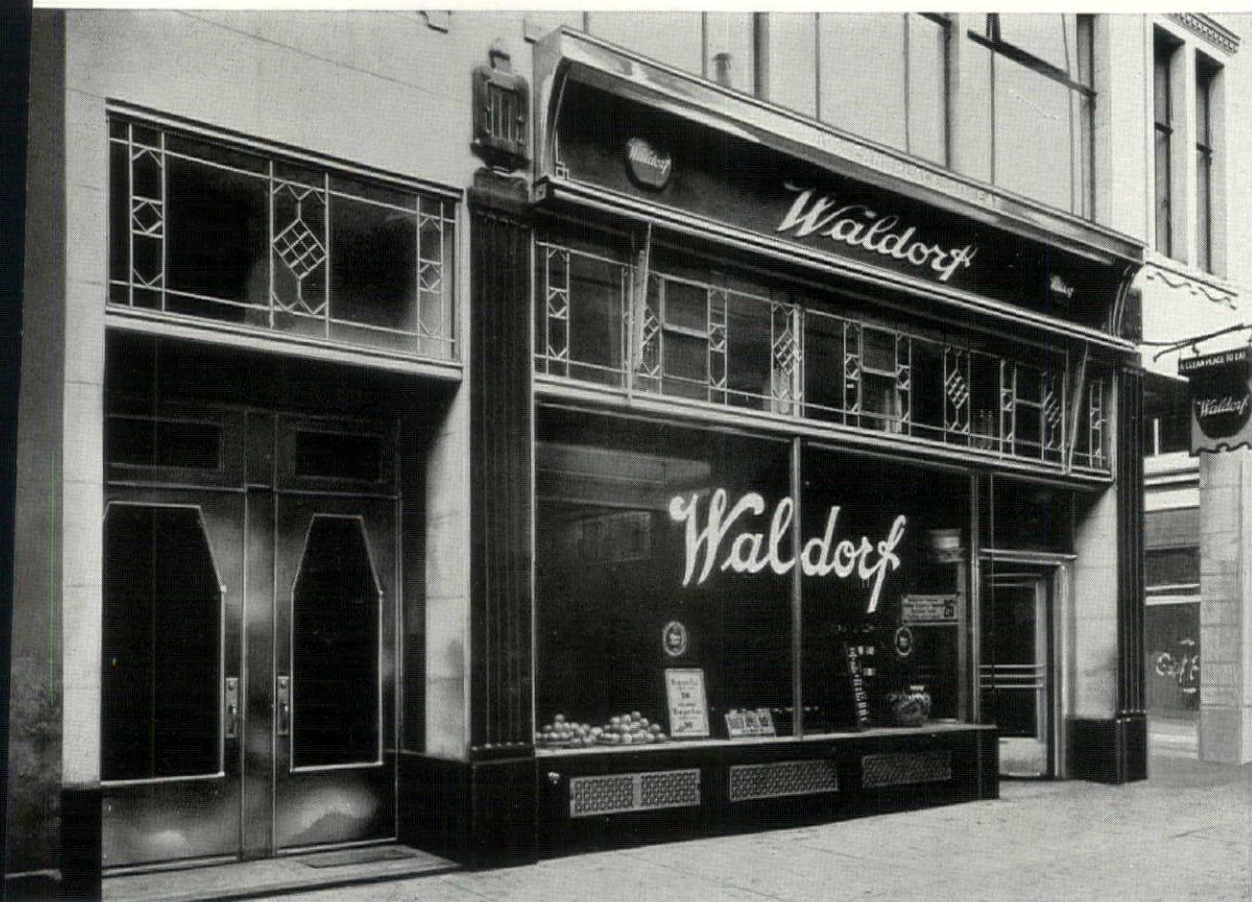
Our new booklet, called "The Making of a Lead describes in dramatic pictures the manufacture PennuERNON Window Glass. To get your free copy this interesting book, sign and mail this coupon

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2164 Grant Building, Pittsburgh, Pa.

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Stainless Steel

FOR MODERNIZING STORE FRONTS



● The store front is the merchant's *silent salesman*, ever reflecting the quality of his store and merchandise. Thus modernization of store fronts with *stainless steel* is good business as well as good taste. It brightens the customer's outlook as well as the store's.

Stainless steel will not rust, tarnish or stain. It does not pit, chip, or peel. Hence *stainless steel* trim keeps the store face permanently bright and attractive. It can be washed as easily

as glass. Neither polishing nor protective coating is required to maintain its gleaming surface. The initial investment is more than compensated by enduring beauty without maintenance. *Stainless steel* is forever new.

Practical and unbiased information on stainless steels and their uses is offered by Electromet, pioneer in the field of ferro-alloys and alloy steels. Your request for this information will not oblige you. Write today.

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BILLIARDS are coming back! On a brand-new table—50% lighter . . . 50% less expensive . . . 100% more fun. A trim, streamlined model, with chromium legs. Claret-colored "I-rest" cloth covers a playing surface of Genuine Masonite Tempered PRESWOOD, which replaces the age-old, costly slate bedding. • The weight of this table is its most revolutionary feature. Made possible by combinations of Genuine Masonite products—with sheet steel—it is the result of seven years' experiment by technicians of Brunswick-Balke-Collender Company, Haskelite Manufacturing Corporation and Masonite Corporation. • Four layers of Genuine Masonite Quarterboard are faced top and bottom with rigid steel. This forms the core. A layer of Genuine Masonite Tempered PRESWOOD provides the outside top and bottom surfaces. All glued together in a solid unit with a new adhesive developed by Haskelite Corporation. • Genuine Masonite Tempered PRESWOOD is grainless. Moisture-resisting. Easily workable. Will not warp, chip, split, or crack. Its durability is far out of proportion to its light weight. It is marble-smooth. • Brunswick is offering your club a regulation-size billiard table for less than two hundred dollars. And it is showing the way to more extensive uses of Genuine Masonite Tempered PRESWOOD than ever before. One item alone . . . the ability to glue Masonite products to each other—and to steel . . . is introducing an entirely new era for these materials. • And when you include a new or remodeled billiard room in your plans, remember that Genuine Masonite Tempered PRESWOOD and its allied surfacing and insulating products provide beautiful, lasting floors, walls and ceilings—at a great saving. Write us today for a free sample and further information. Masonite Corporation, 111 W. Washington Street, Chicago, Illinois.



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QUARTERBOARD • STRUCTURAL INSULATION • TEMPRTILE • CUSHIONED FLOORING



ON 8% OF THE BUILDING MONEY

depends 100% OF THE
BUILDING'S
PROFITS !

SCARCELY seven or eight per cent of the entire building budget is allotted to the FLOORS of a building . . . yet on the floors depend all of the building's profits. The floor alone produces the building's revenue. The floor alone decides whether the building will produce profits for many lucrative years or for a miserable few . . . because it determines the extent and convenience of the electrical facilities which the building will be able to offer its tenants.

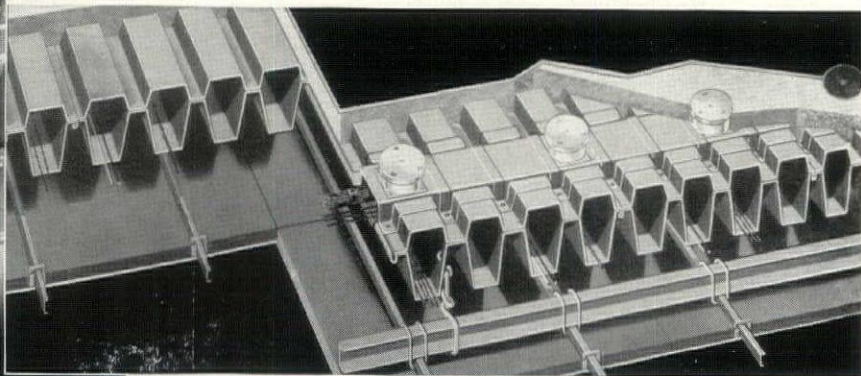
Therefore, in the interests of your clients you will want to investigate thoroughly the manifold advantages of using the most modern and efficient system of floor construction yet developed . . . the new Robertson Steel Floor System.

The Robertson Steel Floor System, electrically, is so flexible and adaptable that every present and future electrical need of a building is perfectly provided

for. And this perfect electrical flexibility, unlike the partial flexibility offered by other types of floor construction, is easily and economically available. Since costly underfloor ducts are eliminated, important savings usually result from the use of the Robertson Floor.

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Every architect, contractor and engineer will find our special technical bulletin on this amazing floor system and our brochure "New Life for Buildings" extremely enlightening. We invite you to write for free copies. H. H. Robertson Co., Grant Building, Pittsburgh, Pa.



ROBERTSON
STEEL FLOOR SYSTEM



The Mark Twain Hotel, Elmira, N. Y., has been protected with a Genasco Standard Trinidad Built-Up Roof since its erection. Associate Architects: Haskell & Considine. General Contractors: Lowman Construction Co., Elmira, N. Y. Roofing Contractor: Harry R. Burgess, Elmira, N. Y.

"Everybody talks about the weather . . . but nobody does anything about it."

—MARK TWAIN

Today Genasco does do something about it

Constructed with alternate layers of Genasco All-Rag Felt and Trinidad Lake Roofing Asphalt — made with Native Lake Asphalt — Genasco Standard Trinidad Built-Up Roofing protects the Mark Twain Hotel, Elmira, N. Y., illustrated above, as well as many other commercial, industrial, institutional and public buildings throughout the world.

Let us give you details . . . Let us tell you why Genasco Trinidad Lake Roofing Asphalt affords such unusual protection from the actinic or ultra-violet rays of the sun.



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Roof security is felt with Trinidad



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**STANDARD TRINIDAD
Built-up Roofing**

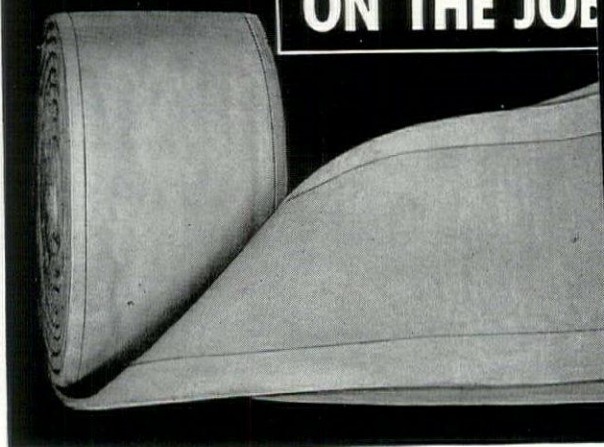
THE BARBER ASPHALT COMPANY, 1600 Arch Street, Philadelphia, Pa.

Please send me a copy of your illustrated book "For Your Roof" which carries illustrations of many prominent buildings in all parts of the country protected with Genasco Standard Trinidad Built-Up Roofing. (AF-12)

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WHAT WILL IT DO ON THE JOB



A FEW UNVARNISHED FACTS ABOUT INSULATION

We have plenty of laboratory figures to show why BALSAM-WOOL is better insulation. But your clients don't want laboratory figures. They want insulation efficiency—on the job. Here are a few questions every architect should ask . . . if he is interested in giving his clients more insulation value per dollar:

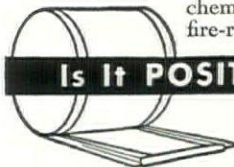


Is It Moisture-PROOF?

We know—and you know—that moisture destroys the effectiveness of insulation.

We know—and you know—that moisture

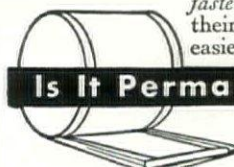
gets into any insulation which is not adequately protected *as a whole*. BALSAM-WOOL is completely and permanently protected from moisture, sealed in a waterproof covering. In addition, chemically treated to make it verminproof and fire-resistant.



Is It POSITIVE in Application?

To be effective, insulation must have no weak spots—leave no loophole for heat or cold to get through. But you

cannot be sure of continuous insulation with materials that are merely poured or dumped in by common labor. BALSAM-WOOL is positive in application, fastened in place by qualified carpenters who know their business. Flanged edges now make it easier to apply than ever before.



Is It Permanent in EFFECTIVENESS?

Materials that settle or that change their form, cannot be permanently effective. BALSAM-WOOL lasts as long as the building which it is applied—stays where it is put and does not change its form.

Does It Offer the RIGHT Thickness for the Job?

For every home and every climate there is a right thickness of insulation beyond which it does not pay to go. BALSAM-WOOL comes in thicknesses to fit every insulation need, everywhere.

Let us tell you all of the facts about BALSAM-WOOL. We believe you will find them worth knowing!

BALSAM-WOOL

WOOD CONVERSION COMPANY
ST. PAUL • MINNESOTA



Made by the Makers of

NU-WOOL

TERRAZZO

H A S T H E S E U S E S

For the convenience of architects in planning interiors, here is a check-list of the specific uses of terrazzo

1. FLOORS. Terrazzo, richly colorful, placed in any design, durable because it is concrete, finds principal use as a flooring material. The range of color in marble chips and pigments used in terrazzo enables the designer to plan floors that carry out the exact color scheme of any interior. In interior design, whatever motif is created for walls and furnishings may be continued in harmonizing pattern in a floor of terrazzo. And terrazzo's surface (85% marble, 15% portland cement matrix) is smooth and hard, free from breaks, easy to clean, hard to mar or stain, wear-resistant under heaviest traffic.

Because they retain their original fine appearance under severe wear with minimum upkeep, terrazzo floors find wide use in public and commercial structures. Floors in vestibules, lobbies, corridors and offices; floors in halls, private rooms and wards, sun parlors, operating rooms, laboratories; floors in display and sales rooms; floors in dining rooms and kitchens, ballrooms, lounges and barrooms; floors in lavatories, bathrooms, shower and steam rooms; floors in class rooms and dormitories; floors in creameries and freezing rooms—these are some of the floors that are built of terrazzo for economy, service and appearance.

And with their acceptance so established, terrazzo floors have started to make their appearance in homes. Wherever a floor needs to be good-looking, to wear like concrete and to be economical to install and maintain, terrazzo meets all requirements.

2. STAIRS AND RAMPS. The durability, excellent appearance and economy which make terrazzo a fine flooring material qualify it particularly for stairs and ramps. Because terrazzo is placed, like concrete, in a plastic condition, it may be shaped to

any desired form. Or it may be precast for special shapes and placed in units. It is often advantageous to add abrasive aggregates to the terrazzo mix, so that the final surface is proof against slipping or sliding.

3. COVES AND BASES. Of special value where utmost cleanliness is essential, as in hospitals, laboratories, kitchens, are coves and bases made of terrazzo. Because the floor and cove or base are monolithic, there are no cracks or breaks to collect dirt.

4. PARTITIONS AND WAINSCOTS. Placed on metal studding and lath over a scratchcoat of portland cement and sand, partitions of terrazzo serve exceptionally well in shower rooms, toilet rooms, and for similar installations. For wainscots, terrazzo may be applied to any height against any type of wall backing, over a scratchcoat of portland cement and sand. Wainscots may be extended directly up from coving. Both partitions and wainscots may be installed on the job, or precast.

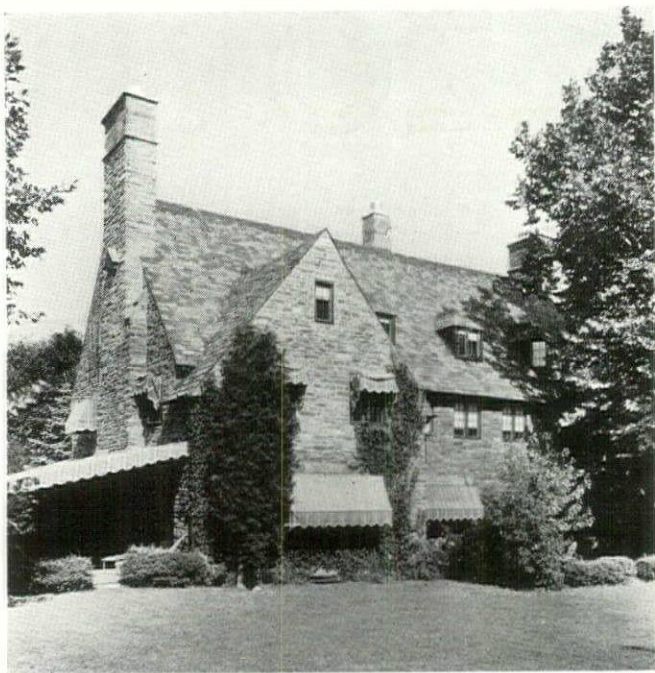
5. ORNAMENTAL UNITS. Ornamental terrazzo, though usually job made, is sometimes precast. It may take any desired form—from statuary to table tops. It is often used in connection with terrazzo flooring, being designed and colored to harmonize with the floor.

6. SIDEWALKS. One of terrazzo's newest uses, and a use which holds promise of unusual development, is in the sidewalk. While commercial use of terrazzo for this purpose waits upon designers' enterprise, the increasing number of entrances to stores and buildings, outdoor dance floors, the colorful walks of Rio de Janeiro and the walkways and esplanade leading to the Adler Planetarium in Chicago continue to prove terrazzo's durability and beauty in outdoor installation.

This information is presented by The National Terrazzo and Mosaic Association, Inc.—an organization of qualified terrazzo contractors formed for the purpose of establishing and maintaining quality standards in terrazzo installation. Detailed information and established specifications for terrazzo may be obtained from the Secretary of the Association, 524 Brook Street, Louisville, Kentucky.

THE NATIONAL TERRAZZO AND MOSAIC ASSOCIATION

102
FOLLOWING ADVERTISEMENTS WILL PRESENT OUTSTANDING EXAMPLES OF TERRAZZO INSTALLATION



Residence at Chestnut Hill, Philadelphia. All exterior window and door frames calked with Pecora Calking Compound by the Ev-Air-Tight Calking Company, Contractors, Philadelphia.

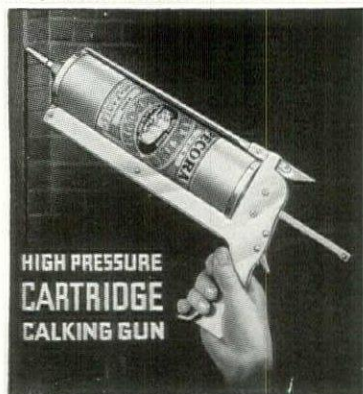
To Be Sure Of A WEATHER-TIGHT RESIDENCE

Be Sure To Calk All Door
And Window Frames With



Don't wait until the owner complains that he cannot keep the weather out nor the heat in. A tight house is a calked house, especially when a reliable material such as Pecora Calking Compound is used. Properly applied, it simply will not dry out, crack or chip. Specified by leading architects for all types of buildings in all parts of the country.

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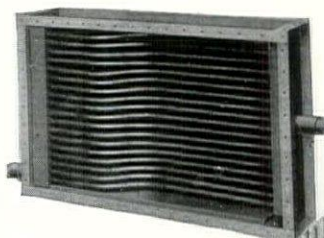
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Formica now makes available to architects and designers the possibility of building photo inlays into Formica sheets specified for veneers on doors, table tops, counter panels and wainscot.

The photographs become an integral part of the Formica sheet, as resistant to wear and chemical injury as any Formica, and stable in color. They may be sepia and white or black and white.

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The background may be any one of the many Formica colors, and the photo inlay may be combined with inlays in various colors.

Formica is a material with many possibilities. May we send you further information about it.



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TO COMPLETE a modern building wire it for **SOUND**

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RCA Victor Sound Systems can be provided for in every building you plan. When built in at the start, cost is less, the appearance is exactly as you planned, and your client recognizes that you have kept abreast of modernity in this as in other departments.

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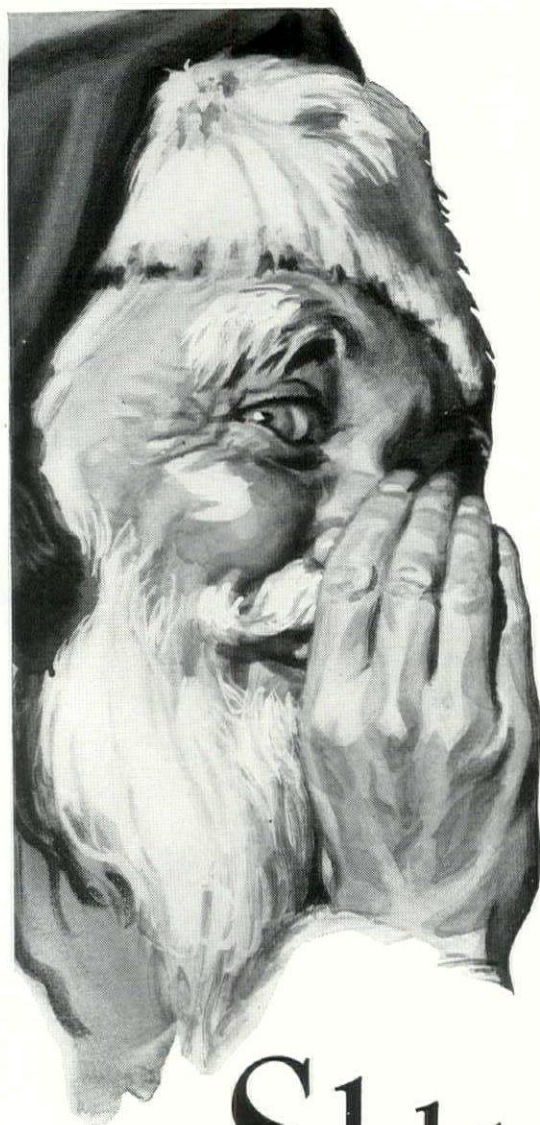
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That's sound advice because you avoid congestion and delay by using the safe, swift Railway Express Service. Prompt pickup for all shipments; super-swift transportation on passenger trains and quick delivery at destination! These are the outstanding characteristics that have made Railway Express famous throughout the industry. • Prompt pick-up and delivery in principal cities and towns without extra charge. Take a tip from Santa, whenever you have *anything* to ship *anywhere* to phone Railway Express.

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AGENCY INC.
NATION-WIDE RAIL-AIR SERVICE

or all-round performance

.... choose a floor that's colorful and durable !



IN department stores, where costs are guarded with an anxious eye, you'll find a great deal of Armstrong's Linotile. There are two good reasons for this.

Linotile is colorful, and retailers know the value of color.

Linotile is durable. Its resistance to indentation is great, removing the likelihood of damage by heavy furnishings . . . and making it possible for this floor to take the severe punishment of heavy store traffic, year after year, without showing it.

If you have, or are likely to have, a department store or any other retailer among your clients, it will pay both you and your client to investigate Armstrong's Linotile. It's inexpensive to install, inexpensive to maintain, and it keeps its appearance. For full information, see Sweet's Catalog or write now for file-sized "Armstrong's Linotile Floors." Armstrong Cork Products Company, Building Materials Division, 1204 State St., Lancaster, Pennsylvania.



Armstrong's LINOTILE FLOORS



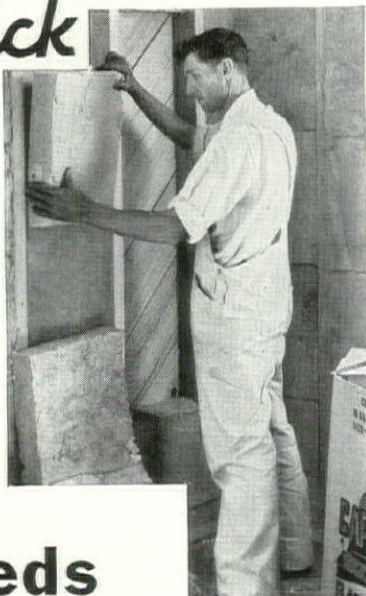
Wall-thick CAPITOL

ROCK WOOL
INSULATION

meets

5

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- 1 Saves 80% of the heat otherwise lost in winter through walls and roof. Kills drafts.
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- 4 Puts fire-proof material under the roof and between the walls. Deadens sound. Moisture-resisting.
- 5 Pays for itself by reducing fuel costs 20% to 35% (permits smaller heating equipment, if desired).

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Capitol Rock Wool is so easily and quickly handled that it seldom costs more than inferior materials. Manufactured in 15" x 23" bats, it fits between 2 x 4 studding spaced 16" or 24" centers. No wastage; every piece is usable; can be ordered to approximate square footage desired.

It can likewise be applied as readily to existing construction in a blown form. Contractors are available in all cities, licensed to install Capitol Rock Wool Blowing Fibre by our patented pneumatic process.

[Write for our technical data prepared especially for architects' and engineers' files, covering methods of installing and full details of the insulation efficiency.]



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Please send us the free Capitol Rock Wool facts on:

- ☐ Home Insulation.
- ☐ Building or Apartment Insulation.
- ☐ Technical Data for Architects or Engineers.

AF-12

Name _____
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Partial View of Kitchen
St. Mary's Hospital, Detroit

Frederick
Architect

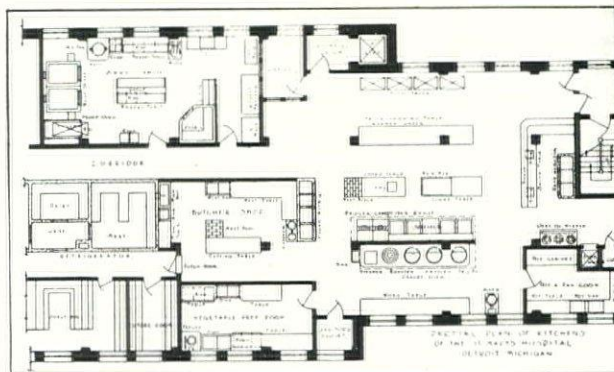
ON a visit to St. Mary's Hospital of the Sisters of Charity of St. Vincent de Paul at Detroit, the Superior General from headquarters in Rome, pronounced the layout and equipment of the kitchen of this hospital to be the finest of any institution of the Order, either in this country or abroad. The architect, Frederick Winter, generously attributes much of the credit for this achievement to the assistance rendered by the

JOHN VAN RANGE KITCHEN ENGINEERING SERVICE

In planning the addition, the hospital gave definite instructions that the architect provide food service equipment that would last for a long time and reduce operating cost. To this end, Mr. Winter requested the services of our kitchen engineers at the very inception of this project. They assisted in planning every detail of equipment and arrangement for preparing and serving food for patients, resident staff and employees. The equipment was specially designed and manufactured by us and the entire installation was made under our personal supervision.

For three generations we have extended kitchen engineering service to the architectural profession without charge or obligation. Many leading architects rely on this service in connection with all their more elaborate plans. But efficient planning should not be limited to large institutions. Efficiency and economy are quite as necessary in small plants. Our services are equally available, regardless of the size of the undertaking.

Please submit plans of all food service floors—before construction is begun, if possible.

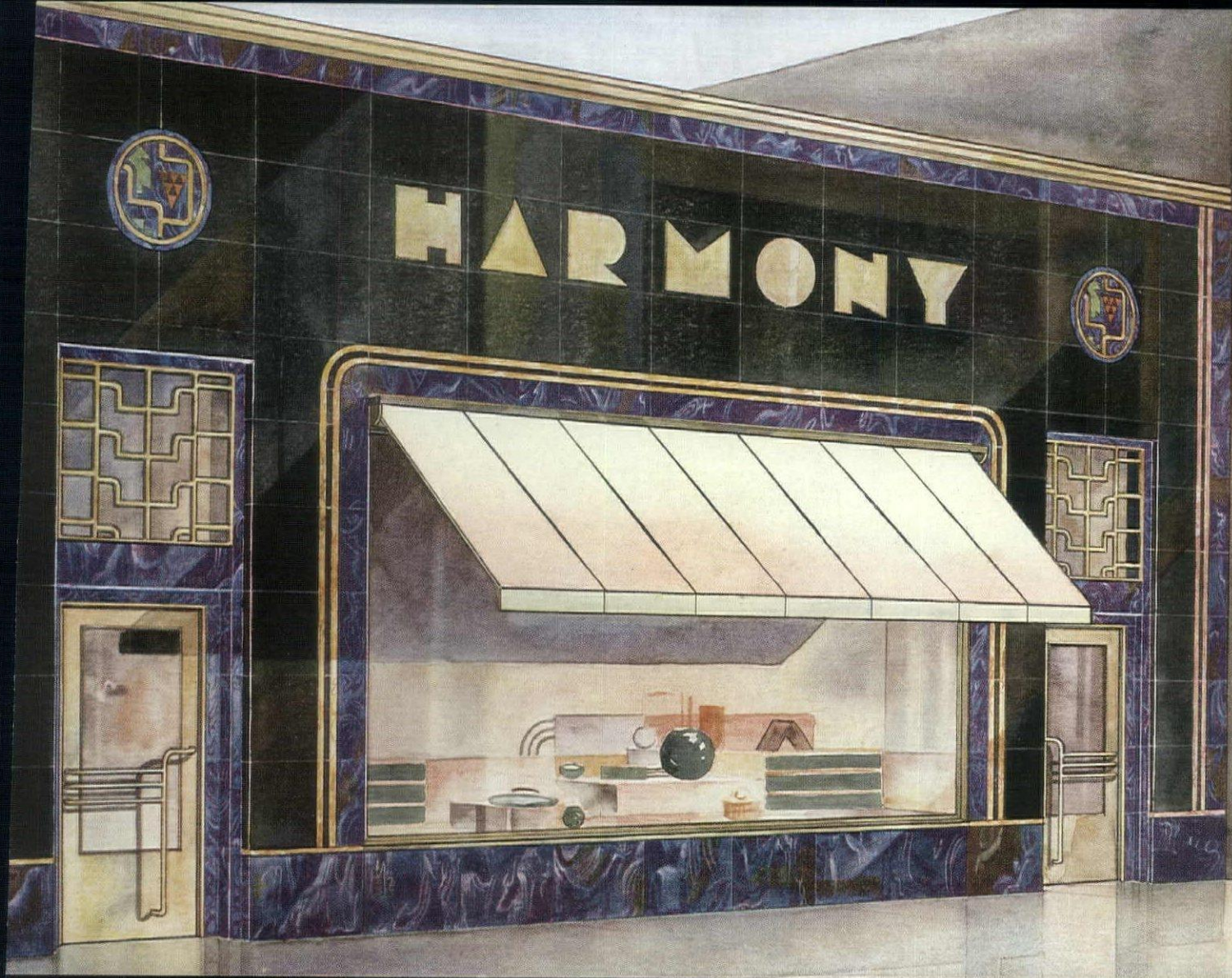


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beauty, today and always—modern, ant, colorful—that's what Vitrolite new or remodeled structures.

beautiful colors—ten rich, solid hues, some agate shades, an endless vari- indblast, inlay-decorated, and color- d effects—give unlimited opportunity opment of color schemes.

ming, flint-like surface of Vitrolite is —impervious to water, acids, oil or It will not stain. It will not check, r grow dull with age. It is always heerful, clean, and sanitary. A damp

cloth is the only facial treatment Vitrolite ever requires.

Vitrolite pays its own way by immediately increasing property value, by increasing ready salability or rentability of property, by attract- ing and increasing flow of traffic in retail establishments, by its no-upkeep cost, and by its ease and economy of installation. (Applied directly over present walls, without fuss, muss, or cost of tearing out plaster.)

Your Vitrolite Distributor has a special display easel on which he will gladly set up actual arrangements in Vitrolite to illustrate designs and color possibilities.

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Please send New Vitrolite Color Chart of 16 colors—10 solid hues, 6 agate shades, and various surface effects—together with:

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- ☐ Vitrolite Store Fronts (Colored Views)
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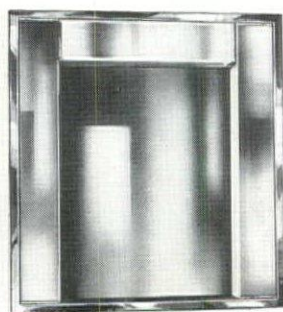
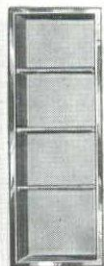
Name

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City State

MIAMI Bathroom CABINETS Mirrors and Accessories

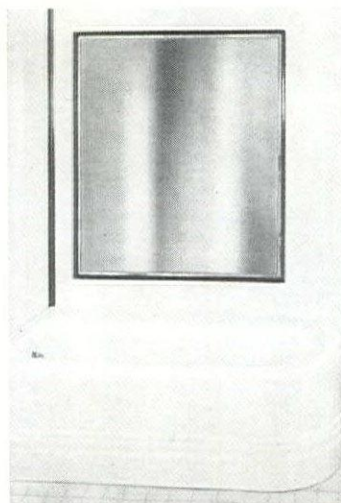
Miami Bathroom Cabinets and Mirrors for 1936 reflect entirely new ideas in design, color and arrangement. Heretofore bathroom cabinets have been much alike. Now Miami again pioneers with an entirely new line, featuring new shapes, tinted mirrors, recessed mirrors, side cabinets, indirect lighting and many other new features that maintain and enhance Miami leadership in the bathroom cabinet field. The few styles illustrated give but a hint of the new line. Send for Bulletin AF or refer to 1936 Sweet's Architectural Catalog for complete details.



Patent Applied For

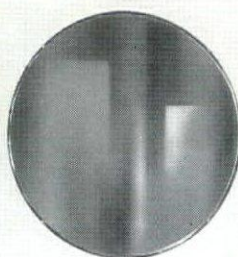
DuBarry Cabinet and Mirror Ensemble

A beautiful recessed mirror in the new flesh color glass. Straight line frame of chromium plate. Narrow mirrors beside the recessed mirror in blue, green, gunmetal or rose. Concealed light fixtures behind both the ground glass panel at top and the side mirrors, reflect light onto the large mirror and also illuminate the bathroom with a soft, pleasing, colorful effect never before provided. Two side cabinets are recessed into the wall and lined with mirrors of blue, rose, gunmetal or green. The shelves are colored glass to harmonize with side mirrors. Altogether, the DuBarry Ensemble is one of the most striking and original bathroom mirror-cabinet creations of the century.



Neptune Bathtub Mirror

A revolutionary new idea for bathrooms—the bathtub mirror. Placed in a position that is usually a blank wall, it adds new beauty, refinement and convenience, yet displaces nothing, requires no additional space. The cost is little more than the same coverage of tile, vitrolite or Carrara—mirror is 42x48 inches.



Patent Applied For

The Powder Puff

(Illustrated above)

New, Different, Distinctive. A complete, custom-built powder room and dressing room unit. Large center mirror may be either regular clear glass or the enticing new rose (flesh) color. Side mirrors of blue, green, rose or gunmetal. Entire assembly surrounded by a chromium-plated frame. Electric lights, concealed behind the narrow side mirrors, throw light directly onto the mirror and at the same time illuminate the bathroom.

The Pompadour

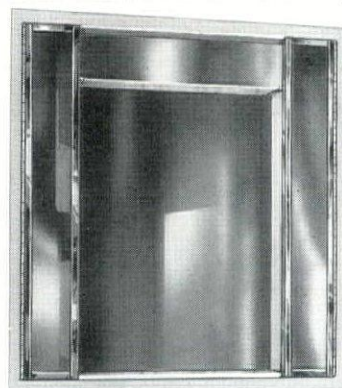
(Illustrated at left)

Another original Miami conception in modern bathroom mirror-cabinet equipment. The 26-in. round mirror is attached to the wall. The functions of a cabinet are supplied by the recessed shelf below the wall. The shelf has chromium-plated frame and is lined with colored mirrors in blue, flesh, green or gunmetal.

The Oxford

(Illustrated at right)

Entirely different from any bathroom cabinet you have ever seen. The large recessed mirror of clear or colored glass is flanked on either side by a narrow cabinet with chromium-framed mirror door. Each of the little cabinets is 4 1/4 inches wide inside and has three adjustable shelves providing ample storage space for everything usually kept in a bathroom cabinet. An exclusive Miami creation for which patent application has been made.



Patent Applied For

See Sweet's Architectural Catalog or
Write for Bulletin AF

1936 Sweet's Architectural Catalog contains 24 pages illustrating and describing the complete Miami and Carey lines of bathroom cabinets, mirrors, laundry chute doors, access doors and built-in ironing boards. A copy of this bulletin will be sent by mail on request.

MIAMI CABINET DIVISION • The PHILIP CAREY COMPANY, Middletown, Ohio.

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The newest addition to U. S. "scientific" vocabulary gives the home aspirant his first exciting idea to play with . . . J. André Fouilhoux examines this development, establishes criteria for judgment, defines prefabrication's current status, its future claim . . . 33 data sheets on the most advanced available techniques including construction details.

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Editor, HOWARD MYERS; Managing Editor, RUTH GOODHUE; Associates: JOHN CUSHMAN FISTERE, ALAN JACKSON, ERNEST BORN, MAX FORESTER, GEORGE NELSON, PAUL GROTZ, MADELAINE KROLL.
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THE 1936 HOUSE

NEW CONSTRUCTION METHODS, MATERIALS AND EQUIPMENT

The October issue of THE ARCHITECTURAL FORUM presented 101 houses recently built in the United States. The emphasis was on Plan and Design. This issue, companion to October, presents new and current techniques, materials and equipment. The emphasis here is Construction.

Certain significant facts emerge:

While recent house-building has called into play a variety of new materials, most of the materials used are old stand-bys and indications point to their continued use in the near future.

Houses are still built by assembling a great number of individual units on the site and erecting them by hand labor.

The completely prefabricated house, mass produced and of low cost has not appeared.

But the partially prefabricated house built principally of large size standard floor, wall and roof units is possible today.

All houses today, as they have for years, contain certain elements that are prefabricated. As the number of these elements increases, the era of prefabrication draws closer. Prefabrication is today's most exciting prophecy.

The greatest advances have been in equipment and appliances, particularly in air conditioning, heating, plumbing and electrical devices, nearly all of which are suitable for houses of conventional construction. Air conditioning has increased in excellence and dropped in cost. Improvement in kitchen equipment has been spectacular. Strangely enough, scientific lighting of rooms is not yet generally practiced. All of this means that building science has not advanced as far as the Sunday supplements like to believe but has made definite and, in some cases, extraordinary progress. The Building Industry is about at midfield toward the goal of reducing the cost and improving the quality of the House.

PIONEER PREFABRICATOR

In 1907 when Thomas Alva Edison wanted to provide his workers with good, cheap houses he attempted to prefabricate them of concrete complete even to bathtubs at one pouring. When he found that the forms cost so much that the houses showed no saving he abandoned the scheme. In 1935, getting the cost down apparently still has prefabricators baffled.

Photo from the Edison family collection

The data in this issue should be considered representative rather than complete. Two features, prefabrication and air conditioning have been treated in some detail because of the great current interest in these new technological developments. The sources for the material in this issue include several hundred manufacturers and many authorities. The prefabrication study was carried out under the direction of Architect J. André Fouilhoux. The air conditioning study was under the direction of Engineer A. Warren Canney. THE FORUM further acknowledges research by A. C. Shire, Eugene Raskin, Elizabeth Boyter, and the counsel of H. R. Dowsell.

FOOTINGS

The common method of designing footings of equal width is scientific and wasteful. The following data are based on material supplied by Engineer Sheldon D. Werner.

FOOTING DESIGN

In spite of the fact that settlement cracks are dangerous points where water, frost, and termites may enter, footing design is a subject that has received little or no attention from the architect. The application of the most elementary principles of engineering, however, will eliminate the possibility of the occurrence of these structural defects.

Settlement cracks customarily occur when two adjacent portions of a footing settle at a different rate of speed due to unequal loading. Consequently it is important to proportion the footings so that the soil pressure is equal at all points.

When a footing is more than four times as wide as the wall it supports, the use of reinforcing must be considered, the size of the bars being determined by the following formula for 12" thick footings:

$$A_s = \left\{ \frac{.125 W (l-a)^2 \times 12}{f_s j d} \right\} = [W (l-a)^2 .00001058]$$

in which

A_s = Sq. in. of steel per linear foot of wall.

W = Soil pressure in pounds per sq. ft.

l = Width of footing in feet.

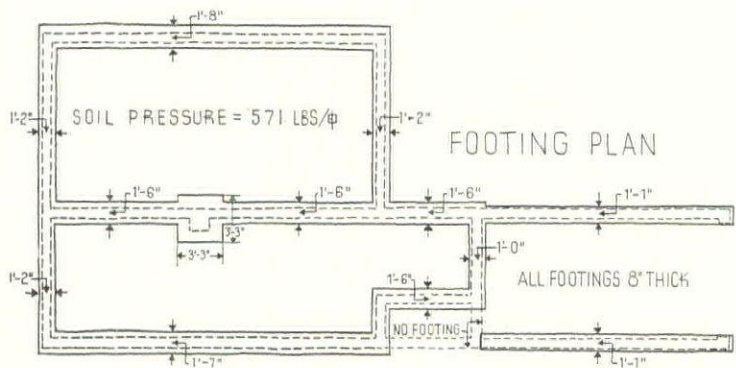
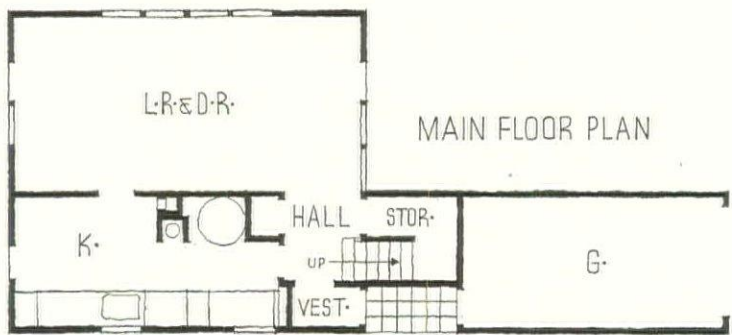
a = Width of wall in feet.

f_s = Allowable steel stress (18,000 lbs. in New York City)

j = .875, a constant for this type of footing.

d = 9", the distance from the top of the footing to the center of the steel.

If the value of A_s is found to be less than .05 square inches, the steel may be omitted.



A simple application of the method described is illustrated in the plan and chart. The second column, "Footing," represents assumed sizes, while the last, "Footing Width" gives the correct size as calculated. The soil pressure, 571 lbs. per sq. ft., is taken because the lowest figure, 275, applies only to a small strip under the entrance.

	SECTION	FOOT- ING*	LBS. PER LIN.FT.	FOUNDA- TION WALL	LBS. PER LIN.FT.	EXTER- IOR WALL	LBS. PER LIN.FT.	SECOND FLOOR	LBS. PER LIN.FT.
1	LIVING ROOM	20"x8"	168	2 1/2"x100	208	17 1/2"x20	350	6 x22 (17+5)	132
2	LIVING ROOM & KITCHEN	14"x8"	116	2 1/2"x100	208	17 1/2"x20	350		
3	KITCHEN	19"x8"	158	2 1/2"x100	208	17 1/2"x20	350	4 1/2"x22	99
4	INTERIOR	18"x8"	150	2 1/2"x100	67			10 1/2"x22	231
5	STORAGE-EXT.	18"x8"	150	2 1/2"x100	208	17 1/2"x20	350	3 x22	66
6	FRONT ENT. STEP	8"x8"	67	2 1/2"x100	208				
7	GARAGE	12"x8"	100	2 1/2"x100	208	8 1/2"x20	170		
8	GARAGE SIDES	12"x8"	100	2 1/2"x100	208	10 x20	200		

*THESE SIZES ASSUMED FOR TRIAL CALCULATION.

PROCEDURE

Determine the load per lin. foot for each section of wall where it varies. Figure concentrated loads for chimneys, masonry columns, etc.

If the settlement takes place very slowly, consider only uniform stresses and live loads of long duration. Until uniform loads have been determined the footing weight must be assumed. If it is within 100 pounds of the correct figure, do not revise the calculations.

The most lightly loaded walls will determine the soil pressure to be used. Unless required by the building code, all walls need no footings.

Soil pressure = $\frac{\text{Total load per linear foot}}{\text{width of wall (or min. footing in ft.)}}$

Width of all other footings = $\frac{\text{Load per foot}}{\text{soil pressure}}$

Where uneven soil conditions are encountered careful consideration should be made, if possible under the direction of a competent engineer, and footings on softer ground should be increased proportionately.

Concentrated loads. To find the weight of chimneys, figure the cubic contents minus all openings, and use the table on the following page. Posts and columns will generally require footings; the shape of footings should approximate that of the members supported.

Particular loads, as for example at the corner of the house, may become concentrated loads due to the existence of valleys and openings close to the corner. If the condition occurs at an interior angle, and an interior wall continues on the line of the foundation wall, a certain

amount of the load will be distributed, making it necessary only to widen the footing for a length equal to the height of the wall. If it is an exterior corner, a square footing must be used, precisely as for any other concentrated load. This must also be done where the wall is continuous but of greatly varying depth.

4) When floor girders or other members produce a concentrated load half again as large as the uniform load per foot on the supporting wall, the same principles of designing for concentrated loads will apply. If the concentrated load is not 50 per cent greater, however, it may be disregarded.

When the variation between loads per linear foot is great, as in a small house with a partially excavated cellar, following the rules given above would require a minimum footing for the lightest walls, and a footing seven or eight feet in width for the heaviest. This is obviously inconvenient in practice, and the procedure employed is to place a series of piers under the light wall with intermediate spandrel walls. The piers support the house sill, while no weight falls on the spandrel walls, so that the soil pressure is greatly increased, making it possible for the heavy wall to be carried on a footing of moderate width. For example, if a total load distributed over ten feet is 2,500 pounds, the soil pressure per foot, for a continuous footing, is 250 pounds. If two piers are used instead of a continuous footing, the soil pressure will be greatly increased due to the reduced bearing surface. When this is done, care should be taken to increase the thickness of the house sill, and to leave a space between it and the top of the spandrel wall.

In larger houses, where footing loads may run over 4,000 pounds per linear foot, the soil pressure should not exceed 4,000 pounds per lineal foot, unless tests show that the soil is safe for a higher pressure.

ROOF	LBS. PER LIN.FT.	PARTITION	LBS. PER LIN.FT.	NET TOTAL	GROSS TOTAL	FOOTING WIDTH		CHIMNEY	CU. FT.
x22 (18+4)	132			822	990	1'-8"	1	1" x 1" x 22	44
							2	LESS FLUE 3/4" x 3/4" x 22	11
				558	674	1'-2"			33
1/2" x 22	99			756	914	1'-7"	3	33 C.F. x 121 LBS. = FRAMING & INSULATION	3,993
1/2" x 22	231	16 1/2" x 11	182	711	861	1'-6"	4		1,331
x22	66			690	840	1'-6"	5	FOOTING	5,324
				208	275	NONE	6		1,200
		8 1/2" x 11	93	471	*571	1'-0"	7	GROSS WT. 6,524	6,524
3/8" x 22	102			510	618	1'-1"	8	6,524 / 571 = 11.4 = 3'3" x 3'3"	
*SOIL PRESSURE = 571 LBS. PER SQ. FT.								571	

WEIGHT PER SQUARE FOOT OF DEAD AND LIVE LOADS

CONSTRUCTION		EXTERIOR FINISH		INTERIOR FINISH		
ALLOWANCE HAS BEEN MADE FOR USUAL NO. OF OPENINGS			LATH & PLASTER	CELOTEX ETC.	WOOD PANELING	NO FINISH
WALLS		10" SHINGLES	15	9	11	8
		1" CLAPBOARDS	16	10	12	9
		1" STUCCO ON METAL LATH	24	18	20	17
	7/8" x 6" T & G SHEATHING	4" COMMON BRICK VENEER	49	43	45	42
	2 x 4 — 16" o.c.	4" FACE BRICK VENEER	53	47	49	46
	7 LBS. PER SQ. FT.	8" STONE VENEER	118	112	114	111
		12" STONE VENEER	169	163	165	162
	8" CONCRETE BLOCK + FURRING	3/4" STUCCO	60	54	56	53
		4" COMMON BRICK	87	81	83	80
		4" FACE BRICK	91	85	87	84
8" CINDER CONCRETE BLOCK + FURRING		NO FINISH	52	46	48	45
		3/4" STUCCO	48	42	44	41
		4" COMMON BRICK	75	69	71	68
		4" FACE BRICK	79	73	75	72
		8" STONE VENEER	144	138	140	137
	8" SOLID BRICK + FURRING	3/4" STUCCO	85	79	81	78
		IF SOLID COMMON BRICK	77	71	73	70
		IF 4" FACE & 4" COMMON BRICK	81	75	77	74
	8" H. D. TERRA COTTA BLOCK	1/2" STUCCO	43	37	39	36
		4" COMMON BRICK	72	66	68	65
	4" FACE BRICK	76	70	72	69	
ROOFS		LIGHT WOOD SHINGLES	16	8	10	7
		HEAVY WOOD SHINGLES	17	9	11	8
	1 x 8 SHEATHING	3/16" SLATE	23	15	17	14
	2 x 10 — 16" o.c.	3/8" SLATE	29	21	23	20
	6 LBS. PER SQ. FT.	ASBESTOS OR ASPHALT STRIP	18	10	12	9
		SPANISH TILE	27	19	21	18
	FLOORS					
2 x 10 — 16" o.c. — 7/8 x 6 SHEATHING		HARDWOOD STRIPS	23	15	17	14
		SOFTWOOD STRIPS	22	14	16	13
	10 LBS. PER SQ. FT.	CERAMIC TILE ON 3" CIN. CONC.	49	41	43	40
		5 PLY ROOF DECK	24	16	18	15
FOUNDATIONS						
POURED CONC.						
CONC. BLOCK						
BRICK						
RUBBLE STONE						
DRY STONE						
GRANITE ASHLAR						
FLOOR LIVE LOADS						
ROOF LIVE LOADS						
STUD PARTITIONS						

WATERPROOFING

KEEPING buildings dry involves some means of protection against the infiltration of surface water or ground water. Surface water is a temporary condition as a rule, due to rain or melting snow. It has little or no hydrostatic pressure, and dampproofing the foundations is a comparatively simple matter. Ground water, due to the pressure of lakes, rivers, or springs, presents a more serious problem; it has a definite hydrostatic pressure, and some method of waterproofing must be employed to seal the foundations. There are wide divergences of opinion among specialists as to the relative merits of methods and products, and there is not a little quackery in the field. The experience of many years, however, has brought about the adoption of certain standard practices, which if properly selected and employed, using materials of proved quality, will usually prove satisfactory.

Before considering the various methods it might be well to note that soundness of construction is of prime importance. It is asking a great deal of a product to require it keep a building dry when the contractor has sloppily tamped on the cement and when badly designed footings have resulted in structural cracks. In spite of the fact that there are many products on the market which are absolutely worthless, much unfair criticism has been leveled against reputable waterproofing materials when it should have been directed against the shoddily constructed buildings to which the waterproofing was applied.

DAMPPROOFING (Figure 1)

In many cases a system of drainage is sufficient, and in some cases of dampproofing drainage should be provided. The common practice is to lay a loose fill of broken stone with tile drains to carry the water away from the foundations to a sewer or dry well. The cost of dampproofing the small house is not large, and it might well be considered in the majority of cases. Methods fall into two classifications: integral and surface coating.

INTEGRAL METHODS

It is claimed that a mixture of one part cement, two parts sand, and four parts gravel will produce an impermeable concrete. While it is possible to produce concrete in laboratories which resists infiltration to a considerable degree, in actual practice it is not safe to depend too much on the mix. Defective workmanship, improper proportioning, uneven tamping, or an excessive water-cement ratio are all factors making for unsatisfactory results.

There are a number of compounds on the market, obtainable in paste, powder, or liquid form, which will assist

in creating an impermeable concrete. They consist of chemicals which reduce permeability and retard capillary action, acting as aids to fatter, denser, or better cured concrete. Here too, modern practice puts the chief emphasis on design and the placing of the concrete. Should the workmanship be bad, or should settlement or structural cracks appear in the wall, obviously the effectiveness of the admixture is nullified. Integrals are widely used in residential work, and a reputable product will improve the concrete without question; products advanced as cure-alls should, however, be regarded with suspicion.

SURFACE COATINGS (Figure 2)

On foundations the application of one or two coats of a bituminous compound is a cheap and effective method of dampproofing. The rule has been to brush on hot coatings, but the best modern practice tends toward bituminous coatings applied cold since they give the same penetration into the masonry surface and form a coating less likely to be chipped or broken. Such cold coatings can be used in heavy trowel consistency where extra protection is desired.

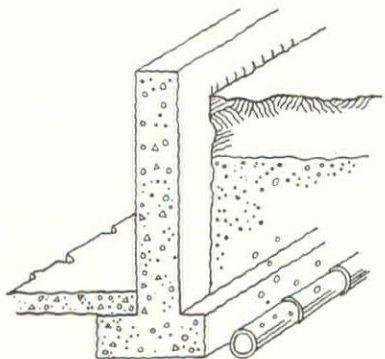
WATERPROOFING

When there is considerable hydrostatic pressure from ground water the problem of waterproofing becomes acute. Where it will help to reduce the pressure, some system of drainage under the basement slab is employed; the important thing, however, is to create a watertight envelope through which water cannot pass. The site of the average home should be selected with an eye to avoiding possible unfavorable water conditions, but where any hydrostatic head may exist in excess of what would be balanced by the floor slab proper reinforcement, placed in the top of the slab, must be provided regardless of the method of waterproofing used. Waterproofing methods are of three types: integral, membrane and surface coating.

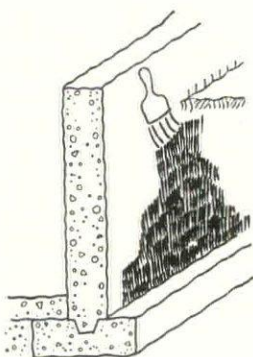
INTEGRAL

The same compounds used for dampproofing apply here. Theoretically an impermeable concrete might be produced by introducing some water-repellent substance which would line all of the pores in the concrete. One reputable manufacturer claims that this is actually possible. The consensus of opinion, however, is that an integral compound, used alone, is not sufficient where a considerable hydrostatic head must be resisted.

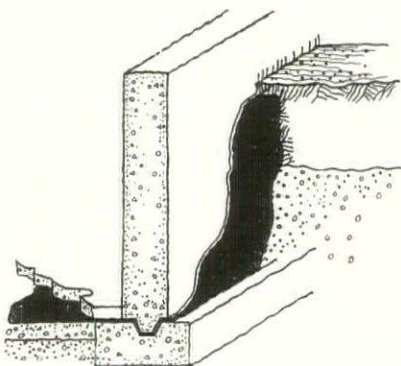
While the basic materials of integrals are becoming generally known to architects, most manufacturers have their own trade formulas which are not made public;



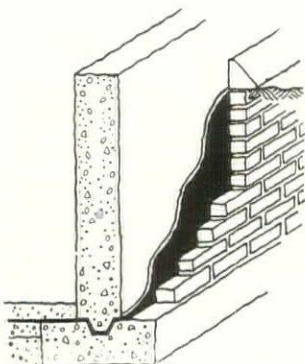
1



2



3



4

these formulas fall into certain standard categories, the most part, and the better manufacturers put little emphasis on the fact that they use secret formulas. When an architect runs across a compound which is passed off as a secret and wonder-working preparation, he will do well to demand an analysis and investigation of its performance record. And in all cases the manufacturer should be required to substantiate claims for his product by giving proof of his experience and the service record of his product. It must be remembered that while an integral waterproofing may materially aid in rendering a concrete wall impermeable, its efficacy ends when cracks begin to appear. In small constructions where footings have been properly designed there is little danger of structural or settlement cracks, and it is possible to use a good integral waterproofing if the proportioning and placing of the concrete are carefully supervised.

MEMBRANE (Figures 3 and 4)

This is the oldest, and still one of the most satisfactory methods of waterproofing. Felt or fabric is used, with alternate layers of hot asphalt or pitch. Felt is the cheapest material, but the present trend is to replace it with fabrics which have greater elasticity. Both felt and asphalt are satisfactory when care is taken to specify a grade and brand specifically recommended for waterproofing. Membrane is most commonly applied to the outside of the wall so that the water will press it against the wall. Since all membrane is puncturable it must be protected against injury during back filling by a coat of cement mortar, a course of brick, or, when cost conditions require it, a layer of wallboard. The membrane must be laid so as to form a complete envelope from grade down to the footing and across the floor on a sub slab. Special provision must be made for pipes which carry through the wall. In membrane work it is of critical importance to select a thoroughly competent waterproofing contractor.

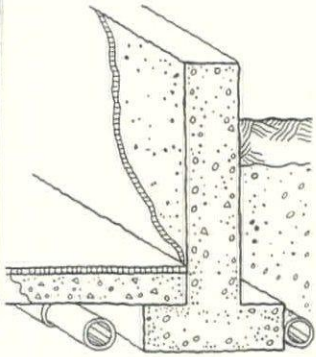
A standard form of guarantee certificate has recently been adopted by the Waterproofing Contractors Association to protect owners from defective workmanship. It specifies to fix the time limits within which a contractor may be held liable. The architect who specifies waterproofing for a house may receive full information from the Association.

SURFACE COATING (Figure 5)

A common method involves the application of an integrally waterproofed cement mortar to basement floors and to the inside of foundation walls. A very solid body is necessary to resist water pressure, and if the hydrostatic head is considerable, other waterproofing methods should be used in connection with the cement coat. Completely applied coats of metallic waterproofing are also used for this type of waterproofing with success. The advantage of surface coating is that it can be easily repaired since leaks may be quickly located.

WEATHERPROOFING

Protection of masonry above grade is customarily an afterthought in residential construction. If, after a reasonable period of time, it is found that rain water comes through, one of several methods is employed to remedy the condition. Penetrative surface coatings may be applied to the exterior, asphalt coats may be applied to the interior surface, or caulking may be used if the leakage is around window and door openings.



PENETRATIVE SURFACE COATINGS (Figure 6)

A great number of these materials is available. They are designed to penetrate into the building material, leaving indestructible solids in the pores, thereby tending to prevent leakage, erosion, and efflorescence. The so-called transparent coatings are generally of two kinds: wax and gum preparations which cause some change in color, and water-repellent chemicals which change the masonry color less noticeably. Claims vary widely.

It must be understood that a transparent liquid cannot be expected to fill cracks in the masonry, and much leakage is due to the fact that shrinkage of mortar in the joints takes place during the first six months after construction. Such a wall should be carefully inspected for shell joints, poorly filled joints, and shrinkage cracks. The joints should be struck with a hammer and chisel to test their soundness. All openings of this kind should be cleaned out and re-pointed in a proper manner before the transparent coating is applied. In new work the water-cement ratio should be carefully controlled; the more water that can be eliminated from the mix without interfering with its workability, the less likelihood there will be of shrinkage. It is only after the major sources of leakage have been taken care of that a penetrative surface coating can be expected to fulfill its function. Of the two types of coating mentioned, the wax and gum preparations tend to be more permanent in their effects.

ASPHALT COATING

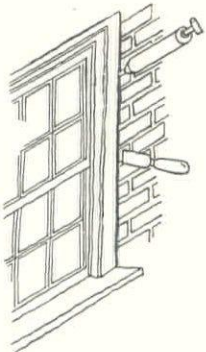
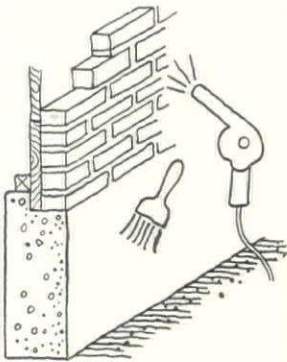
These are applied on the interior of the masonry surface and are chiefly used to protect the plaster. Obviously this method is hardly one to be used after the building has been completed. As a precaution, however, it is excellent.

CALKING (Figure 7)

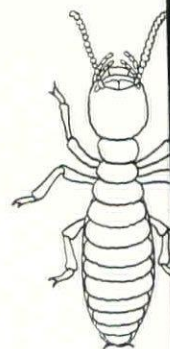
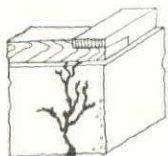
To take care of leakage around doors and windows, calking compounds have been developed. Where the joint is over one-half inch wide and one-half inch deep, oakum should be driven in between frame and masonry, and the last half inch filled with a standard calking compound. It is not wise to select calking on a price basis, since the cost of labor is several times the cost of the material, and the cost per year of service is the important price factor, not the initial cost of the preparation. Calking material should contain non-oxidizing oils, and must have the property of retaining its elasticity. Materials of the putty type, which dry up, shrink, and crack, are to be avoided. Calking compound can be applied with knife or gun, and joints should be primed with clear lacquer or shellac before application.

COLORLED SURFACE DAMPPROOFING

Commonly marketed under the name of concrete paints, they are applied to cement, concrete, masonry, etc., with a brush or a spray gun. A paint with an oil, resin, or wax base will effectively resist the action of water provided that there is no moisture from within the concrete to destroy the bond. These paints should be applied only after the concrete is thoroughly dry. Another type uses a Portland cement base, and can be used with fewer precautions, since the paint has the same base as the concrete to which it is applied. Concrete paints are comparatively cheap and are used successfully where color is desired.



TERMITE CONTROL



TERMITE damage to wood construction, from which no section of the United States is immune, now totals fifty million dollars annually and is mounting with epidemic proportions. New construction can be protected from infestation at a cost of 2 per cent of the initial investment. Driven from their natural source of food and shelter by the clearing of forests, termites have invaded buildings. This movement, with its consequent damage to construction, was accelerated by the building boom of the Twenties when thousands of cheap frame houses were thrown together with no precautionary methods to prevent the termite from flourishing. Many of these houses were stuccoed directly on wood lap, the stucco being brought down to the soil all around the building. Sap lumber was used, there was little or no sub-first floor ventilation, and the result was a perfect working condition for the termite.

The fifty or more species of U. S. termites fall into two classes: the subterranean (blind, grayish-white, soft-bodied, ant-like, and the most pestilential), and the dry wood termite which burrows directly into the wood and lives in trees or mounds above the earth. The latter occurs only in that half moon of country south of a slack line from Norfolk, Va., to San Francisco. A good preservative, carefully applied, will prevent its damage.

The subterranean termite is not so easily handled. When mature, this termite is the color of ivory, less than one-quarter inch in length, and looks more like a larva than an ant. It is blind, but when exposed to daylight will run quickly to a dark sheltered place. It can stand any amount of normal tropical heat, but direct sunlight is fatal. It depends first for its existence on moisture, second on wood or any kind of cellulose. To obtain moisture from the ground while working, it builds small earthen tubes of much the same color and texture as an ordinary mud wasp's egg depository. In an infested building these tubes can be seen running up walls, pipes, or any other available connections from soil to timber. In cases where there are no connections at hand it can run the tube unsupported from the soil twelve inches or more to reach wood. The termite does not need this connection with the ground if it can obtain moisture in any other way. A wood sill laid directly on a damp masonry wall, or rain water periodically leaking through from above, in fact anything keeping a supply of moisture in the wood, is all that is necessary for his requirements.

Termites always work in the dark, and therefore confine their activities to the insides of the timbers they attack, leaving often only a very thin outside shell. Their presence may not become apparent until some one of the structural members fails and the floor sags, or until cracking plaster warns of more serious damage. The termite seldom works in siding or in any outside covering of a building since there is too much direct sunlight, and since

better quality materials are generally used here where they will show. The termite likes sap lumber; real h lumber he won't touch except in rare cases.

Perhaps the first sign that termites are attacking a building will be a swarm of white winged dark brown insects that resemble flying ants. These insects will get into the interior of the house through a small hole in the floor or plaster, and if not destroyed will be apparent for a day or two during which time they will shed their wings and then disappear. The termite in this stage is not attacking the building, but is in the process of establishing colonies. However, its presence is warning that there is a nest not far away, and accessible to the building through which it has made its appearance.

In fighting this insect the most important fact to remember is that it depends on moisture for its existence. If the supply of moisture is cut off, it will either die or go back into the ground. Keeping this axiom in mind, the problem resolves itself into the effective insulation of the wood frame from the ground (which always holds a certain amount of moisture) and the prevention of rain or pipe leaks from getting in behind the outer covering, whether it is wood siding, stucco or brick.

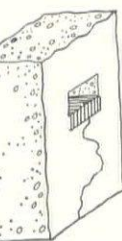
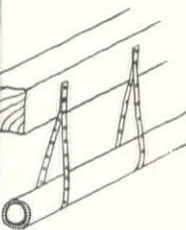
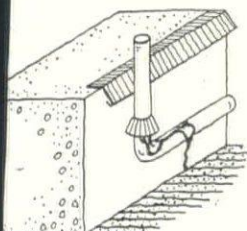
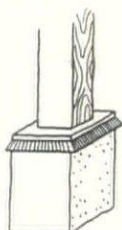
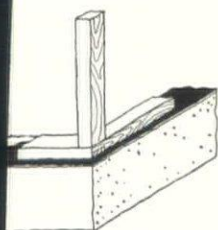
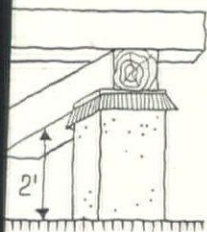
There is, of course, no termite problem in any construction system which does not employ wood or cellulose products—the vulnerable points. Termites cannot attack metal or masonry. However, as mentioned above, masonry can hold enough moisture to satisfy the termite's needs and may thus serve as a bridge for an attack on adjacent wood.

No wood has been found immune to termite attack, though redwood, yellow cypress and western red cedar have a fair degree of resistance. The obvious specific against termites is insulation of all untreated woodwork from soil and moist areas. During the last decade when architects and builders have been increasingly alert to the termite menace, many new anti-termite methods were developed and are now widely employed. Architect James Gamble Rogers II, in connection with his termite studies for the Government, reduces anti-termite practice to twelve fundamental rules to prevent infestation in new houses, or in repairing termite damage in old ones:

"1. Use only good rich concrete mixtures for footings, cellar floors and mortar. Termites can go through a very small crack in good concrete and can penetrate porous concrete.

2. Remove all wood forms from footings and floors, and all debris from under the building.

3. Have at least 2-foot clearance under the building between any wood girder and the ground. This will insure no soil touching any wood, will permit free circulation of air and will allow crawling space for periodic inspection. Allow ample ventilation to the outside.



4. Do not permit any wood to come in contact with the ground. This is one of the most common mistakes and is responsible for the majority of infestations. On the outside of the building a minimum of six inches must be allowed between any wood and the ground. Use steel basement sash, frames and ventilators. All lowest outside steps must be masonry. Any wood posts must have masonry bases brought at least six inches above grade.

5. Do not place any wood directly on masonry without using a dampproofing strip between. Masonry holds enough moisture to keep the wood sufficiently wet for the termite's needs.

6. Do not use metal for a dampproofing strip unless it is backed with felt paper or a strong building paper. When nights are cool and days hot, a metal strip will sweat enough each morning to give the termite the moisture he requires. Use either a strip of heavy felt paper mopped in place with hot pitch, or mopped on top of a strip of metal so no metal comes in contact with wood frame.

7. For all sills, girders, first floor joists, first floor sub-floor and any other wood contacting masonry or any wood directly opposite the soil, use timber which has been given one of the standard pressure treatments. Brushing or spraying creosote or similar insecticides on the understructure is good only for a limited length of time.

8. Around the inside of all foundation walls, and completely around all columns and piers under the building, insert immediately below the top course of masonry a continuous strip of copper or other non-rusting metal, allowing it to project out from the face of the wall three inches. Then bend this strip down to make an angle of forty-five degrees, soldering the joints at the corners to make tight. This is to discourage termites running their earthen tubes up the masonry to the wood. Use a similar stop around pipes running from ground to wood.

9. Hang all pipes and conduit under the building on metal hangers. Never block them up from the ground.

10. Do not build masonry terraces, porches or steps directly against a wood sill. Build a masonry retaining wall to arrange a continuous air space between wood and masonry.

11. Do not allow stucco to come all the way to the soil. Stop it at least six inches from grade and be sure a good bond is obtained with the stucco base. For stuccoing a frame building use one of the metal laths as a base; preferably one backed with paper.

12. Be sure there are no roof, pipe or other leaks which might keep any part of the frame wet. Termites can live on moisture from rain water as well as any other. They need no contact with the ground provided they can obtain moisture otherwise."

In repairing termite damage all structurally unsafe materials should be replaced. All removed materials which contain live termites should be burned. Ventilation of the substructure should be inspected. Cracks in the foundation walls, concrete floors, porches and platforms should be filled, preferably by cutting a small hole, placing a sheet of corrosion-resistant metal across the bottom and filling with rich dense Portland cement mortar. Here only sufficient water to make very fragile balls when compressed in the hand should be used. Put a little mortar in the hole and ram it solid with a hammer and iron rod, repeating the process until the hole is completely filled. After repairing, the building should be carefully checked to see that no part of its construction violates the above twelve rules.

PREFABRICATED UNITS FOR THE HOME

by
J. ANDRÉ FOUILHÉ

It has been in the past, it is now, and it will be in the future, the home builder's constant endeavor to minimize labor in the field and to have prebuilt in the factory as much of the house as possible. To be consistent, therefore, a survey of prefabrication should include practically all construction materials, for we have been using prefabricated units for ages.

The pioneer first cut his own forest trees and built himself a log cabin. But as soon as civilization caught up with him, a saw mill was put in operation, and prefabricated wood members in the form of studs, joists and boards supplanted hand-hewn logs. Later on studs and joists were cut to proper width and length before delivery. The latest development is to have the wood floor and the wood ceilings glued to the joists, and exterior and interior wood panels glued to the studs to form unit panels.

Where, instead of lumber, clay was available for building, clay huts were first built, followed later by adobe and baked bricks as prefabricated units.

Formerly, building stone was delivered at the site in large rough blocks which had to be sawn and dressed by hand to fit conditions found at the building. Now every piece is cut, dressed and carved at the plant following accurately detailed and dimensioned drawings.

In the old days steel beams were cut to length and holes punched at the job. Today prefabrication of every steel member permits erection of two and more stories of a skyscraper in one working day.

A builder is now able to buy a roof truss of wood or steel for different spans and loading already fabricated and ready for erection.

Combination bucks and frames are used to frame door openings at a great saving of time and money over the successive operations of erecting a rough buck, then a finished frame, and later the door trim.

Lime delivered hydrated in packages, rather than being slaked at the job; ready mixed mortars, and ready mixed concrete delivered by trucks to the job, are other examples of minimizing labor at the job.

Concrete blocks, artificial stone blocks, plaster boards, compo boards, corrugated iron sheets to form walls, stamped sheets of galvanized iron to finish ceilings, are prefabricated units.

Finish floors now come in large sheets of linoleum and rubber.

Pipes for plumbing and heating are now delivered on the job cut to required length and threaded, and in some cases assembled with all fittings.

Prefabrication, therefore, is nothing new. It is a term used to identify a trend. Under the pressure of demand for an economical solution of housing, and with the manufacturers' desire to create new markets for their products, the study of prefabrication has lately been greatly accelerated.

Houses Are Not Automobiles

There has been an ill-considered tendency to compare the housing and the automobile industries. In reality they have little in common.

The automobile has only one use—transportation. A

house has many uses—work, recreation, entertaining, eating, resting, sleeping.

The proper housing of five members of a family, relation of these people to each other, their habits, scale of living, the climate, the lay of the land, the surrounding country and the orientation—all these are to be related. This creates a much more complicated problem with many possible solutions, and with more susceptibility to standardization than the seating of the same five members of a family in one automobile. An automobile leaves the factory a finished product ready to function. A house has to be erected partly or wholly, it has to be set on foundations, connected to utilities, graded and landscaped.

The financing of an automobile is completed in two to eighteen months. The payments on a house extend over ten to twenty-five years. In case of failure to make the disposition of the movable car is easy—of the movable house, difficult.

* * *

A house may be built entirely and exclusively of prefabricated units, or it may include only as few or many prefabricated structural or finish units as the architect or the owner deems advisable from the point of view of cost or appearance.

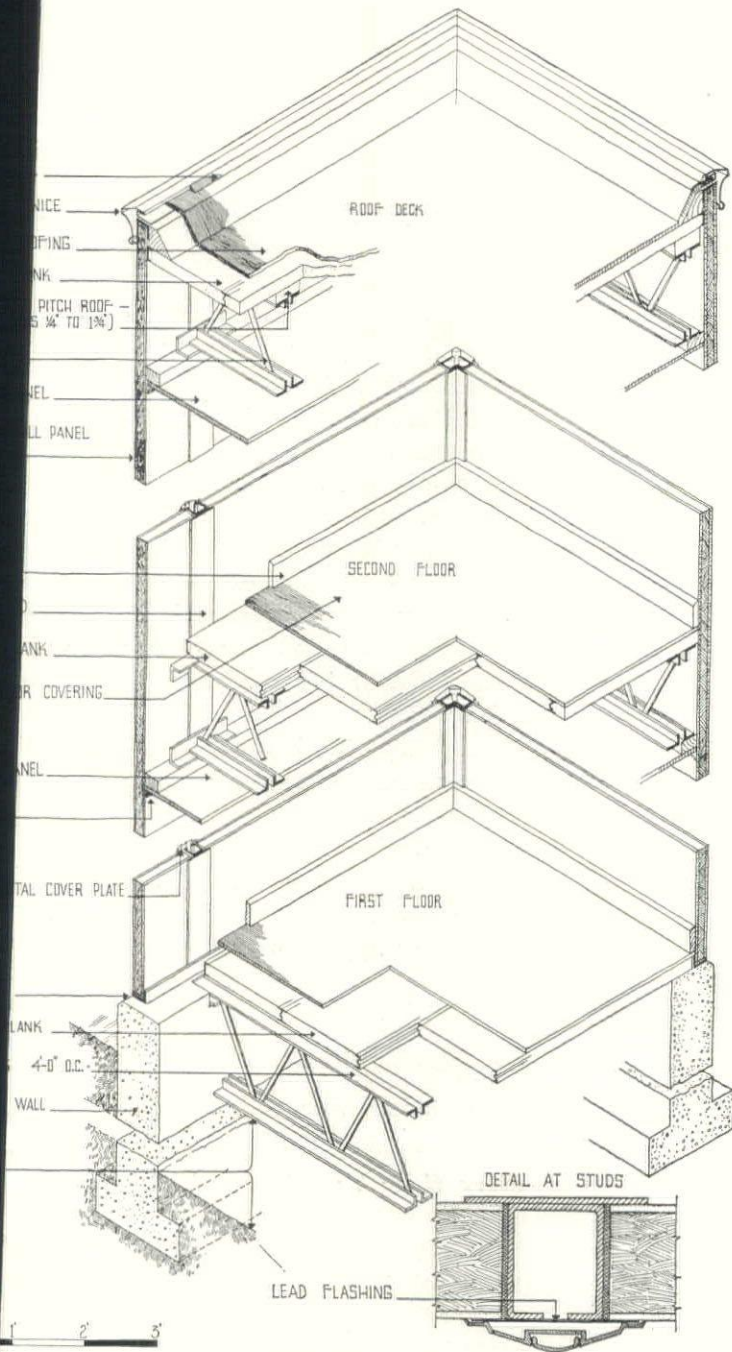
In addition to the desired properties of strength, durability, fireproofing, heat and soundproofing required of every building material, prefabricated units should have

1. Light weight—to enable economic shipping to distant points.
2. Small size—to allow flexibility which will meet a reasonable variety of demand, and permit durable convenient packing for shipment.
3. Ease of handling—to facilitate safe shipment.
4. Simple assemblage—to permit rapid erection with simple equipment.
5. Permanent attachment—to insure a rigid structure.
6. Finish, if part of unit—to satisfy type and quality demands.
7. Low cost—to compete with regular building units they replace.

The factory cost may be too high due to lack of quantity production; and quantity production may be impossible due to the cost's limiting the market. On the part of the manufacturer with enough faith in the quality of his product can break this vicious circle of reduction of his first quotation.

As to the acceptance by the public of new materials, new finishes and new forms, it is self-evident that as soon as a house better than the conventional one of the same price, less troublesome to run, more comfortable to live in and more economical to operate and maintain is produced and put on the market, the public will buy it regardless of whether it is modern in style, has no finish materials inside or outside, has a flat roof or no cellar or attic.

It should be realized, however, that the manufacture of prefabricated units is in a state of flux. The units described in this article are commercially available.



AMERICAN HOUSES, INC.

480 Lexington Avenue
New York City

Construction: tubular studding, bar joists for floors and roof, spaced 4'-0" on centers. Floor slabs of prefabricated gypsum planks.

Wall panels 4'-0" center to center of joints and continuous from sill to top of parapet. They consist of 2" celotex core cemented to an outer and inner covering of asbestos board.

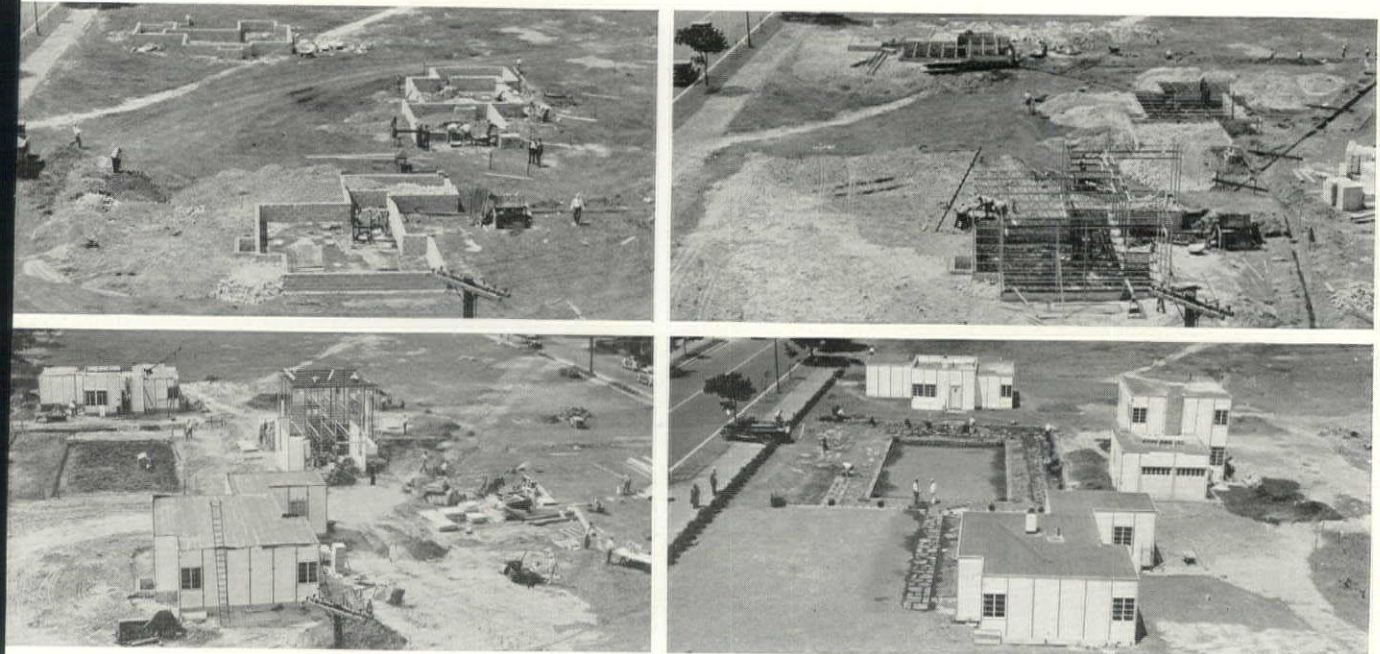
The tubular studding has a steel plate fastened to its inner face which holds the panels in line for setting. The outside joint is covered by a molded aluminum batten with a snap-on strip to conceal the bolts. Outer face of stud is split, allowing the insertion of bolts. Joint water-proofed with lead flashing and mastic.

When a parapet is desired, a copper base flashing, screwed tight to asbestos panel, is used. Otherwise built-up roofing is as shown on drawing.

Ceilings 4'-0" wide bevel-edged Celotex panels. Interior partitions gypsum plank with hollow metal flush buck and trim. Windows standard steel sash. Doors, trim, floor coverings are standard. Plumbing pipe assembly built in shop, and set in one or two large pieces at the job. Kitchen and bath are back to back.

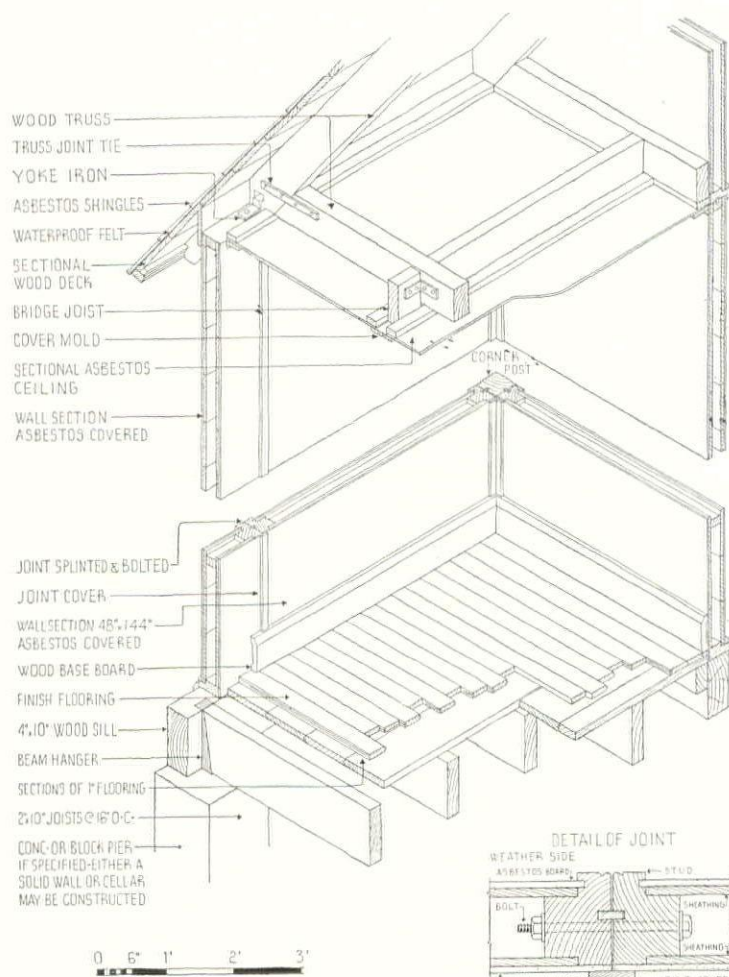
The bathrooms have prefabricated steel paneling on fixture wall. All other work standard construction.

BELOW: Four stages in the erection of a group of "American Homes" at Cambridge, Mass.



Wide World

2-3 PREFABRICATION



AMBLER ASBESTOS BUILDING

Keasby & Mattison Co.

Ambler, Pa.

A factory manufactured complete building formed mainly of asbestos sheets and framing.

Wood sills 4" x 10", carried on piers or continuous footing, and floor joists 2" x 10" on centers are ready cut.

Sub-floors 1" thick are furnished in panels.

Wall sections are in units 4' x 12', made of wood sheathed frame with enclosed air space and covered on both sides with asbestos lumber. Units butted together and splined. The vertical sides are bolted together, forming a rigid wall. Two types of units are available: the "Standard" type with exposed interior stud, and the "Liberty" type, of heavier construction eliminating the interior stud. Wall units include doors, windows, and blank surfaces are interchangeable. Inside partitions similar to wall units.

Factory-made wood trusses, spaced on 4'-0" centers with rafters midway between, support roof sections.

Ceiling sections covered with asbestos lumber are attached to trusses. Interior trim consists of moldings covering all wall unit joints. The finish floor applied over floor sections.

BOSSERT HOUSES

Grand and Newtown Creek, Brooklyn, N. Y.

Typical floor framing ready cut. Girders on every 6' or 7'; joists and girders have standard circular tongue and groove joints. General floor joists are 2" x 6", but in longer than 7' spans the depth is increased.

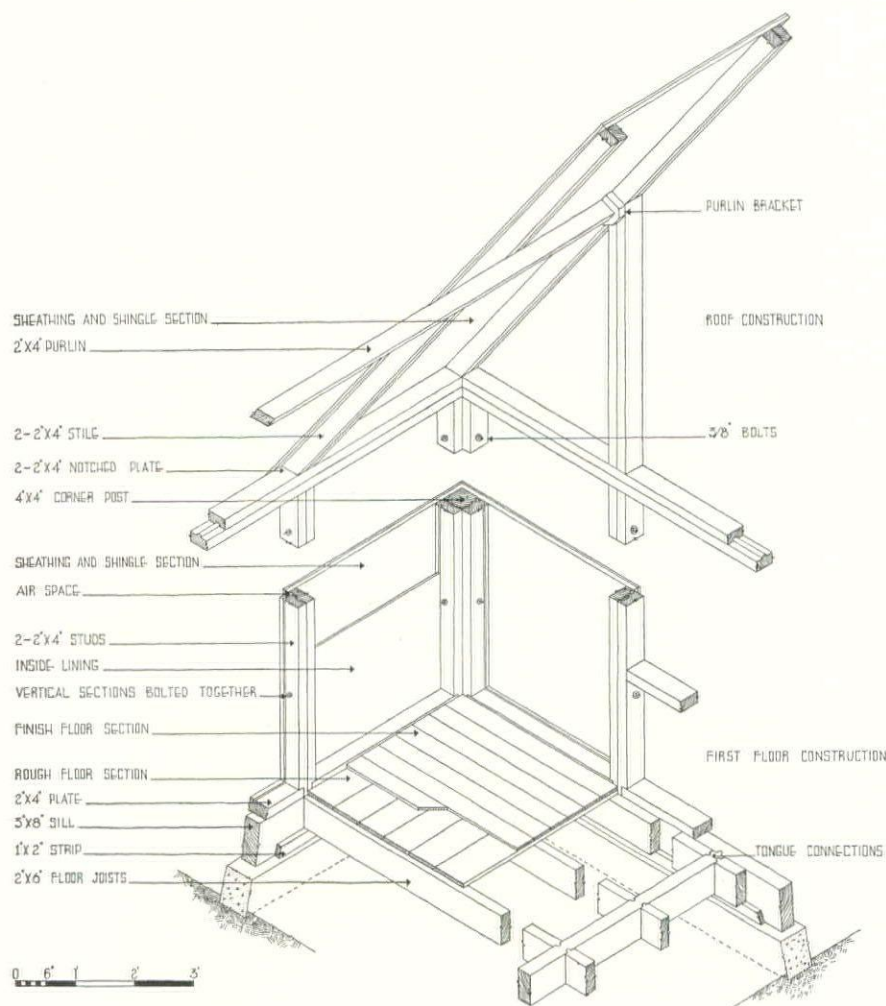
Walls of ready-made sections. Approximate height 8'-6" and consists of a 2" x 4" frame covered with sheathing paper and finish. The bottom member rests on sill and side members are notched out, continuing down over the sill. Top member is tongued, fitting into a groove in the plate. Sections include wall, door, and window units.

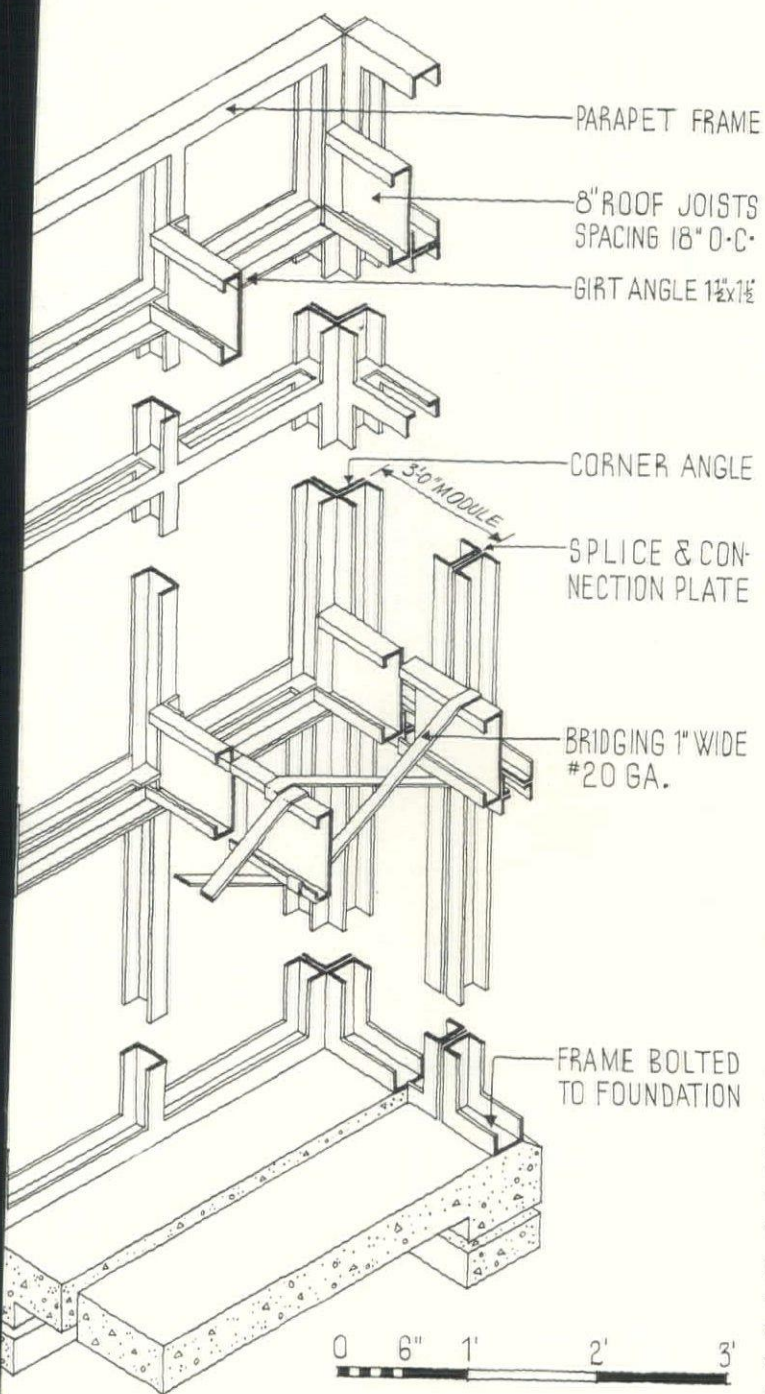
A plaster board set in grooves just away from the sheathing forms the interior wall surface. Gable ends are built in one piece with frame and exterior covering. Roof supported by trusses approximately 12' on centers.

Roof sections similar to wall sections, and bolt fastens roof, wall section, and plate together. The joints of roof sections stagger over the joints of wall sections.

Finish flooring and sub-flooring are furnished in panels of 3'-0" x 8'-0". These have tongue and groove joints.

All mechanical work is typical construction.





BERLOY STEEL FRAMES

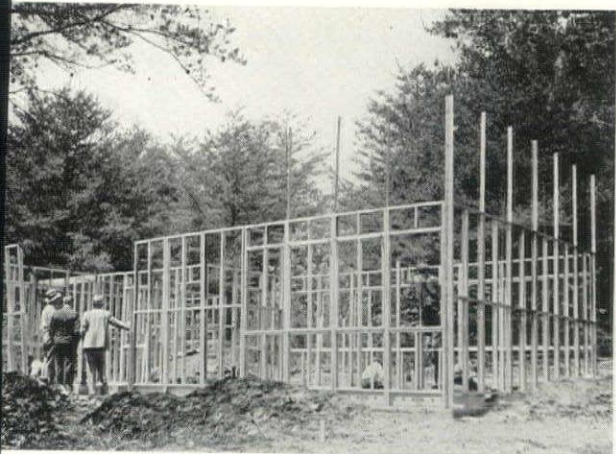
Berger Manufacturing Company, of Canton Ohio. (Subsidiary of the Republic Steel Corporation)

Walls and floor frames are shop fabricated from 18-gauge strip steel. Individual members are channel shapes. Wall frames are 2'-11⁷/₈" wide and of desired ceiling height. They consist of 3" channels welded together, typical wall frames having an intermediate vertical and an intermediate horizontal member. Frames for blank wall surfaces are interchangeable with frames containing doors or windows. They can easily be handled by one man. The rectangular steel frames are simply bolted to the foundation and to each other, forming a rigid and continuous steel framing. At the corners L-shaped strips comprise the connection between the abutting frames. An ¹/₈" connection plate is used between the frames. To this plate the floor and roof framing channels are bolted; splice plates are used for connecting the first and second story frames.

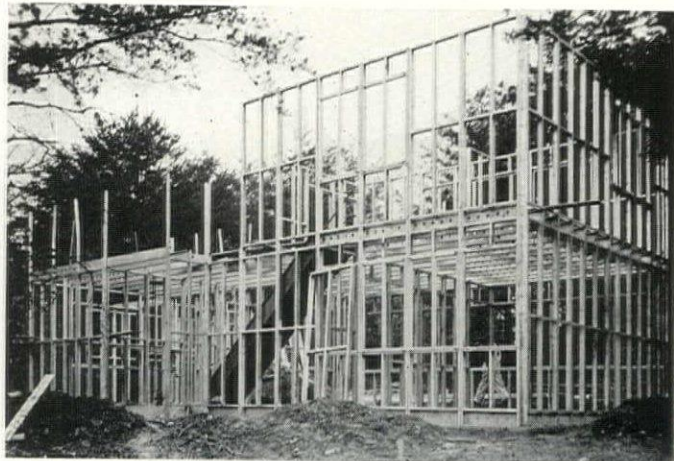
The floor and roof members are channel-shaped joists 6", 7", 8" deep. They are bolted to the splice plate or to a connection angle bolted to the intermediate vertical member of the frame. They also rest on a girt angle bolted to wall and floor frame. Holes for bolts and conduit are provided in the frame and, where desired, slot holes are cut through the horizontal members to allow for air circulation in connection with heating system. Circular holes are provided in the web of floor joists for the same purposes.

Any building material may be used for exterior or interior finish, or floors and ceilings. Holes are punched in the flanges of the channels for attachment of these materials.

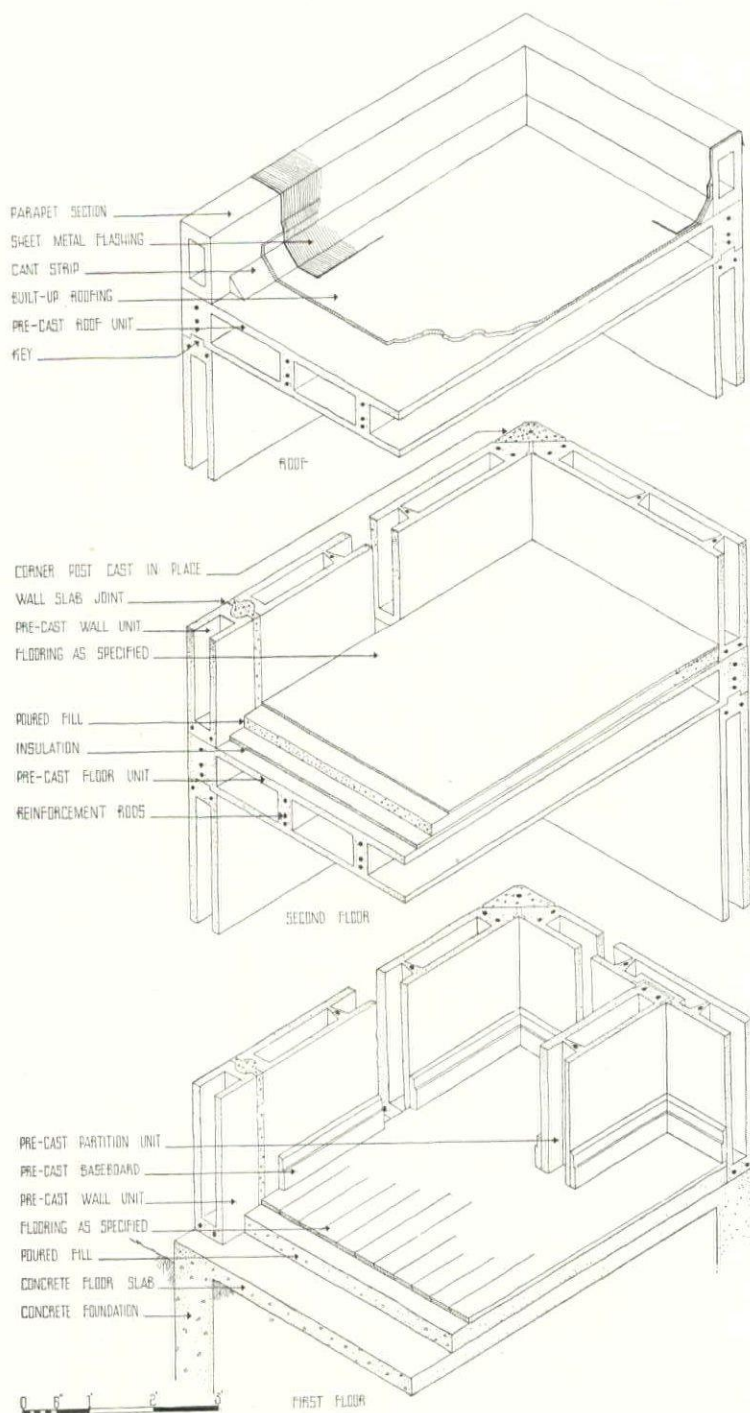
FIRST FLOOR



SECOND FLOOR

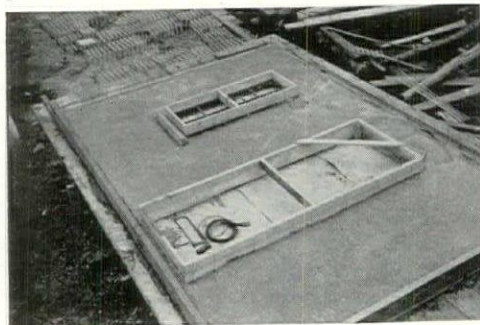


5 PREFABRICATION

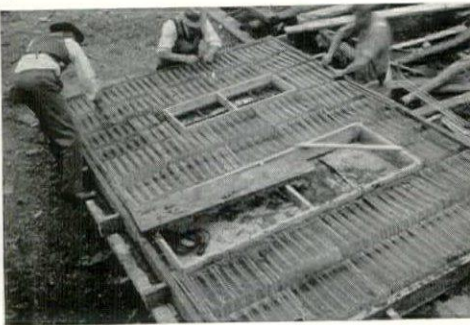


PROGRESS PHOTOGRAPHS SHOWING FABRICATION OF WALL UNIT

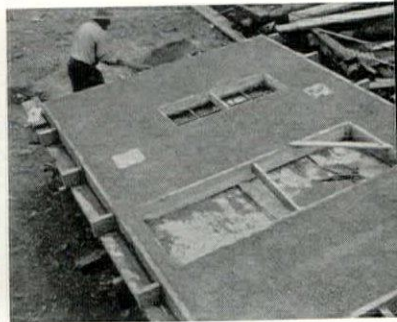
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THE CONNECTICUT PRECAST BUILDING CORPORATION (Quentin Twachtman, Greenwich, Conn.)

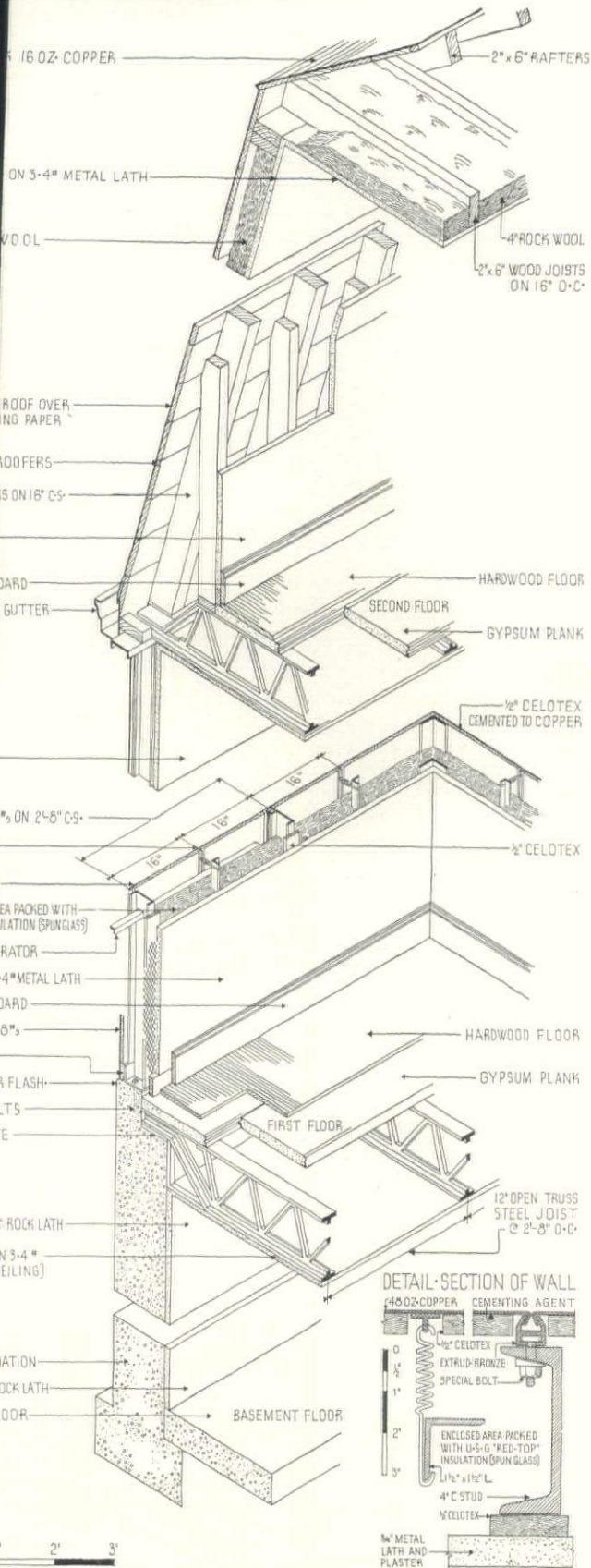
Units consist of prefabricated slabs of slag concrete, locked in position by tongue and groove construction between floors, roofs, and wall units, and by welding the projecting reinforcement. Poured concrete keys between wall units. The width of the wall unit slabs is the height; they are made in lengths up to 30' in thicknesses of 6" and 8". Floor and roof slabs are 6'-0" x 15'-0", 20'-0", and 30' x 16½" thick.

Wall units consist of an inner and outer slab separated by studs 16" on centers. Reinforcement is herringbone mesh and steel rods. Windows and door frames cast in units. Electrical conduit and fittings, as well as major plumbing and heating work, built into slabs. Exterior finish left natural or usual finishes applied. The exterior cast surface is the finish and base and top cast on the slabs. Hooks are cast in the units to facilitate handling.

Wall joints are circular keys filled with concrete. Corners of units are mitered. Reinforcing rods are welded together and a triangular corner post poured to complete wall as one unit. Floor and roof slabs have 2" top and 1" shell. These are spaced by 4" reinforcement 17" center to center.

Fabrication of units is continuous and automated like an automobile assembly line. Erection: One wall unit is set on four others, then the opposite wall unit, then second floor slabs are set, and so on until story is complete. Same procedure for additional stories.





COPPER HOUSES, INC.

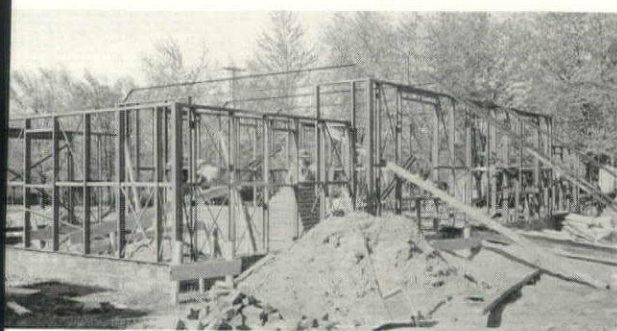
Subsidiary of Kennecott Copper Corp.
10 East 40th Street, New York, N. Y.

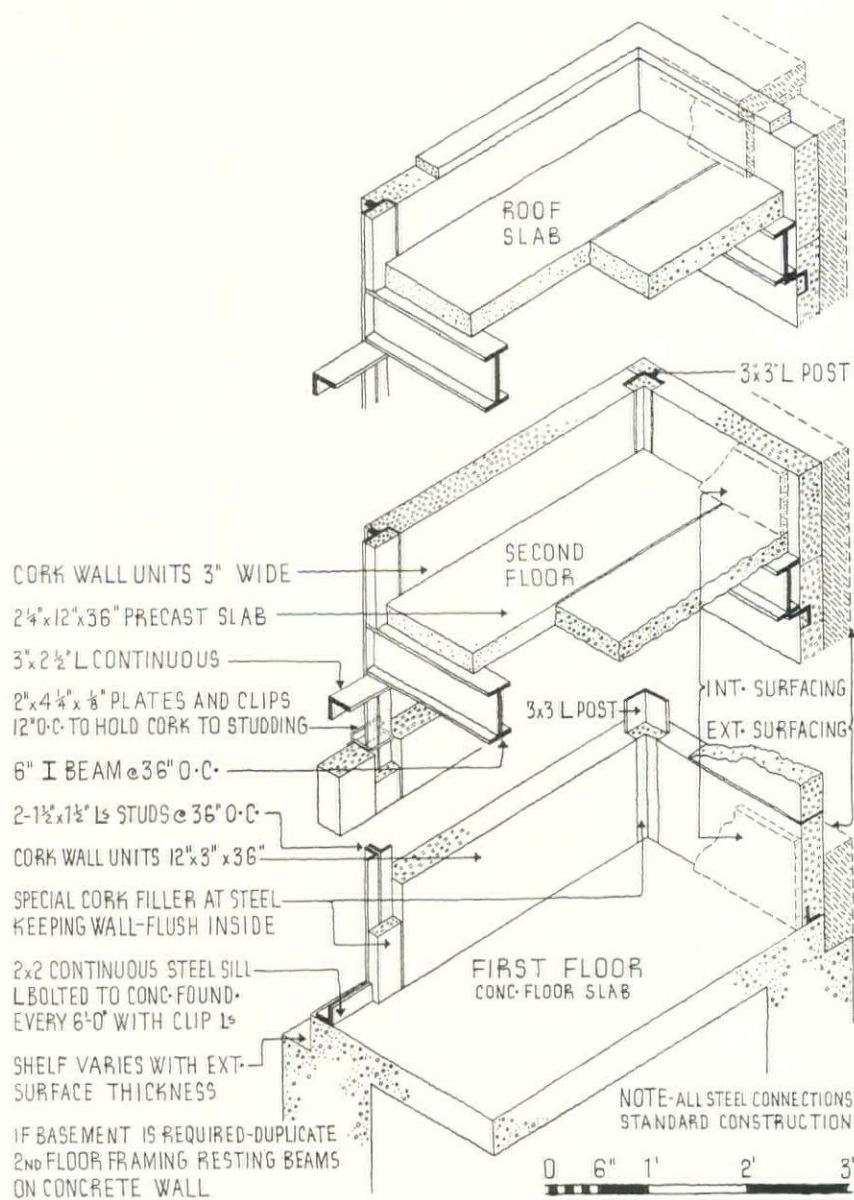
Copper Houses, Inc., furnishes material only. The house is standard construction throughout—steel, wood frame, etc., with a prefabricated copper panel as the first story exterior facing.

The panels are 2' 8" on centers and run the full story height from water table to eaves. There must be a structural stud at each intersection to receive the panel and structural members at the sill and eaves, and framing for all openings.

The panel is 48 oz. copper sheet backed by $\frac{1}{2}$ " of Celotex. The edges are crimped back beyond a 90° bend. The edges of two panels form a dovetail and fit into an extruded bronze track which is bolted to the structure and runs vertically the height of the panel. The panels are slipped into the tracks from the top. At several points in the height, springs are hooked to a continuous bronze tee on the panel and to the construction. The purpose is to create a slight depression in the face of the panel and prevent its bulging out. The manufacturers claim this prevents any appearance of the wall not being flat and true.

All other construction and finish as required.





CORKANSTELE

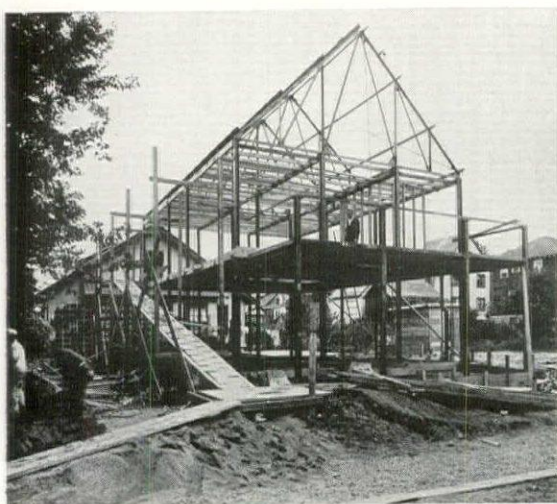
270 Madison Avenue, New York,

This system consists of upright steel angles $1\frac{1}{2}" \times 1\frac{3}{4}"$ spaced 3'-0". They are bolted to a continuous beam anchored to the foundation, and to the wall at second floor and roof levels.

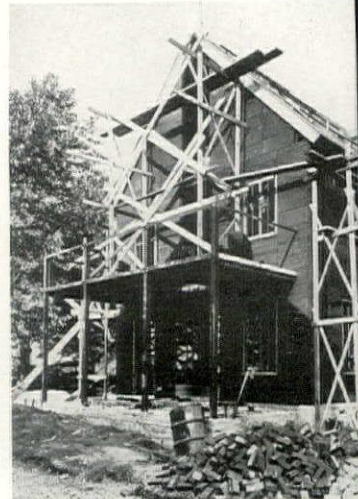
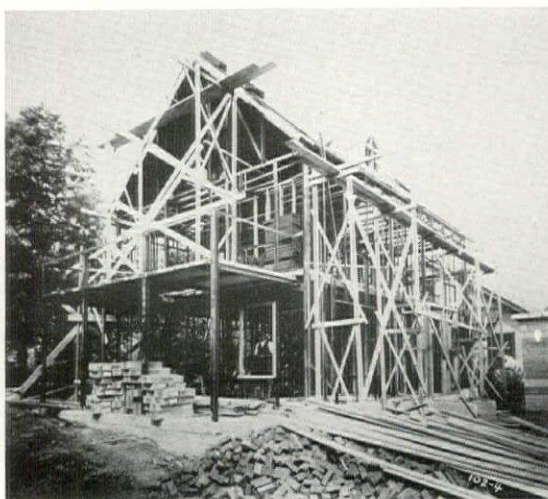
Between the struts are panels of insulation, which are part of the actual structure. The insulation is pure cork 3" thick, covered with steel struts, forming continuous insulation, thereby avoiding condensation and framing lines. The slabs of cork are attached to the steel structure by steel clips. Steel beams and sills framing from strut to strut support the slabs and hold the cork slabs in place. Exterior stucco and interior plaster are applied directly to the slabs. Other finishes such as siding, shingles, brick or stone may also be used. Interior plaster may be applied, or furring or other finishes may be substituted. Floor system consists of rolled steel joists on center resting on and bolted to the wall which is bolted to uprights. Floor is made of "Corkcrete," a patented mixture of cork aggregate and cement, and precast in units 12" high and 12" wide.

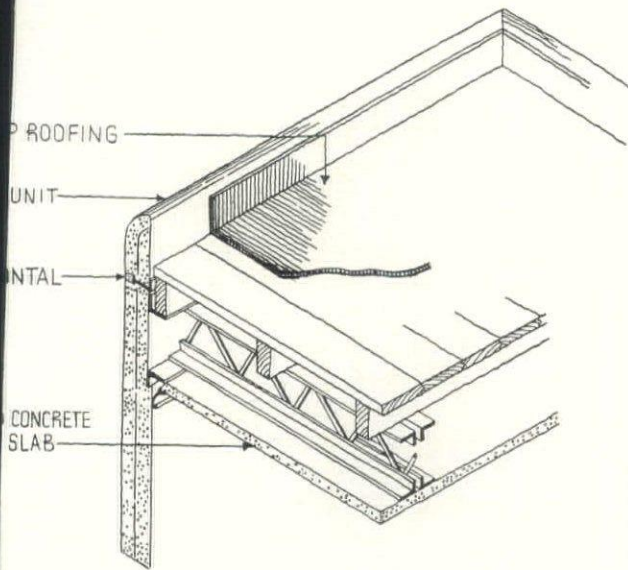
For the roof 1 $\frac{3}{4}$ " "Corkcrete" slabs or
nels are used. Floor finishes, roof
finishes are optional.

High heat insulation as well as ease of erection appear to be the advantages of the system.



Howard Cog





CROWE HOUSE CONSTRUCTION

(Fully covered by patents)

Developed by F. Malcolm Crowe
Burlingame, California

Wall panels combine framing members with aerated concrete sheathing slab to form semi-finished panels which constitute complete one-piece sections of wall, one story in height, certain of which have a window or door already installed therein. This procedure increases the extent of shop fabrication.

Exterior walls: Pressed steel sections, slab in two layers with asphaltic moistureproofing membrane between. Metal buck and casing for windows or doors cast in slab.

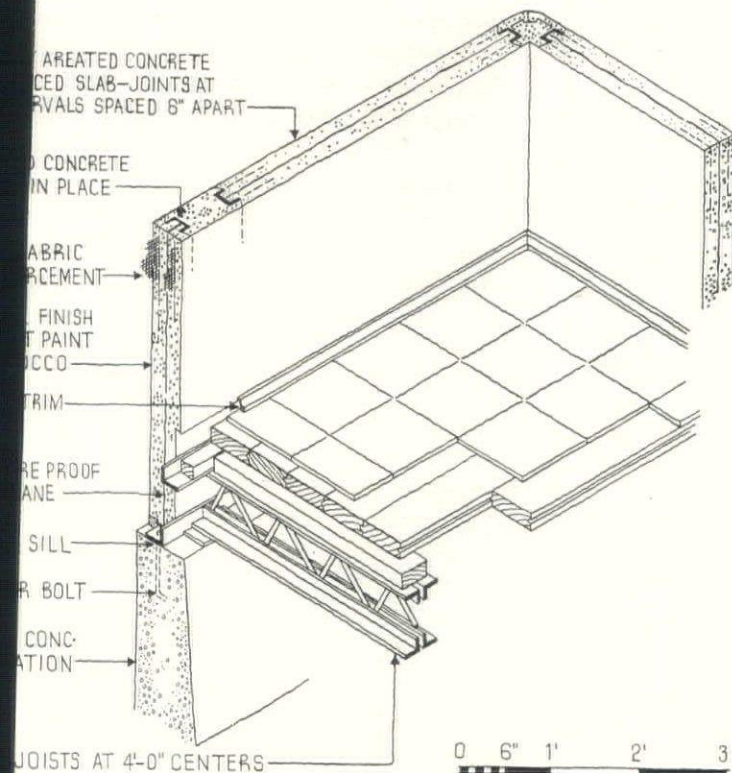
The panel joint is a feature of the system. Joints occur at 4" intervals; panels spaced 6" apart at joints; pairs of opposed vertical framing members of adjacent panels connected by steel spacers, forming structural posts; open joint space utilized for pipes, etc. Metal membrane across joint opening, reinforcement projecting from adjacent panels lapped across joint center and joint space filled with aerated concrete, surfaces finishing flush with adjacent panel slab surfaces.

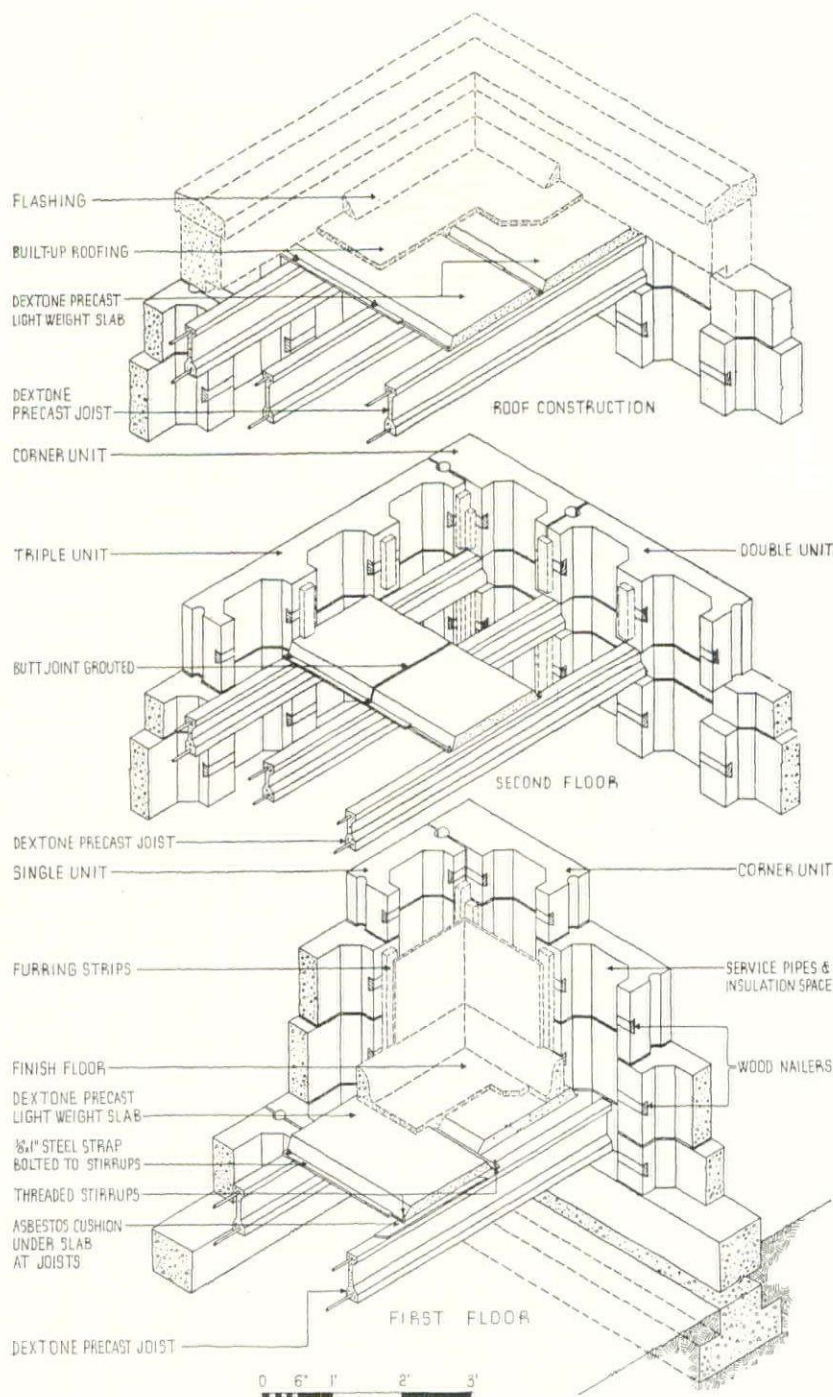
Interior walls: Bearing walls similar to exterior walls except that panel slab is monolithic. Non-bearing partitions similar except that framing members are smaller and slab is thinner; 2' variation in possible location with standard units.

Ceilings: Precast aerated concrete slabs, reinforced and made with integral ties of attachment to floor or roof beams.

The wall surfaces are finished with stucco or plaster or any standard finish.

Floor and roof built of standard truss joists with plank or concrete flooring.





DEXTONE SELF-CENTERING WALL SYSTEM

The Dextone Company, New Haven,

The units are made in three lengths, 16", 24", and 48" and three convenient heights. Continuous wall channels are formed by the hollow spaces in the units. These hollow spaces are 4"x11" and are easily adapted to installation of insulation, pipe risers, electric conduits, and air ducts. They are separated by continuous vertical studs, 16" on center which guarantee rigidity.

The web thickness is 4" for 8" walls and 6" for 12" walls.

A corner unit is made of any one unit placed for the return head, forming a solid corner. At each vertical joint a water stop is provided by grouting the vertical hole which is formed by butting two units together.

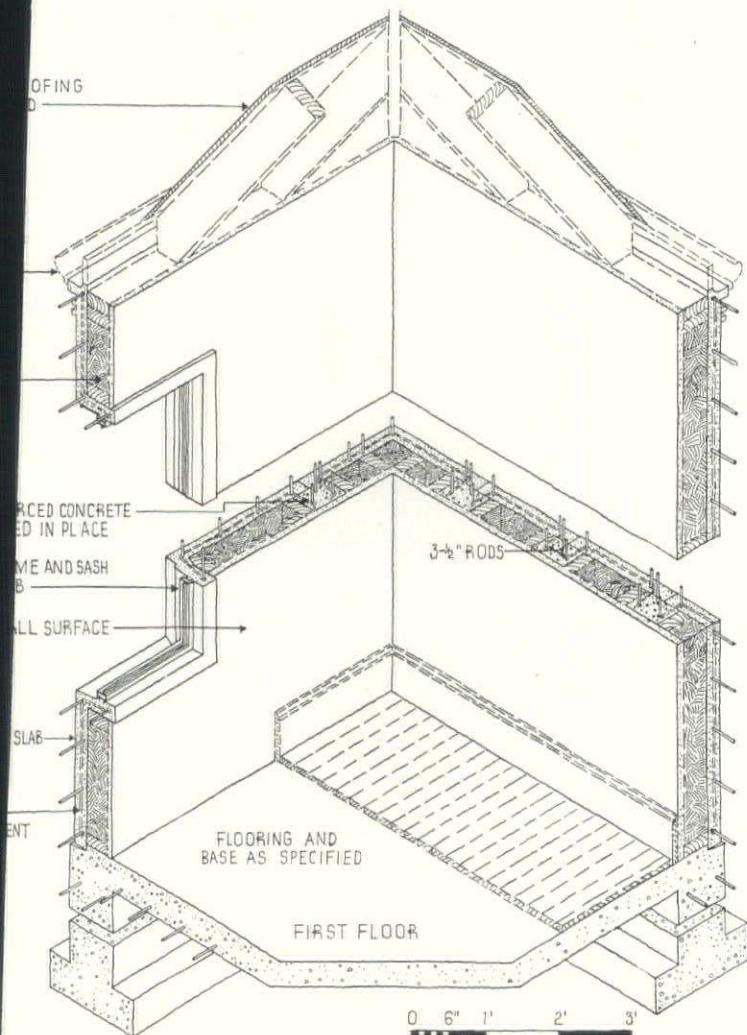
Wood nailing strips are cast integral with each unit and dovetailed for permanency.

Each unit is reinforced and is vibrated in manufacture. The exterior is finished either smooth for whitewashing or in a special texture finish in several shades of gray.

The floor system consists of precast concrete joists which frame on masonry or steel support or on girders made up of precast concrete. The joists are 8", 10", and 12" deep. Lengths are as required. They have holes in the ends for anchors and passage of piping.

Precast light-weight slabs 2", 2 1/2" or 3" thickness, 18" wide, and of variable length according to joist spacing, form the floor ready for receiving a finish. Precast slabs are also made with an integral terrazzo finish. An asbestos cushion strip is provided on top of joists to receive slab. Slabs are made with a longitudinal dovetail shoulder, two adjoining slabs forming a groove into which fits a steel strip bolted to threaded stirrup which is welded to the reinforcement. It is claimed that this arrangement gives a T action between the joist and slab.

The groove is either grouted to a flush surface with the slab or, if a finish wood floor is used, wood sleeper for nailing may be bolted to the threaded stirrup. For slabs with a terrazzo finish, a colored terrazzo strip is provided in the field.



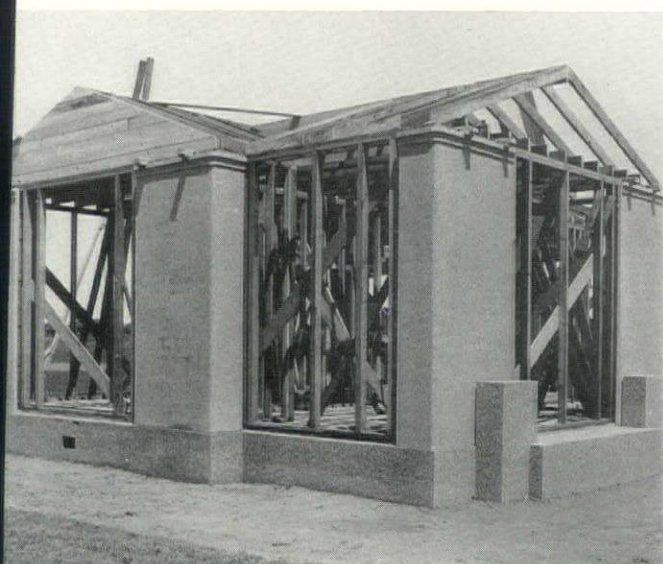
EARLEY SYSTEM

John J. Earley

National Press Building, Washington, D. C.

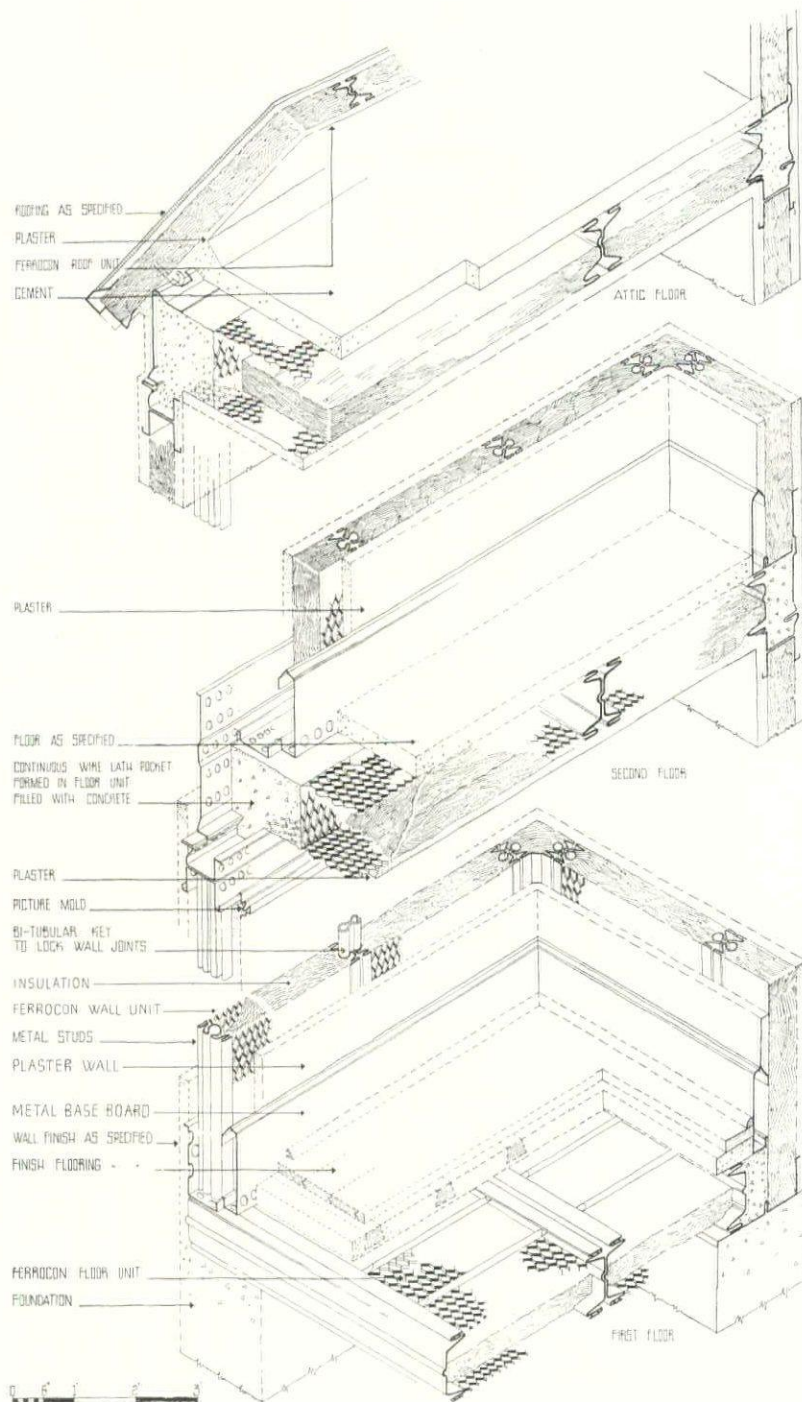
Precast reinforced concrete slabs on a reinforced concrete or steel skeleton. Slab dimensions may be story height by widths of one to ten feet; minimum thickness two inches. Steel dowels one-quarter inch in diameter are placed along the vertical edges, and are embedded in concrete frame or threaded for bolting to steel frame.

The slabs may be made to include windows and doors. Suitable foundations are provided by ordinary methods. When concrete posts are used the slabs are set up before the posts are poured and are temporarily braced. Behind the joints, between slabs, a strip of waterproof fabric or metal foil is placed. Reinforced concrete columns are poured behind the joints. Furring strips separate the interior finish from the exterior. Insulation is placed in the space between. The exposed surfaces can be finished in concrete mosaic with the use of colored aggregates; this is a specialty of the Earley Studios.

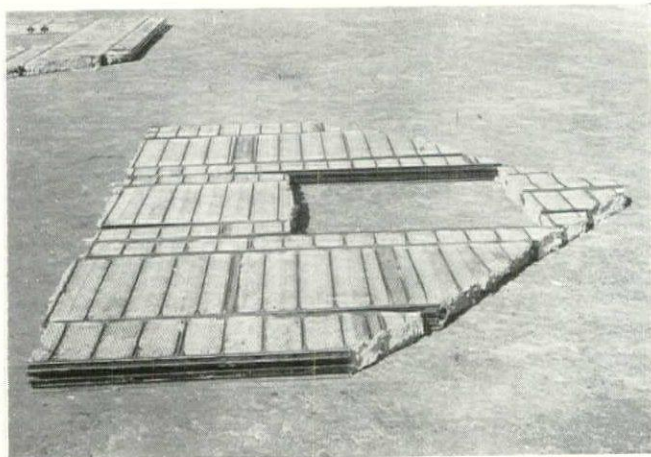


René Photos

II PREFABRICATION



Units preparatory to, and in the process of, erection



FERROCON CORPORATION

Queen Street and Mermaid Lane
Chestnut Hill Station, Philadelphia, Pa.

A patented, interlocking steel unit building system, consisting of factory manufactured floor, partition and roof units.

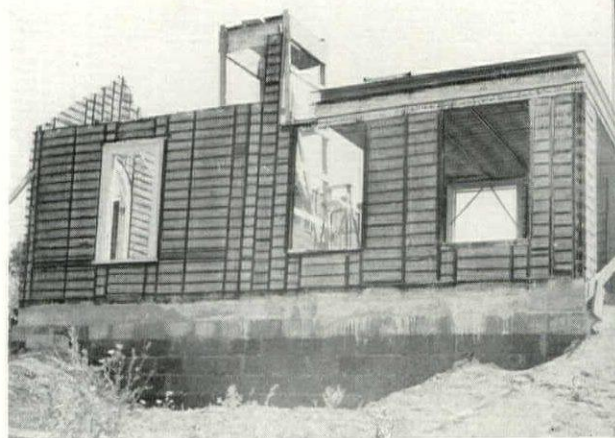
Wall units consist of two composite key-way heavy gauge, cold rolled steel, protected against corrosion, spaced by an approved heavy expanded and ribbed metal lath, with a 3 inch layer of waterproofed and fireproofed insulation. These units are furnished in varying widths and lengths. During erection they are butted together along their vertical edges and the units are aligned and locked with a dumbbell shaped heavy gauge steel key, forming a composite stud member of exceptional strength. These stud members form the structure of the building, and as the lath and insulation are already incorporated in the prefabricated unit it is necessary only to apply the specified exterior and interior coverings.

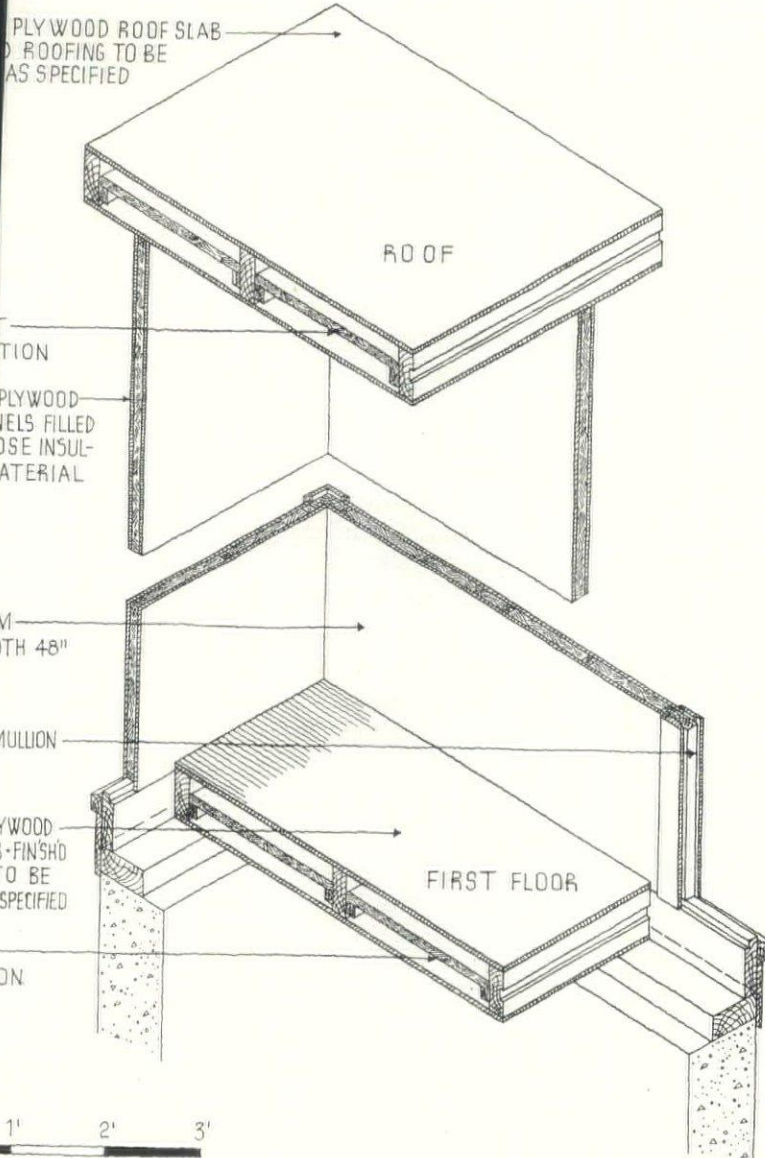
The construction lends itself readily to the installation of all conduit and piping and each floor or wall unit is a potential duct. Partition units similar to other units, forming bearing and non-bearing walls.

Floor units are similarly constructed, the top flanges forming a composite I-beam. At the wall end of each floor unit a continuous wire lath pocket is formed which permits the use of concrete monolithically to bind the floor and wall units rigidly together. Concrete may be placed over the floor units, into which wood sleepers may be embedded for the purpose of attaching finished wood flooring if desired.

For pitched roofs light-weight units are provided. Flat decks may be overlaid with specified roofing.

All trim and accessory connecting materials of proper design and punched to permit free flow and bonding of concrete fills. The members are locked together without the use of bolts, rivets, etc.





FOREST PRODUCTS LABORATORY

Madison, Wisconsin

This house is experimental. In general the wall and floor panels are built up of a wood frame with plywood glued on both sides. The plywood acts as a flange for the members of the wood frame and the whole virtually forms a box girder.

Wall panels consist of $\frac{1}{4}$ " 3-ply wood, 4'x8', glued to $\frac{3}{4}$ "x1 $\frac{3}{8}$ " strips. All outside strips are set in $\frac{3}{4}$ " from the edge of the plywood to form a connection joint. Air spaces between strips are filled with insulation.

Floor and roof panels are 4' wide and 8' to 14' long. The top surface is $\frac{5}{8}$ " plywood, 5 plies, and bottom surface is $\frac{3}{8}$ ", 3 plies, glued to 2"x6" joist. Blanket insulation is attached within the panels. Such panels are stronger than regular construction with 2"x10" joists.

Built-up vertical mullions connect the wall panels. Joints are buttered with mastic before panel is shoved in place.

The sill is rabbetted so that edges of wall panel fit over the rabbet. Similarly the top edges fit over a $\frac{3}{4}$ "x1 $\frac{3}{8}$ " member glued to the bottom of the roof panels at exterior wall and partition lines.

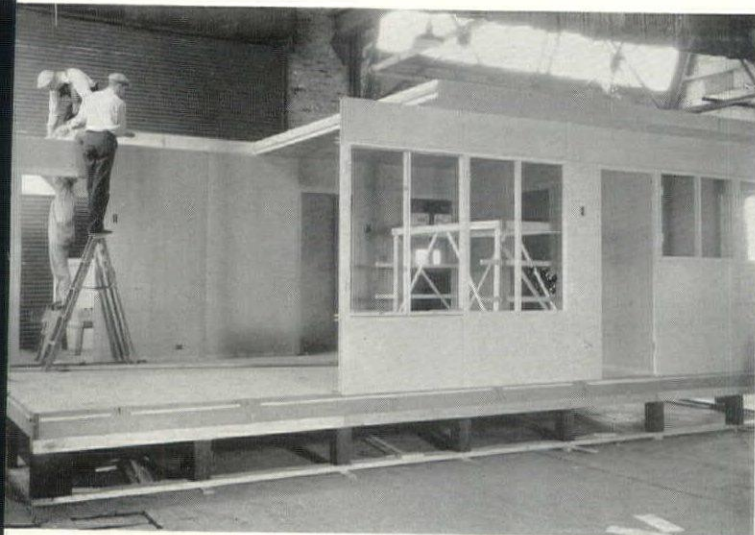
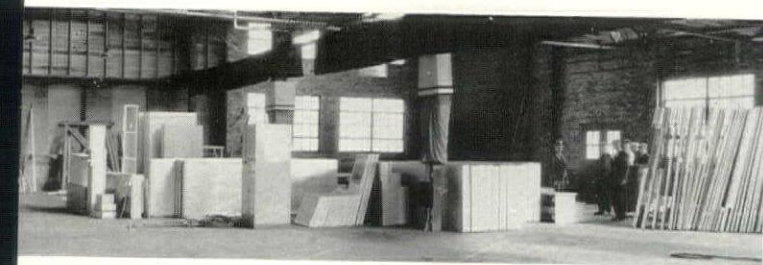
Roof and wall sections are grooved and splined where they come together.

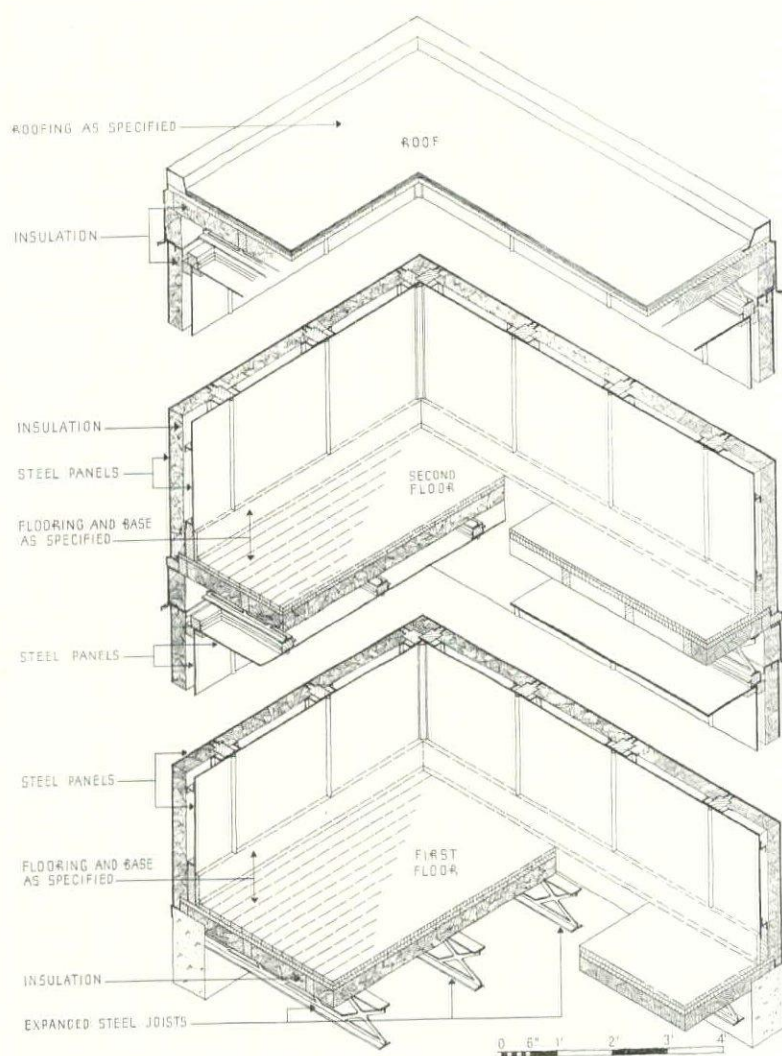
Window and door frames built into panels. Sash larger than opening and has spring bronze strip to seal against weather with projecting drip cap over.

Electrical conduit and fittings built into panels. Heating and plumbing are standard; with quantity production they could be partially prefabricated.

1. Prefabricated units before assembly.
2. Six hours later.
3. Floors are laid in 4-foot units to correspond with wall panels.

3





GENERAL HOUSES

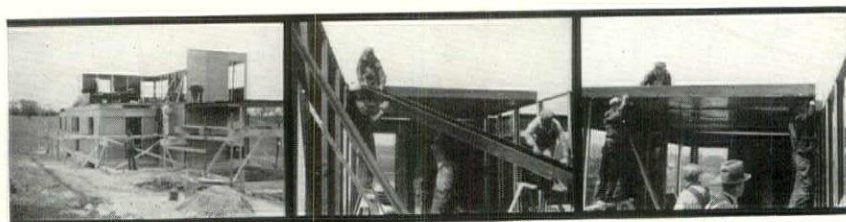
220 So. State St., Chicago, Illinois
Foundations are standard practice.

Walls: Exterior walls are of 14-gauge rust-resisting copper-bearing steel panels of sufficient strength to support all superimposed loads. Interior surfaces are of sanded celotex, sheet or 20-gauge reinforced steel, as selected by buyer. Celotex finish is treated with V-joint sheetrock with flush joints, and steel with panel strip over joints. Insulation is $3\frac{1}{2}$ " of wool for steel or sheetrock finish walls, total of 2" of celotex walls.

Interior partitions are finished on both sides to correspond with exterior walls and are insulated for sound deadening.

Floors and roofs are supported on expanded steel joists with standard flooring attached by wood nailing strips and finished as desired. Roof is similar with usual composition covering and insulated with $3\frac{1}{2}$ " of rock wool.

Windows, doors, cases, etc., and all mechanical work are standard usual practice as desired. A steel base is attached to the outer edge of foundation. The prefabricated panels are bolted to this base and to each other. Steel joists are then bolted to the foundation. Similar joists are bolted to the top of the panels and, if more stories, the process is repeated for the roof and second floor walls. The roofing is then applied and the windows and doors installed. Insulation and mechanical work are placed and the house is then finished and trimmed out and painted.



HAHN CONCRETE LUMBER SYSTEM

Decatur, Ill.

The system consists of concrete nailing board 1" thick, 12" wide, and 16", 32", or 48" in length. The slabs are premolded on wood pallets in a simple mold, concrete being compacted by hand and struck off.

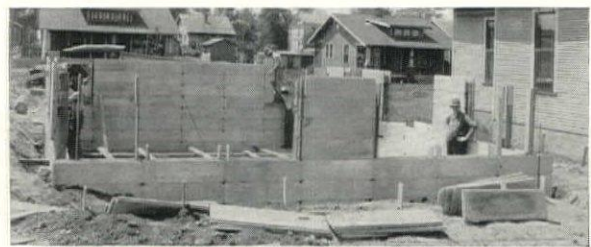
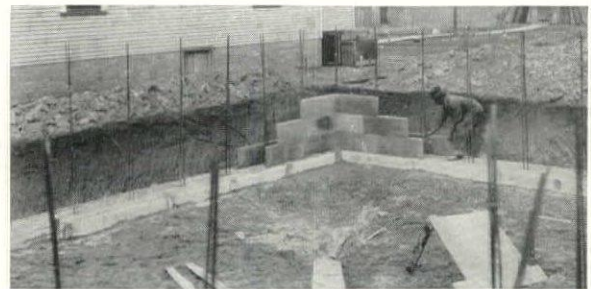
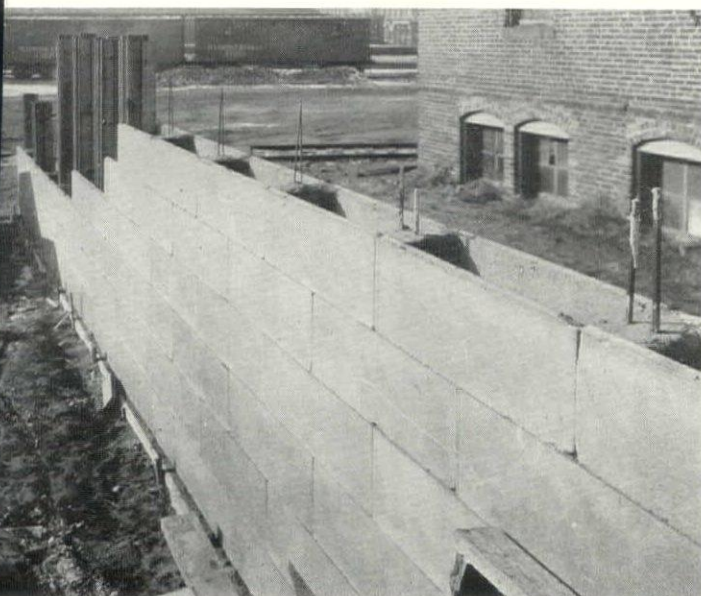
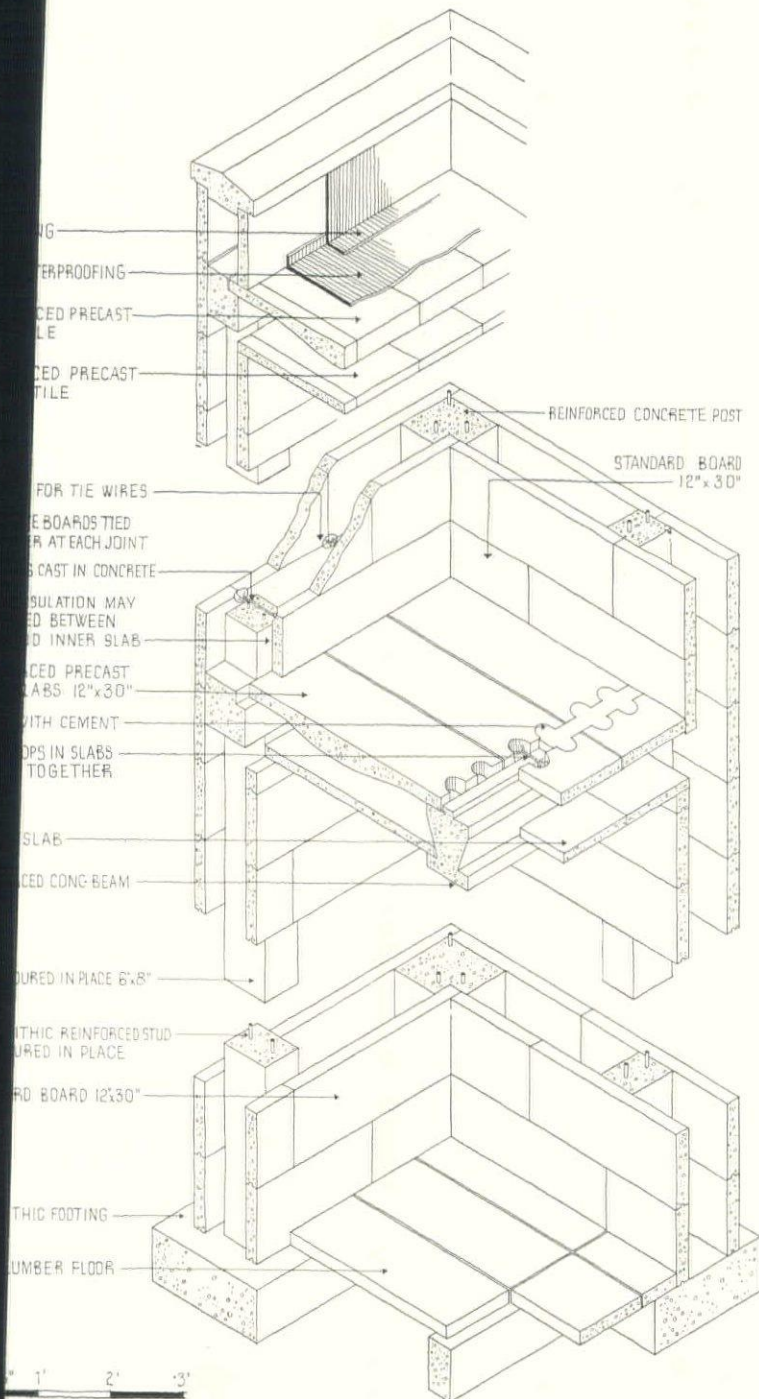
The boards are reinforced with No. 2 soft rods which run through small elongated apertures 16" apart.

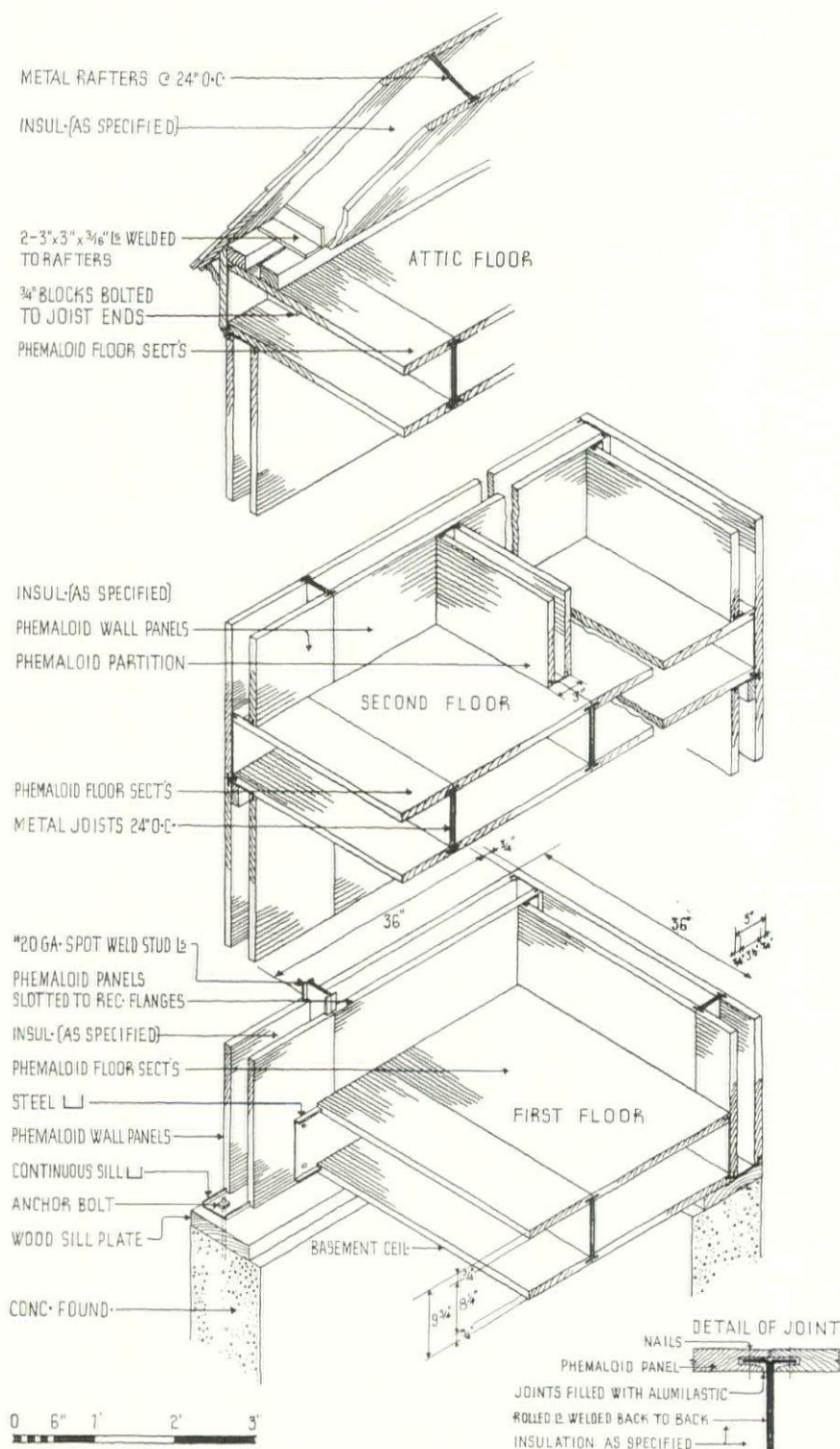
For use with wood framing the boards are nailed to studs and it is claimed that when driving a nail through the aperture under the rod, the rod will bend inward slightly at that point and the board is thus solidly secured at the studding point.

For a fireproof type of construction, the boards are 2" thick laid in opposite rows 6" apart and are tied by wire fastened around the reinforcing rod. Reinforced concrete columns are constructed at corners and at about 32" intervals so as to come at wire cross ties and embed them. The stud forms are collapsible and removable.

The exterior of the walls is stuccoed; the interior plastered directly on the slabs.

The floor system can consist of wood joists or of precast concrete joists and floor and ceiling slabs.





PHEMALOID COMPOUND LUMBER HASKELITE MANUFACTURING

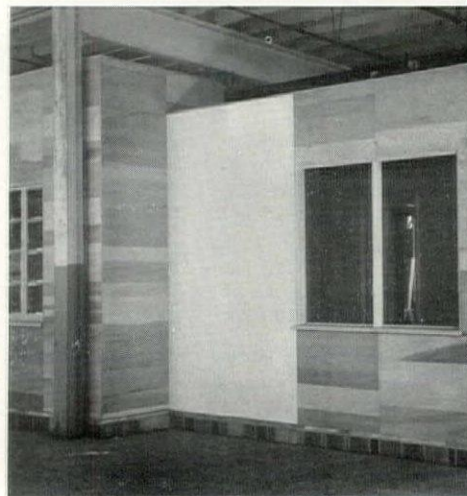
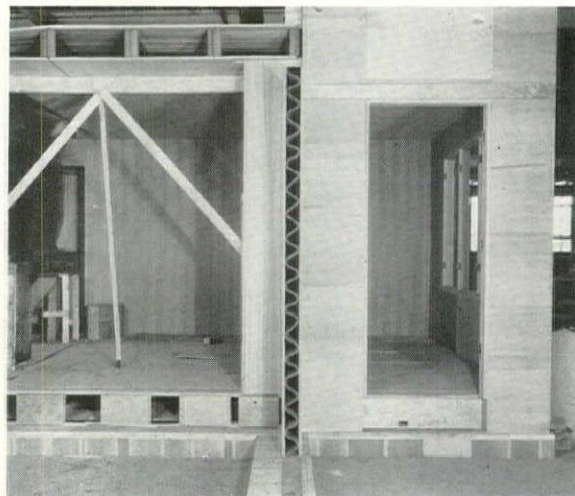
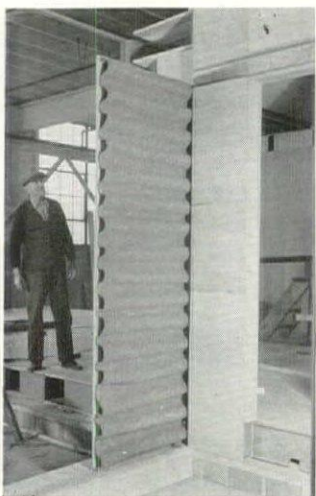
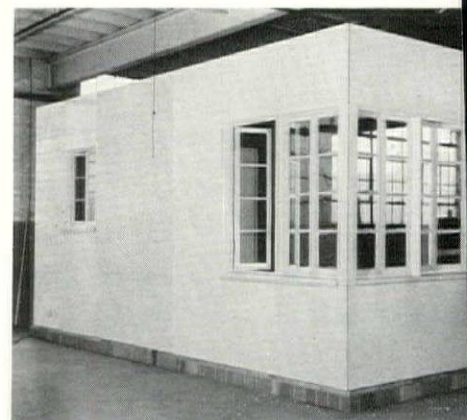
(G. R. Meyercord)

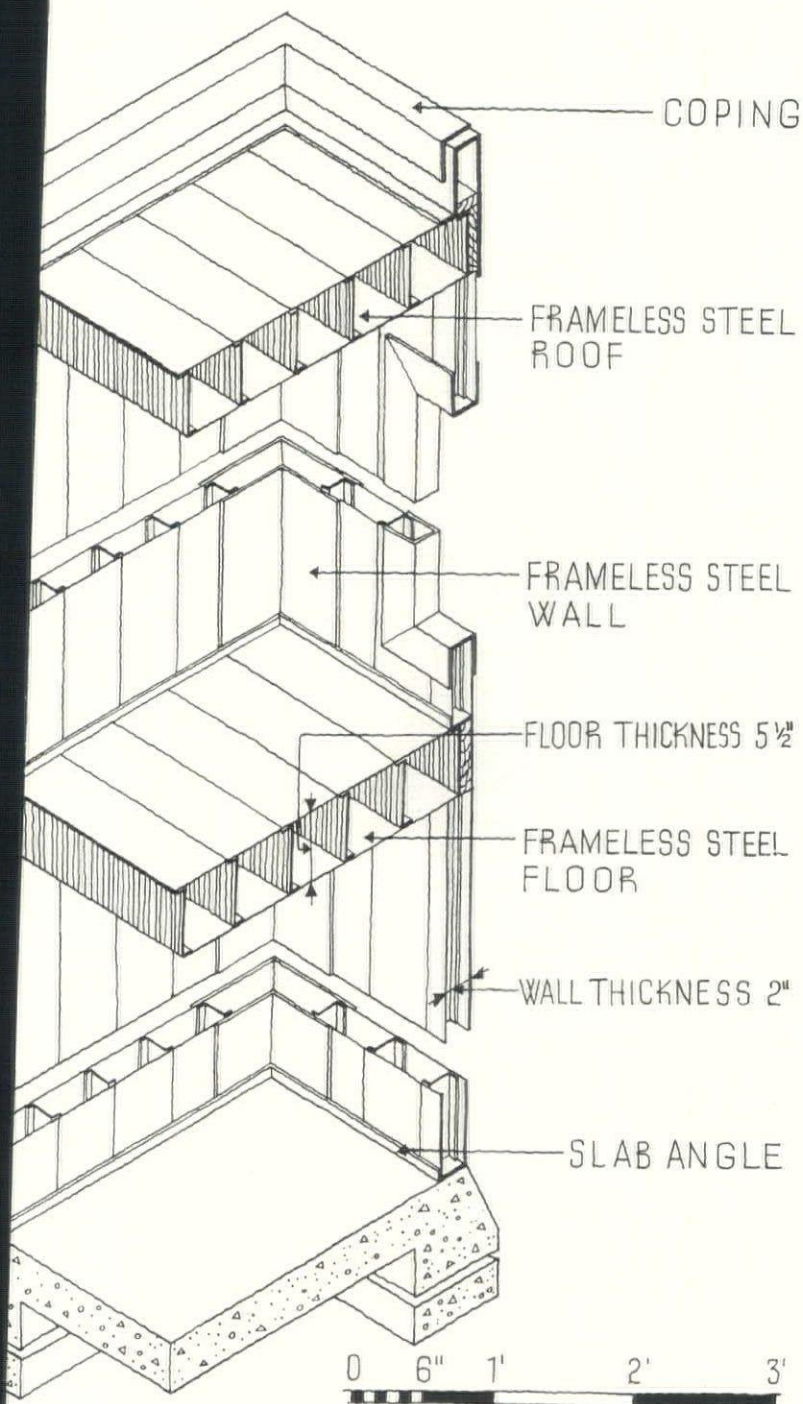
208 W. Washington Street, Chicago

Frame of sheet steel I-beams and charred wood panels, 36" wide for walls, 24" for floors and ceilings. The binder is a formaldehyde synthetic resin set up giving resistance to water, vermin, and fire. Wall panels and studs rest on a steel plate bolted to foundation; fastening done through the light gauge steel members. Panels grooved to lock with steel members. The most economical construction is a pitched roof. A pitched roof may be constructed. Roofing and flashing are standard.

Muslin is fastened to the exterior panels with the same binder used in the veneer. The panels and grooves are buttered with mastic and whole painted. Window and door frames are attached to a channel which contacts the edges of the plywood panels in the same manner as the other joints. Standard doors and windows may be used provided that their sizes are within the panel limits.

Interior partitions are similar, but studs are 2 1/8" deep instead of 4 1/8". Exterior floor steel is generally 9" deep. Foundations and all other items of construction are in usual practice.





FRAMELESS STEEL

**Insulated Steel Construction Company
Cleveland, Ohio.**

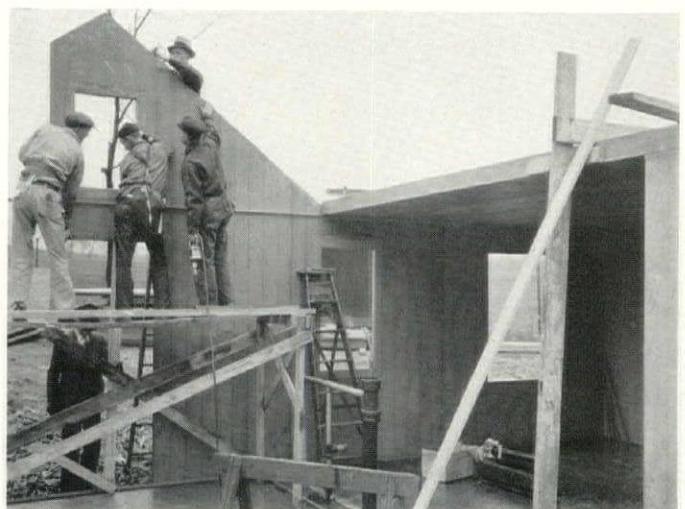
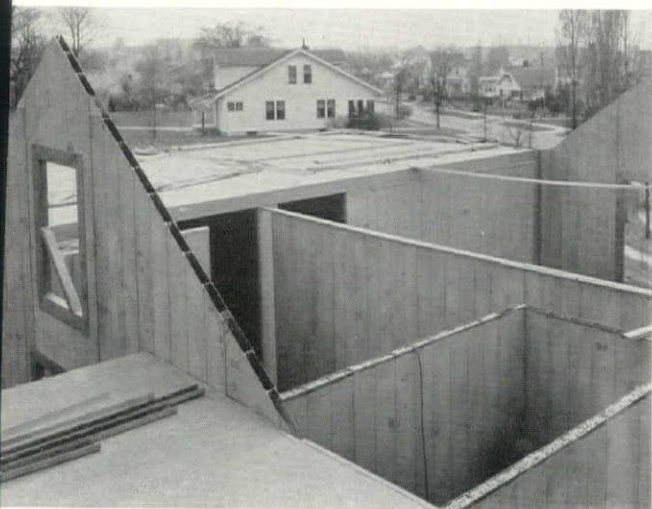
The floors and wall sections are formed of light gauge steel sheets. Wall sections are made of 20-gauge steel stamped into channels facing alternately inward and outward. Window frames and door frames are installed in the wall units complete before delivery to the job. Additional strength of walls may be secured by telescoping channel sections to form a series of columns. Walls are 2" thick.

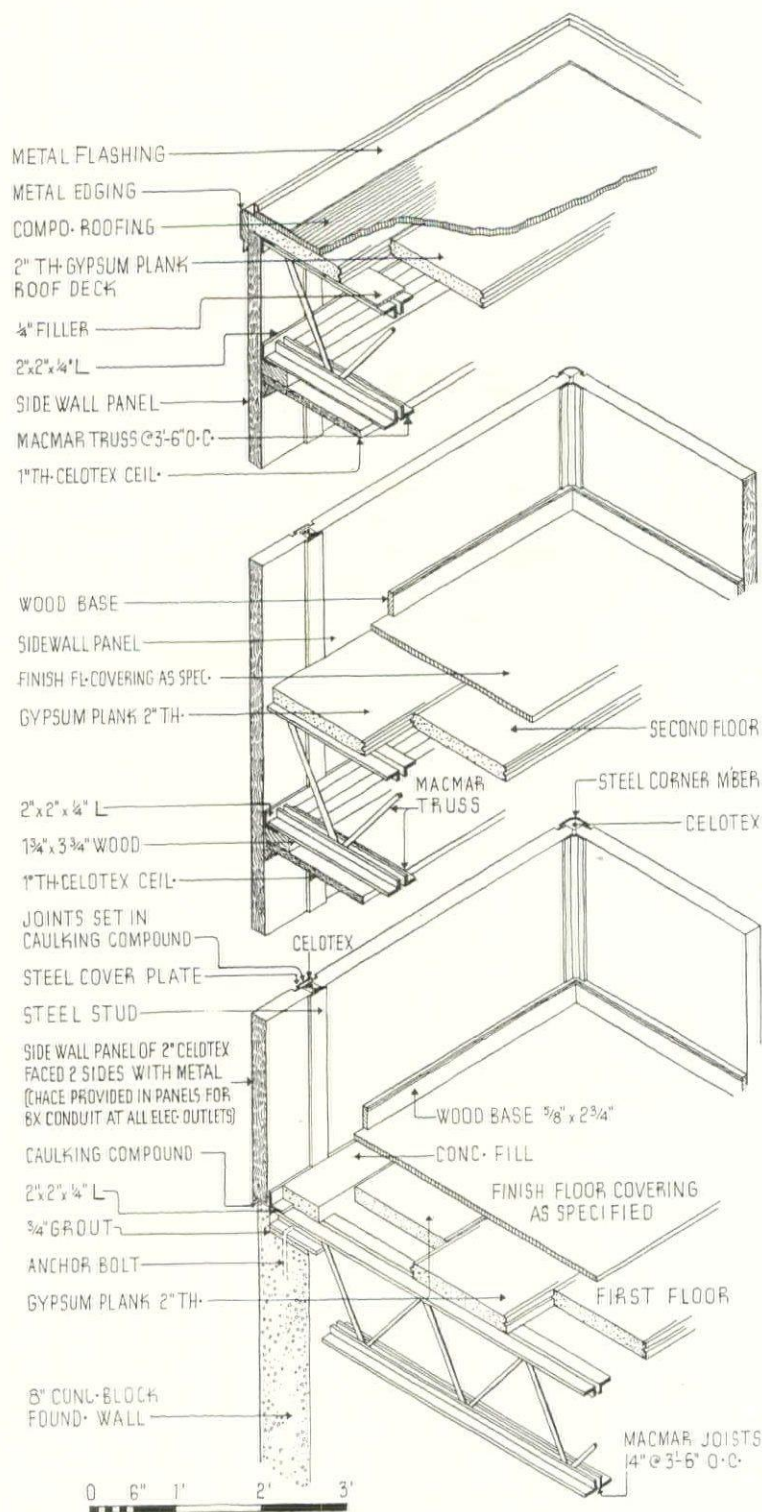
The floor system consists of Z bars of 16-, 18-, 19-, or 20-gauge depending upon span and floor loadings. The floor loading is calculated for an extreme fiber stress of 12,000 pounds per square inch. The Z bars are assembled to form a cellular floor system. Floors are 5½" deep.

As many units as can be conveniently handled in the field are assembled into large erection units. In the field the units are fastened together with sheet metal screws.

It is stated that finishing or insulating materials can be nailed at any point without special provision of nailing blocks.

A special channel is provided for the end of the floor unit, and for a combination floor bearing and electrical conduit channel.





INSUL STEEL CONSTRUCTION

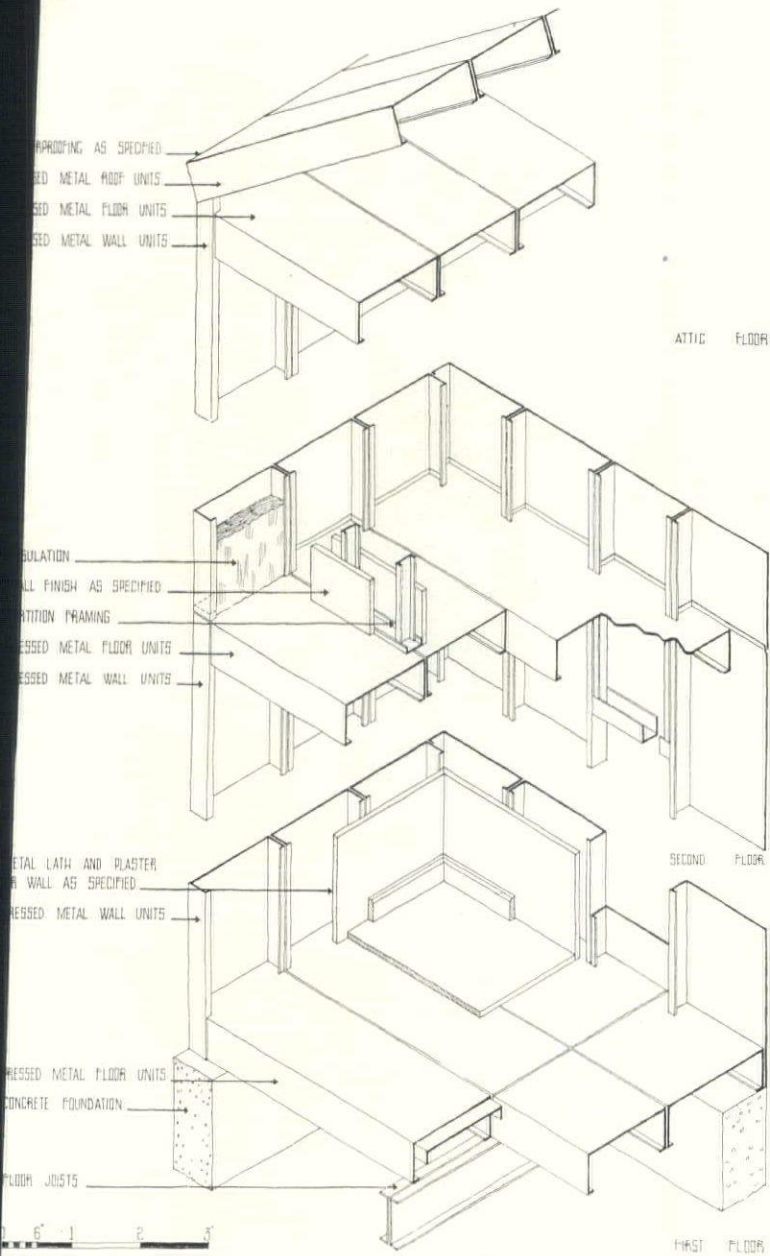
Joah Brogden, 20th Street and Erie Avenue, Philadelphia, Pa.

The exclusive features of the construction of the wall panels and the columns or studs. The wall panels, both for exterior and interior use, are composed of 2" thick celotex both faces of which are laminated sheet copper-bearing galvanized steel. The steel is turned over the edges of the celotex one inch. A special asphalt compound insures bond between the celotex and the steel that it is claimed there is no free interior face and, therefore, no opportunity for internal corrosion of steel.

The columns or studs are specially rolled members which have ample structural value and at the same time provide a bearing for the panels and have a headed stem tapped to receive the bolts of the cap.

The formed caps for columns and corners are made of 12-gauge copper bearing galvanized steel as standard practice. Stainless steel or other metals can be furnished. For partition studs flat caps are used.

Spaces between T-members and caps and the corner members are insulated with celotex filler strips. Voids between panels on either side of T-members, and those between caps and celotex, are solidly filled with mastic. All bearing surfaces of members are treated with mastic before being bolted. The insulation at columns and corners is completely preserved and all points of contact made thoroughly water and air tight.



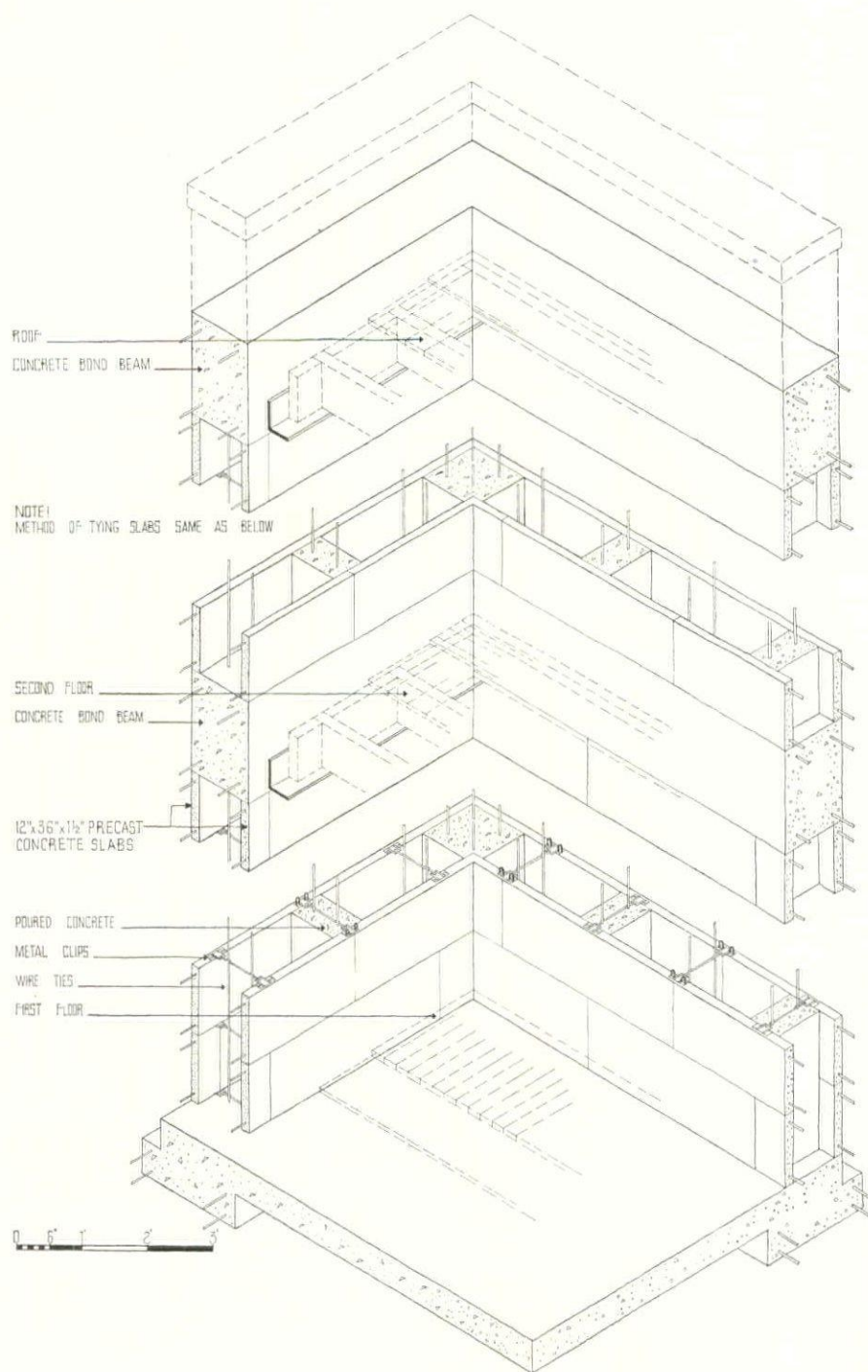
SAMUEL R. LINDSEY
Oakland, California

The floor system consists of sheet steel channels the web of which is laid horizontal and forms the rough floor ready to receive a finish floor. The webs are 12" or 16" wide. The height of the flanges varies, and their spacing, depending upon the width of the web and the gauge of the sheet, determines the carrying capacity of the channel. Holes on standard spacing are provided in the flanges for the connecting of two adjoining channels, also in the horizontal web for anchoring of floor material.

A reenforcing member can be inserted between two adjoining channels to carry special loads, such as unsupported partitions.

The walls are similarly built of channels assembled flange to flange; these flanges are shallower than for the floor construction. The width of the wall channel flange corresponds to the width of the floor channels which are crimped at the end to fit in the wall channels and allow their bolting together. The continuous vertical web surface can be covered by any material desired.

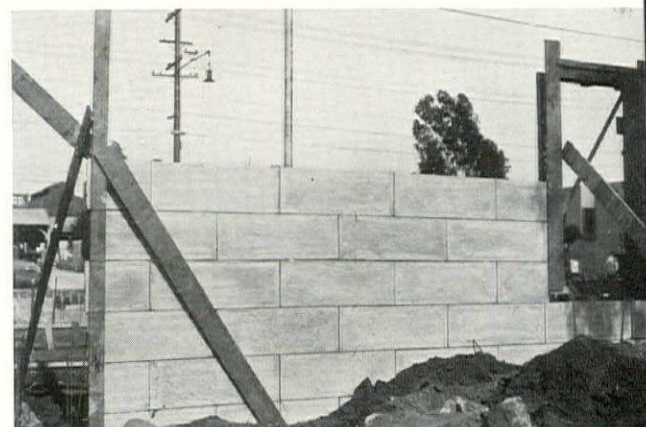
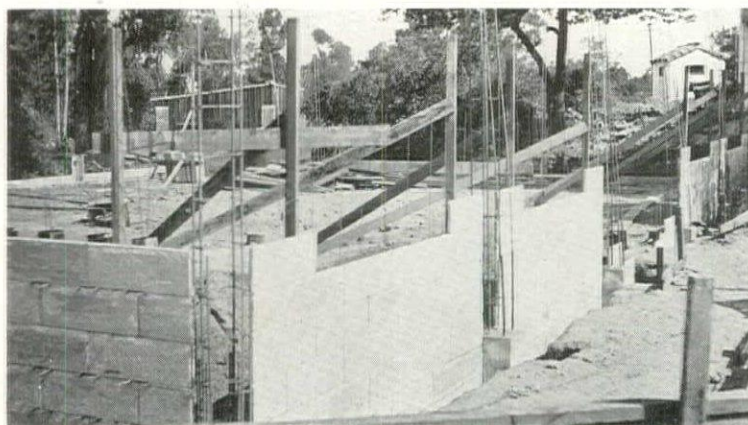
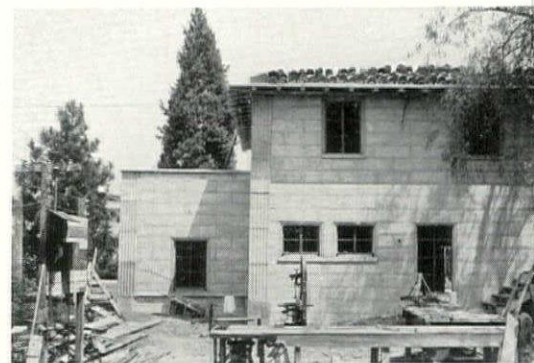
The air space left between the exterior and interior vertical surface may be filled with insulating material.



LOCKWOOD SYSTEM

Ernest H. Lockwood
57 South Raymond Ave.
Pasadena, California

The system consists of precast slabs 36" 12" high, and 1½" thick, erected either in or double rows and attached to reinforced at intervals. Bond beams at all floor level. Slabs laid like ashlar. Reinforcing is continuous, and cross ties are used at every alternate course. Two or three rows of slabs are erected on a poured foundation with ties and vertical reinforcing placed. Metal forms are spaced the concrete studs poured. The process continues until the walls are complete. Floor framing is typical wood resting on continuous angle bolted to bond, but precast and slabs could easily be used and incorporated in this system. The manufacture is a patented system in which a car runs from the mixer to the forms (whose edges form the track) charging concrete. The car on the return pours concrete in a parallel row of forms, building up the rows several stacks high for curing.



NOVELLE SYSTEM OF CONSTRUCTION

15 East 40th Street
New York, N. Y.

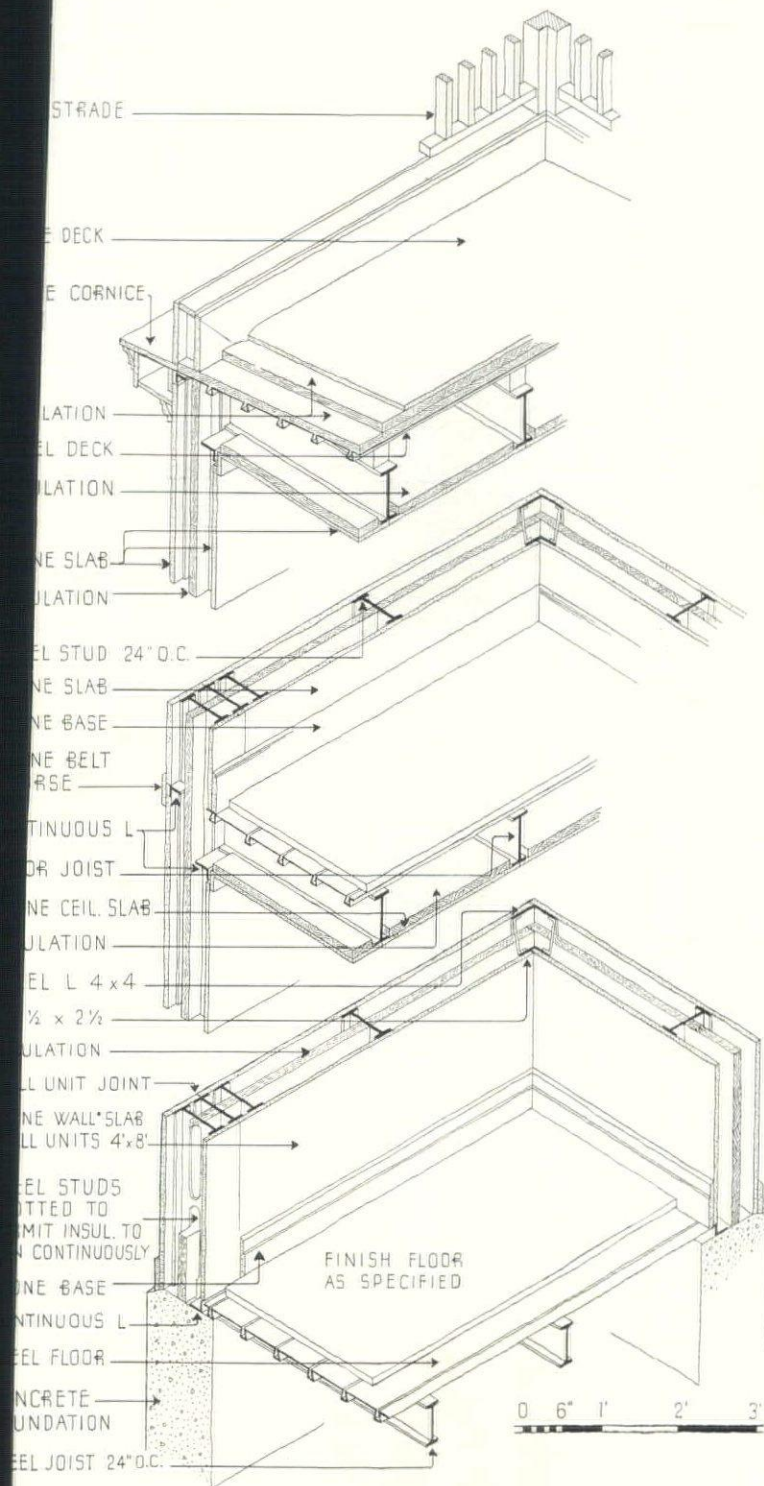
All construction with the exception of the walls is standard, with steel floor beams, steel decking and concrete foundations.

The wall unit is built of steel I-beam studs. The webs are perforated in long rectangles with small bridges separating them for their full length. These studs are united to the asbestos board exterior and interior finish with a special and very strong binder which is a feature of the design. A continuous blanket of patented insulating material is woven through the perforations and crowded together at unit intersection forming a practically continuous insulating shell. The units are butt-joined, with an extra stud bridging the joint, and sealed and united with the special binder. A continuous angle is fastened to the foundation and to each stud in the unit. A similar angle is attached to the top of the studs and to under side of the floor beams. Another angle is fastened to the bottom of one set of studs and top of the lower set at the exterior face at the floor line.

Standard windows and doors are built into the units and trimmed out with asbestos board.

The corners are formed by a special angle arrangement with one surface slipping by the other to avoid having special corner units.

Insulation and an asbestos board finish form the ceiling. Finish floor is wood laid in mastic. Asbestos board base and trim. Mechanical work standard, but much would have to be built into the panels in the shop. The size of these units could be that of standard available board, but the patent holder states any size is possible.



CELLULAR STEEL HOUSE Palmer Steel Buildings, Inc. 116 North Larchmont Bldg. Los Angeles, California

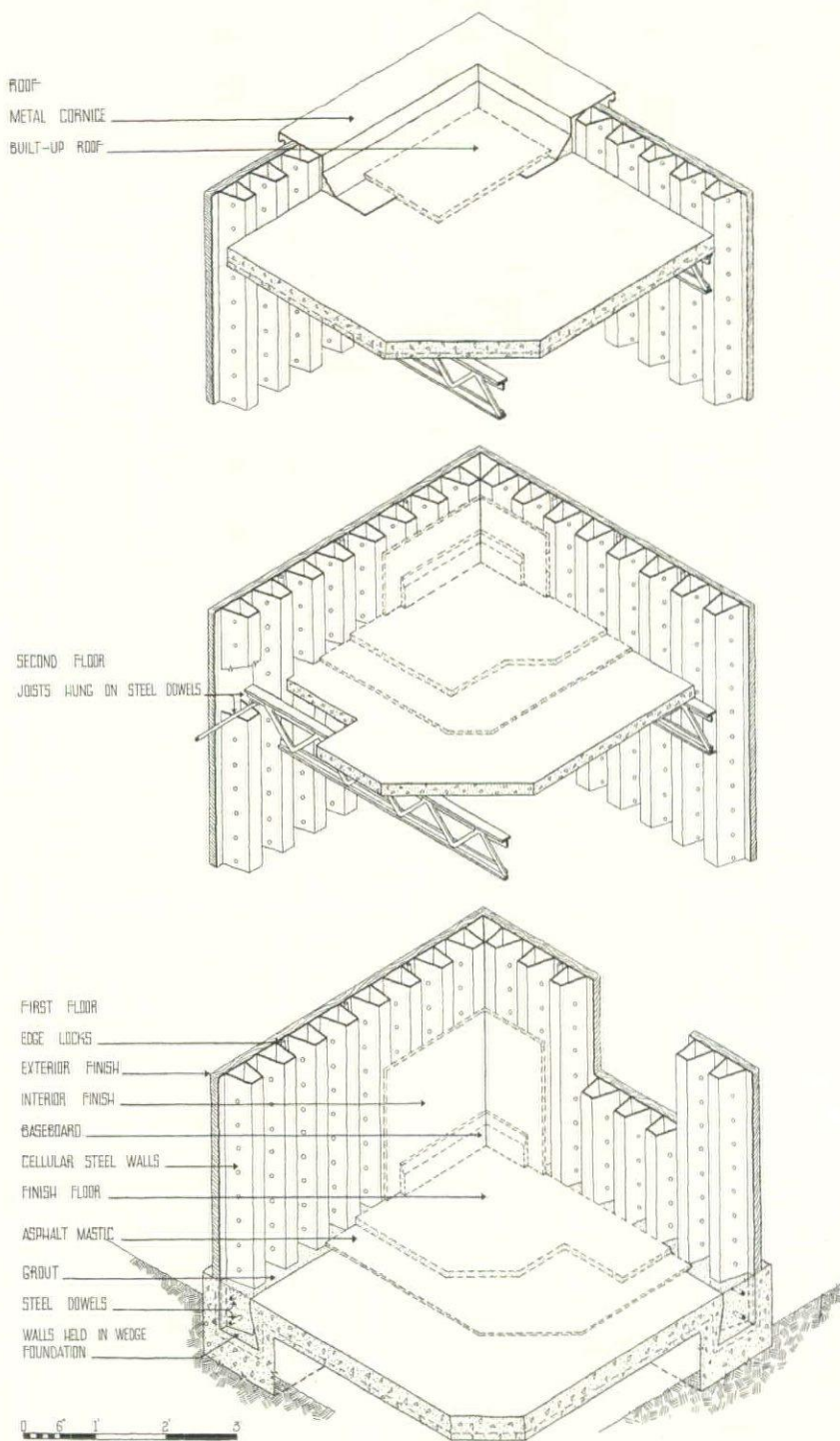
A cellular steel house construction, together with necessary collateral material.

Concrete foundation. Floor construction either bar or wood-joists hung on heavy steel rods which run through the holes in the cellular wall sections. Holes are spaced every 4" so that an desired floor height may be obtained.

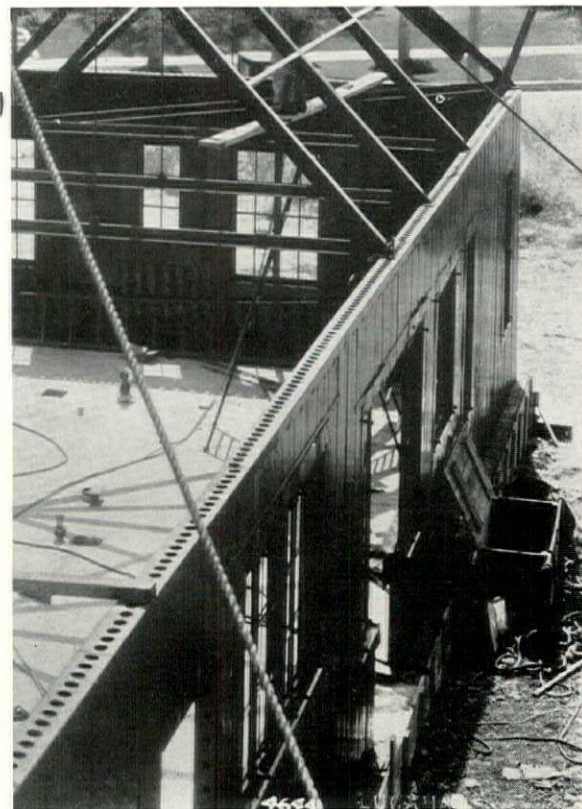
Walls: Load bearing walls of cold rolled cellular steel construction, the base of same being embedded in foundation. In the case of a two or more story construction, the sections run continuously from concrete to eaves without any break.

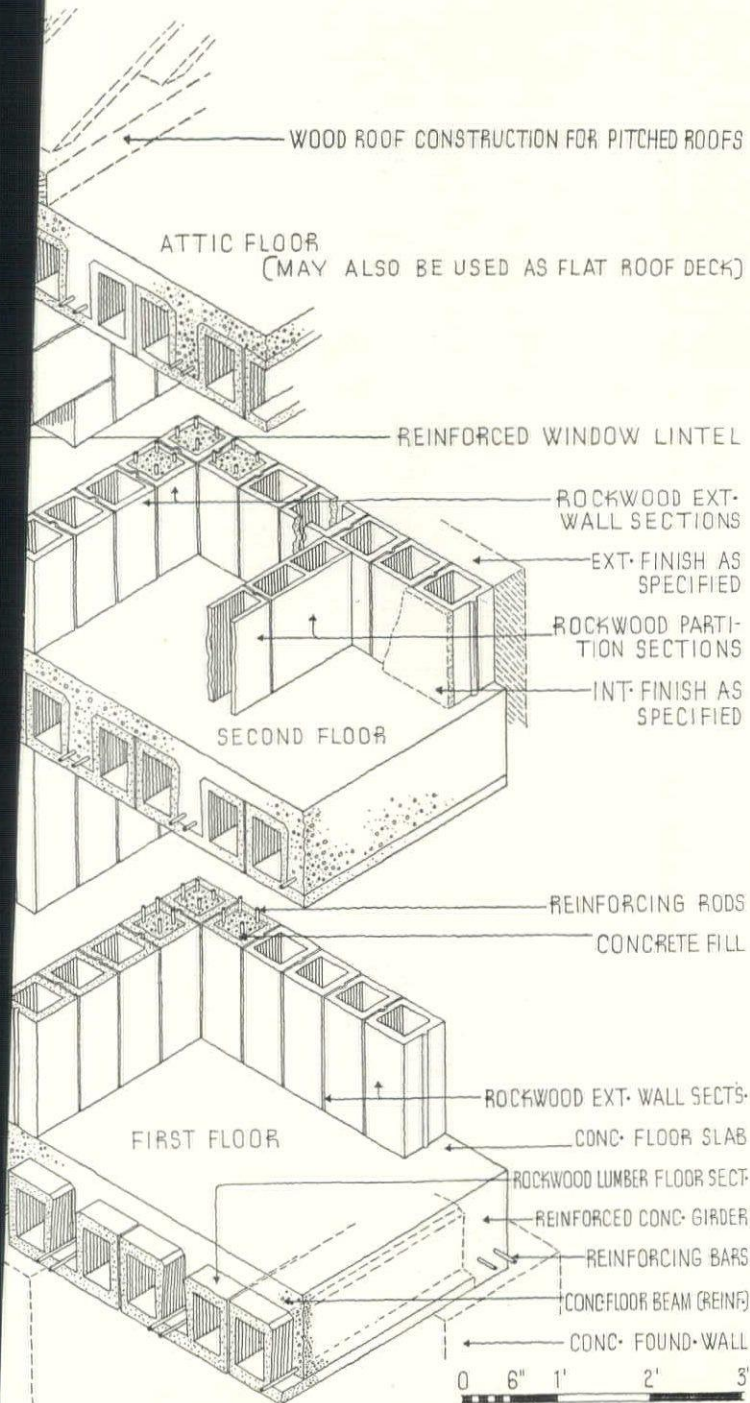
Cellular steel wall sections are prefabricated by H. H. Robertson Keystone Steel Floor System in 1' widths, $4\frac{1}{2}$ " thick, and any required length. They are provided with locking devices on either side of their lengths, and are locked into a dove-tail shaped groove in the concrete. A steel rod is forced through the ends of all sections as an anchor. The W-shaped cellular sections are spot welded to a flat plate. Exterior and interior finishes as specified.

Flat roof constructed similar to floor and waterproofed as specified. Pitched type supported by wood or steel rafters overlaid with deck and weatherproofing as specified.



A one-story adaptation of the H. H. Robertson cellular unit





ROCKWOOD GYPSUM LUMBER CORPORATION

103 Park Avenue, New York, N. Y.

A precast hollow gypsum lumber in various sizes and sections, combined with stud reinforcing rods and concrete to form structure.

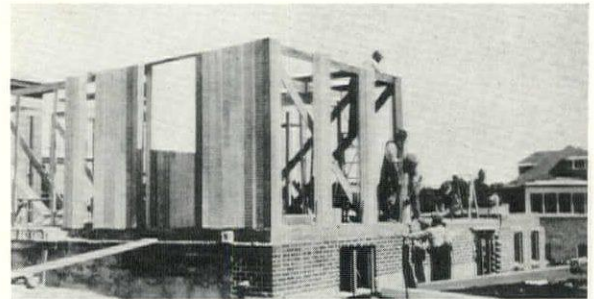
Floors: Precast long-span gypsum floor unit with three rectangular full length cells laid directly on foundation and supports. Butted together with top of center cell cut out. Reinforcing rods laid in cut-outs, concrete poured in and graded over the gypsum units to form a rough floor slab. Finish flooring as specified.

Walls: Exterior load-bearing walls of precast gypsum wall unit with full length rectangular cells. Lengths extend from floor to ceiling. Vertical joints, tongue and groove. At intervals, where required, steel reinforcing rods are placed and concrete poured down the vertical cells. Reinforced concrete girders formed at floor lines. For lintels, section is laid horizontally, top of cell cut away, and placement of reinforcing rods and concrete. Exterior facing and interior finish as desired.

Partitions: Precast gypsum partition unit of narrow width containing two rectangular cells. Finish as desired.

Foundation and roof are of conventional construction.

2



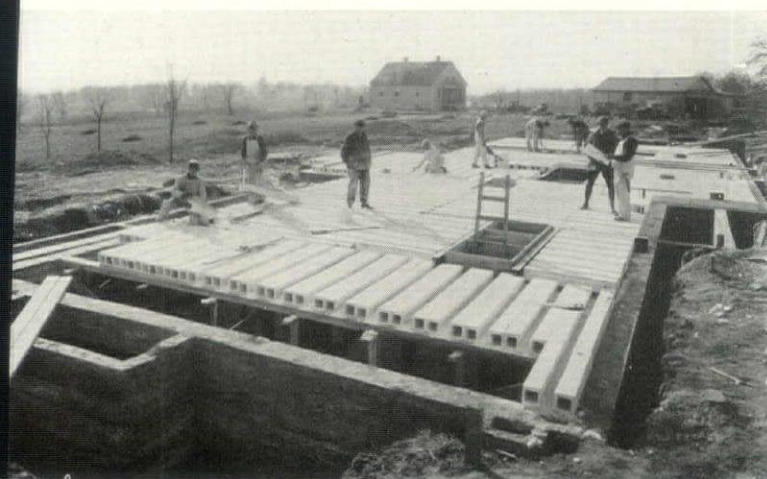
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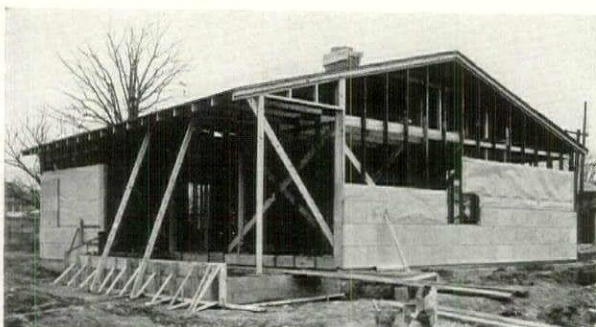
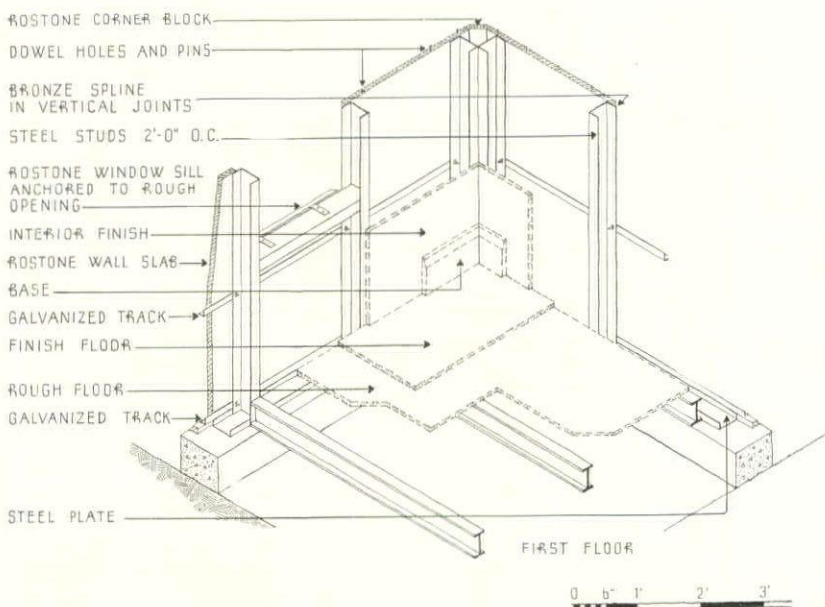
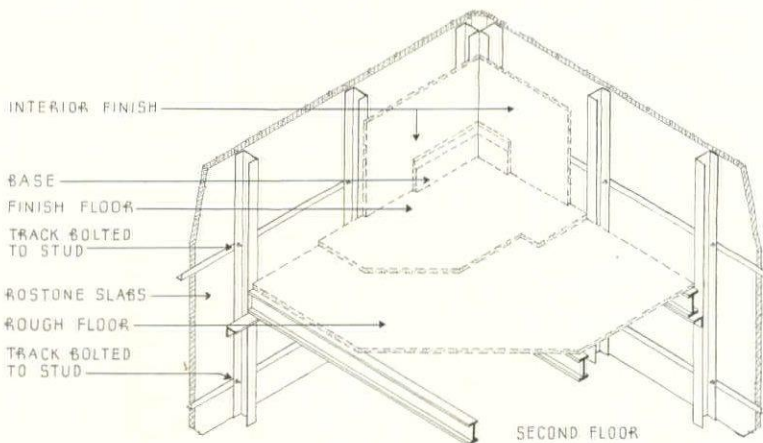
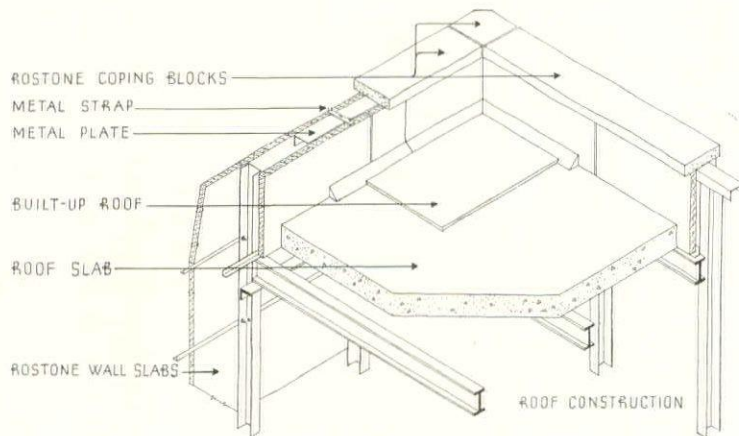


1. View showing first floor units in place.

2. The light-weight units are easily put in place.

3. Exterior wall sections in place.





ROSTONE, INC. 308 Main Street Lafayette, Indiana

Rostone is an artificial stone produced by a speeded up synthetic process containing Portland cement and is available in a wide range of colors which are claimed to be permanent.

The unit prefabrication system consists of a combination of Rostone wall slabs $1\frac{1}{4}$ " thick and steel track construction. The track guides the stone apart and out from the wall. The vertical leg is punched for 16" and 24" spacing wall studs and is screwed or nailed to same. The horizontal leg is punched to receive dowel pins so that in erection the bottom edge of Rostone is set upon a lower shelf angle with dowel pins entering the holes.

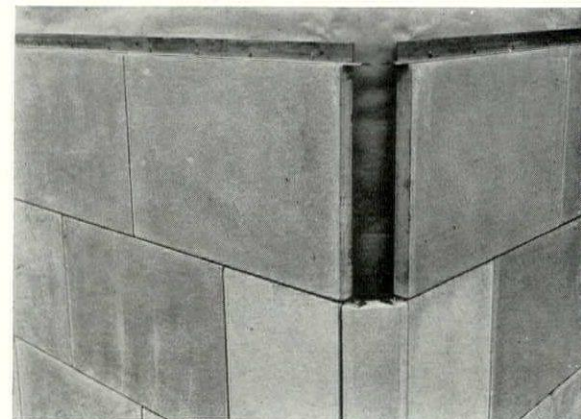
The vertical and horizontal joints are finished. The horizontal leg is cold formed to give a uniform thickness. It is also formed to provide a condensate groove at the back with weep holes. A bronze spline is used in the vertical joint.

All joints are caulked with mastic. Thus with individual support of each slab the wall does not act like a masonry wall, but is flexible and able to withstand unusual stress.

Over openings the slabs are carried on the track which is secured to the header of the frame. To secure the topmost stone the track is inverted.

The standard slabs are $23\frac{1}{8}$ " x $15\frac{1}{8}$ " and $11\frac{1}{8}$ " x $15\frac{1}{8}$ ".

Mitered slabs are provided for interior angles and corner blocks for the exterior. Special slabs are made for window sill, coping, etc. The system can be applied over wood frames (old or new) and over steel frames.



THE STEELOX COMPANY

59 West Austin Avenue
Chicago, Ill.

The unit for walls and roof is a patented channel shaped panel known as "Steelex." This panel is 16" wide, wall height, and 3" deep. It has flanged sides so that the flange of one panel slips into that of an adjoining panel. These interlocked flanged sides serve as structural members 16" apart. The panels are fastened in position with simple hook bolts, and a furring strip is attached to the flange for finishing interior walls.

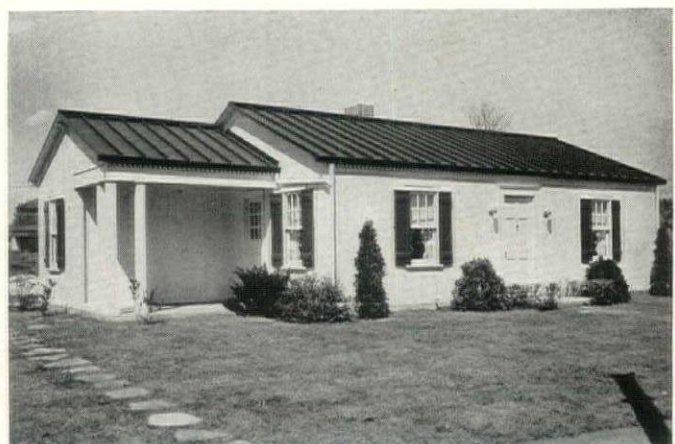
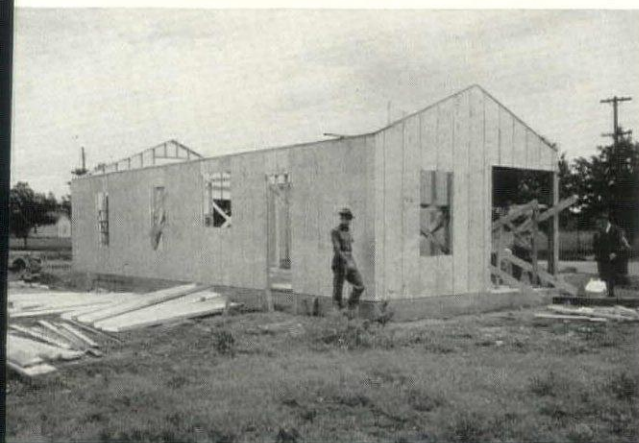
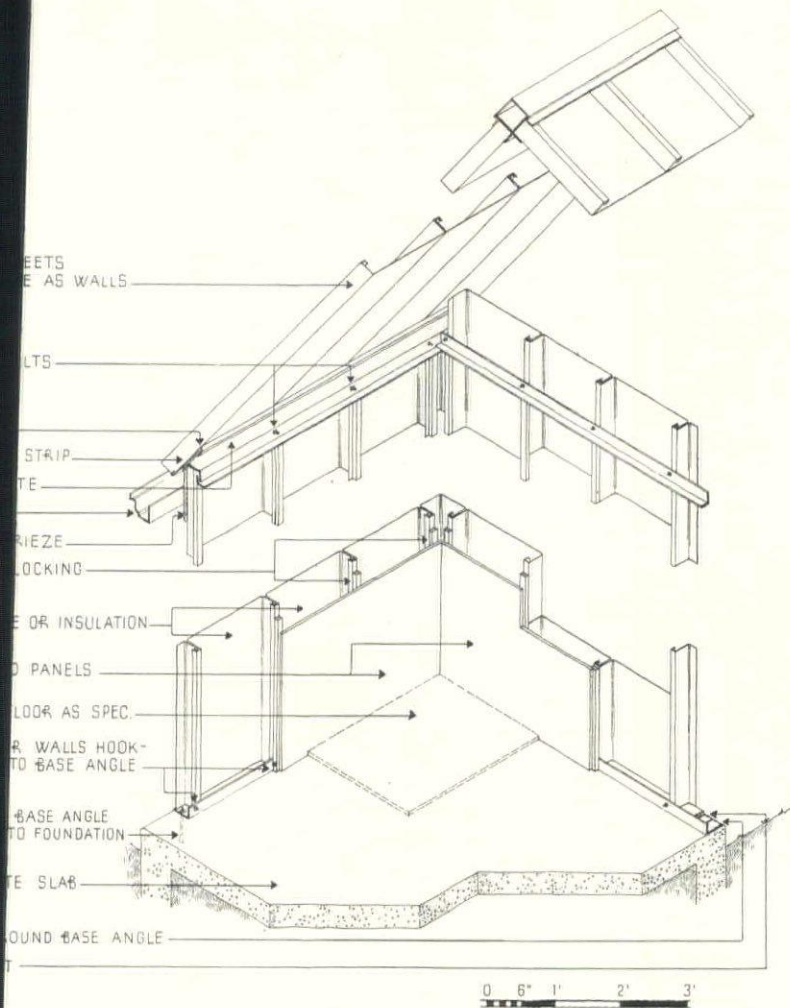
The corner is formed by one of the steel panels bent longitudinally at right angles, with 8" on each face.

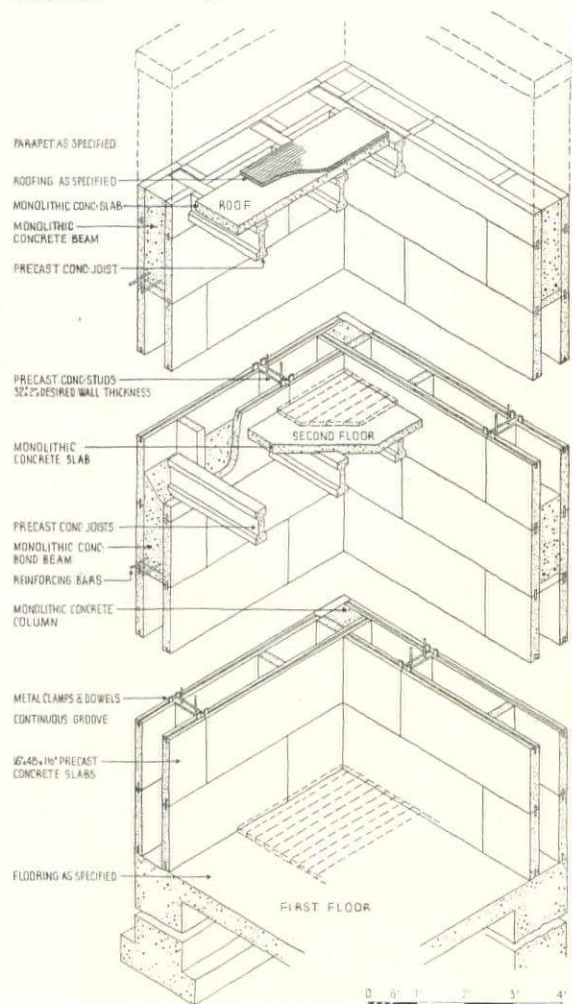
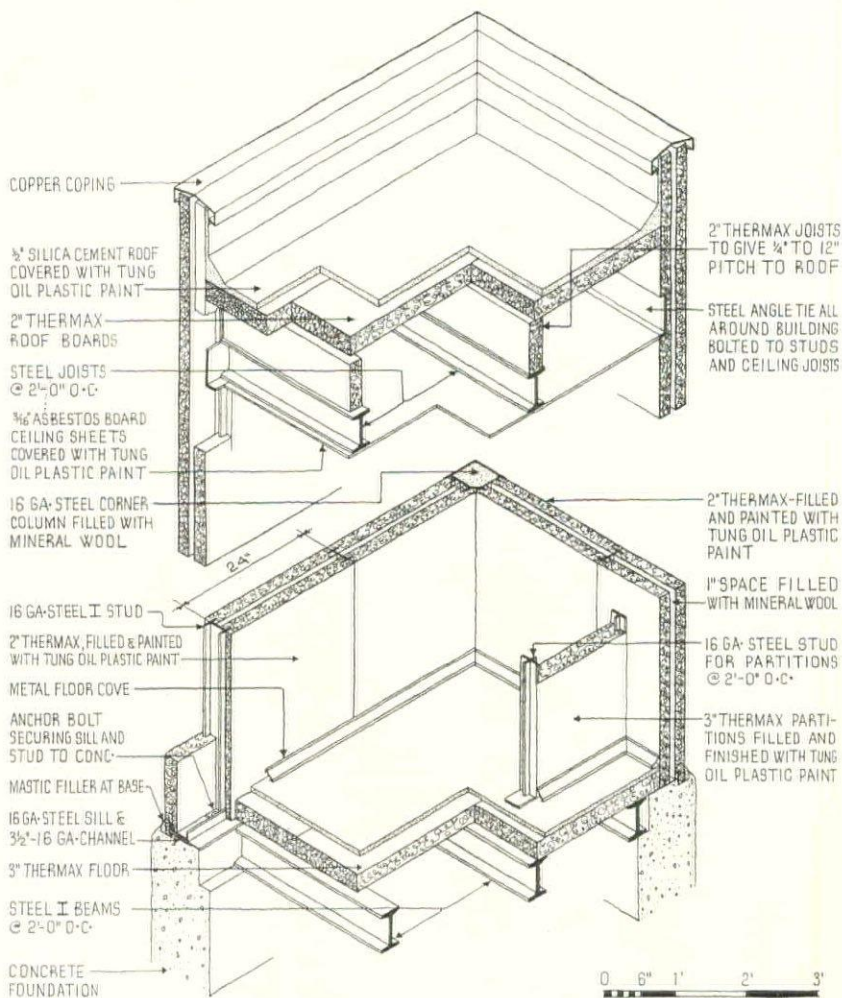
An angle iron set in burlap reenforced asphalt strips is attached to the concrete foundation with expansion bolts. Starting at the corner each wall section is interlocked to the preceding one and hook-bolted to the angle base. A top angle is laid on top of the sections and each unit hook-bolted to it. Short sections are used above and below windows and over doors.

Slanting roof sections are erected similarly, being hook-bolted to wall plates and side plates. A special ridge cap is slipped in position.

The inside of each panel is then filled with bats of mineral wool 4" thick before applying the furring strips.

For nailing to the steel strips, special cadmium plated nails are used with spiral surfaces which twist as they are driven home.





STEEL HOUSING CORPORATION

134 No. LaSalle Street
Chicago, Illinois

The exterior wall is a double shell of 2" max boards set 1 1/2" apart, the space being with mineral wool. The exterior has silicement and plastic Tung Oil Paint, providing uniform surface.

Interior partitions are 3" thick. The Thermawedged between 16-gauge steel studs 24" centers and is received at the outer wall by a T-shaped 16-gauge stud. These studs are attached to the steel flooring.

The floor and roof framing is of 16-gauge steel joists. The floor has 3" Thermax slabs. The asbestos board ceiling is fastened directly to the bottom of these steel roof joists.

GEO. RACKLE & SONS CO.

Cleveland, Ohio

Precast concrete wall units, floor joists, and slabs. Slabs are of vibrated Haydite concrete in standard molds. Exposed surfaces may be colored.

Floors: Consist of precast channel slabs or combination of precast joists with a cast in place or precast slab member.

Walls: Outer and inner rows of precast slab units with precast stud members set at intervals. Edges grooved all around. Stud sections are 3' long, 2" thick, the width depending on desired wall thickness. Studs have projecting dovetail bars at one end and dowel holes at the opposite end, thus providing a means of doweling successive superimposed stud sections. The slabs and studs are erected concurrently, the slabs with broken vertical joints. A special metal clamp having flanged ends which fit into the slab edge grooves serves to lock the slabs and studs together. Band beams and supplemental corner columns, if required, are cast in place. If specified, the exterior may be stuccoed and painted; the interior may be plastered.

The foundations are conventional concrete.

STRAN-STEEL

STRAN-STEEL CORPORATION

(Subsidiary of Kelsey-Hayes Wheel Co.)

6100 McGraw Ave.

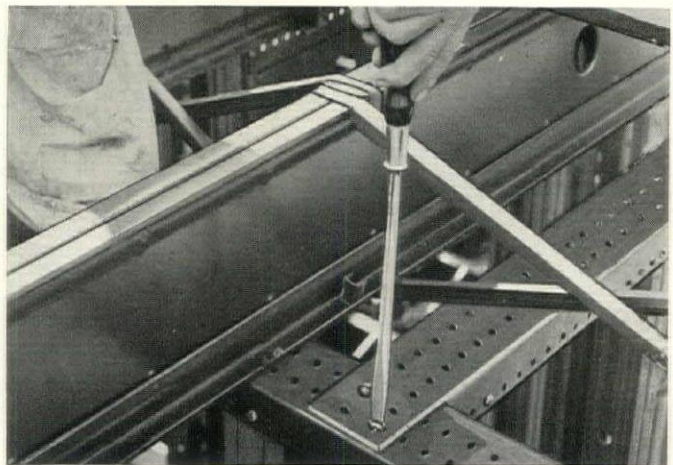
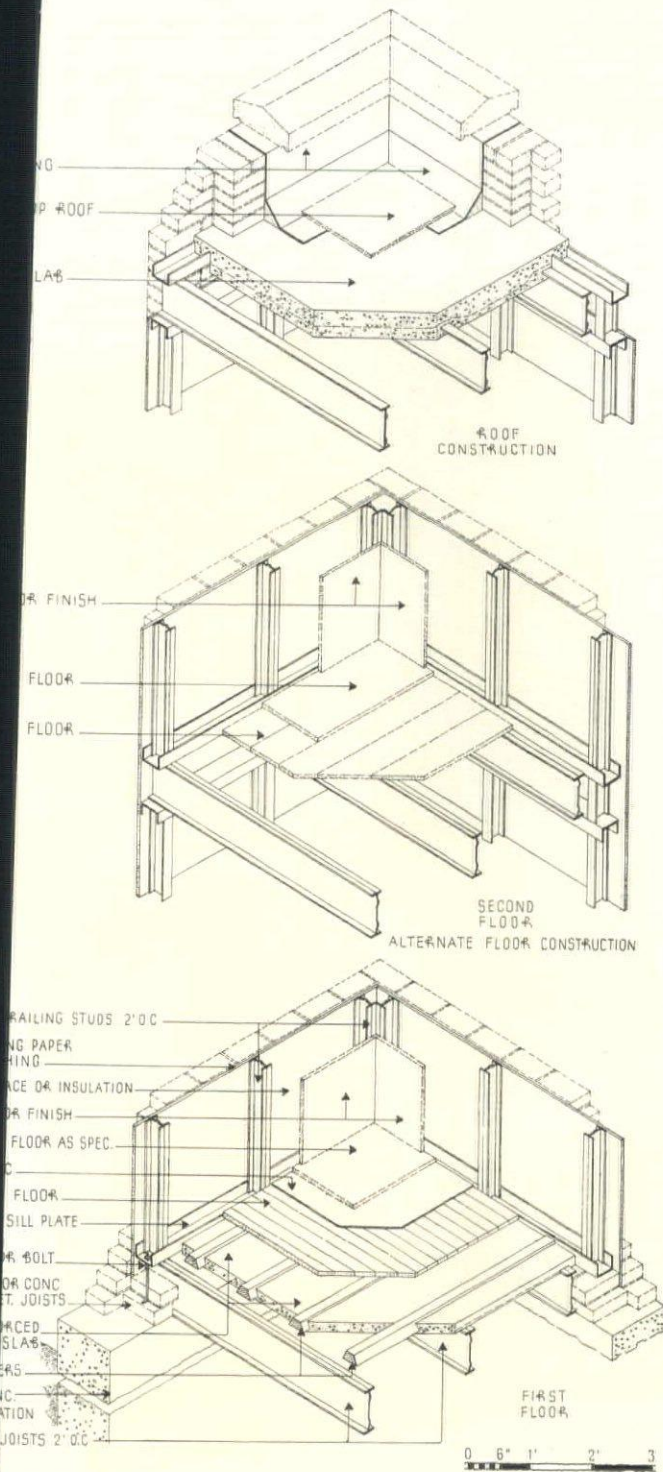
Detroit, Mich.

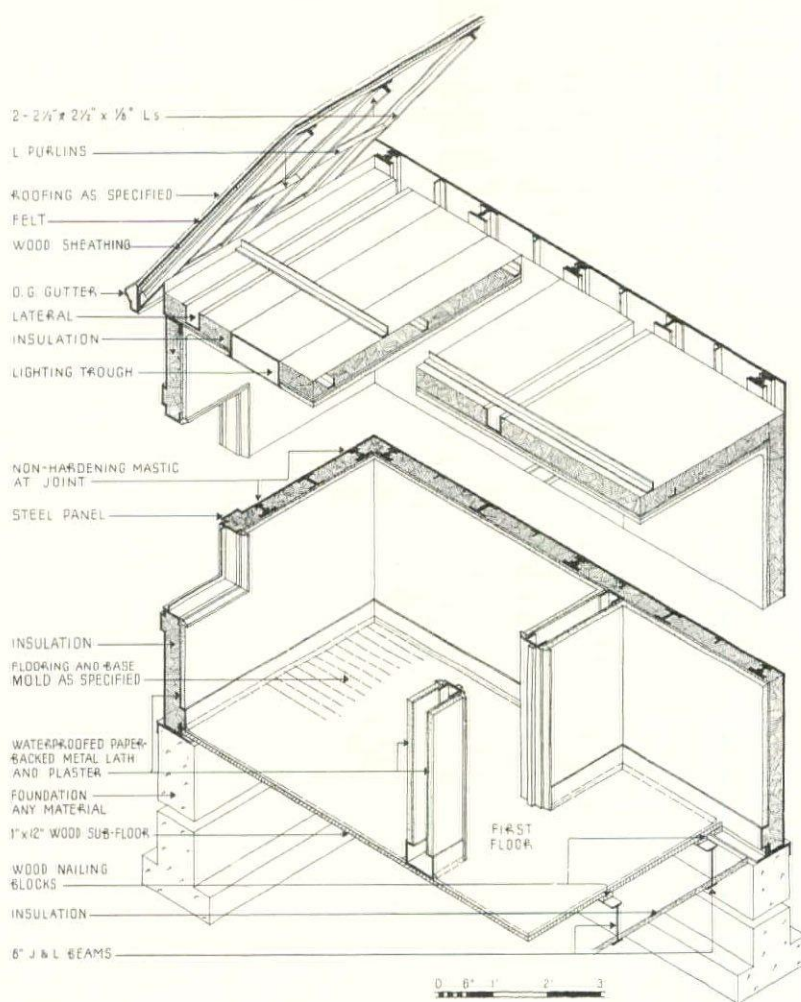
Stran-Steel is essentially a system of rolled strip steel of several sizes to replace the rough lumber framework of conventional construction. Use mainly confined to residences, partitions, and light-load bearing structures. Members are rolled and assembled so as to permit nailing of collateral materials. The system also includes connecting units, brackets, etc.

Floors: Stran-Steel beams overlaid with wood or concrete floor system. Ceilings may be wire lath and plaster.

Walls: Stran-Steel studs. Inner and outer walls as specified.

Roof: Either flat or pitched type. Formed of Stran-Steel sections overlaid with roof-deck and waterproofing as specified.





STRUCTO, INC.

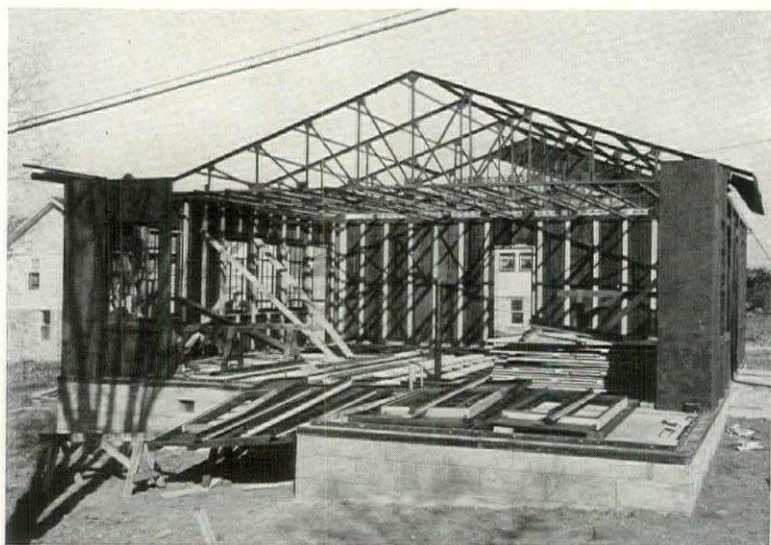
1015 East 63rd Street
 Kansas City, Mo.

Structo is a complete house assembly consisting of standard section steel panel, roof members, and steel floor member binned with the necessary collateral material. Foundation: Conventional concrete construction.

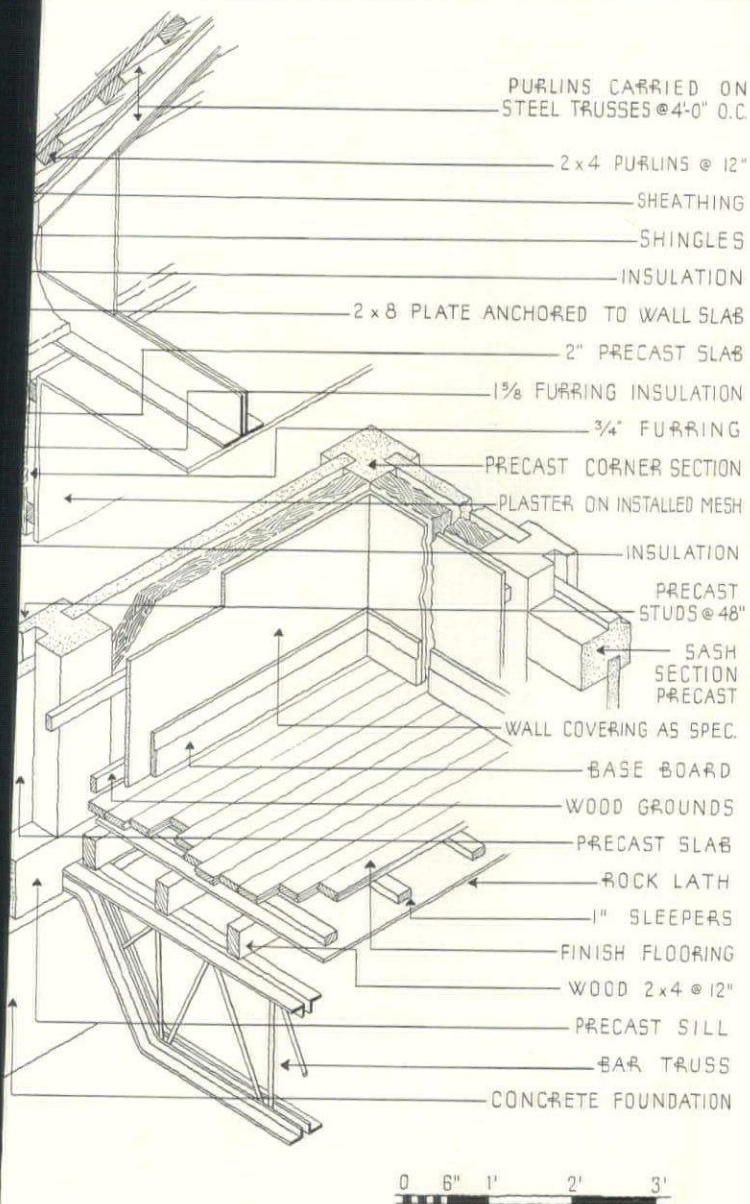
Floors: J & L Junior I-beams. Sub-flooring sheathing applied to wood nailers bolted to beams. Concrete slab may be used if desired. Finish flooring as specified.

Walls: Steel panels interlocked with studs. Interior finish wire lath and plaster as otherwise specified. Wall unit packed with rock wool insulation.

Roof: Pitched wood deck carried on steel purlins. May be waterproofed with shingles or other type waterproofing as specified.



Structo house in course of construction



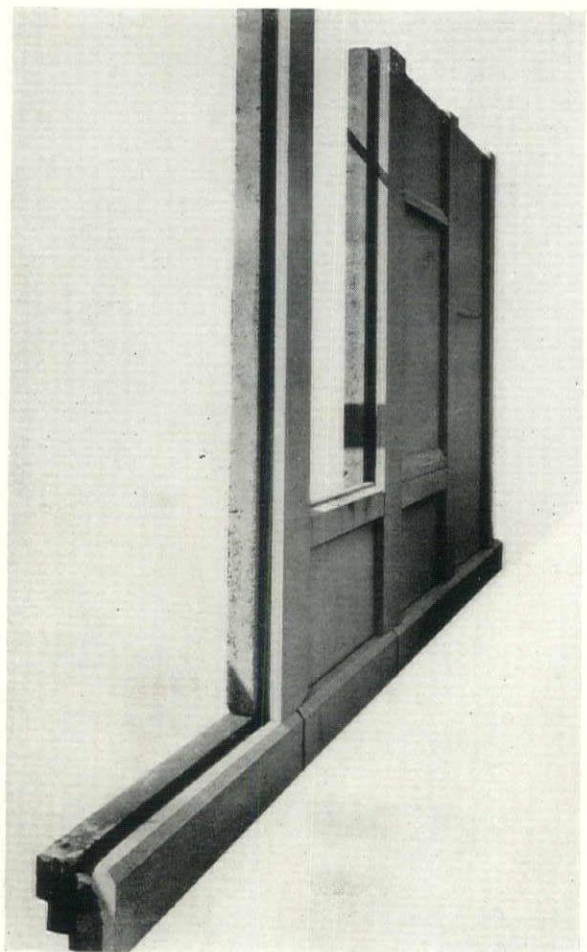
THE SWAN HOUSE, INC.

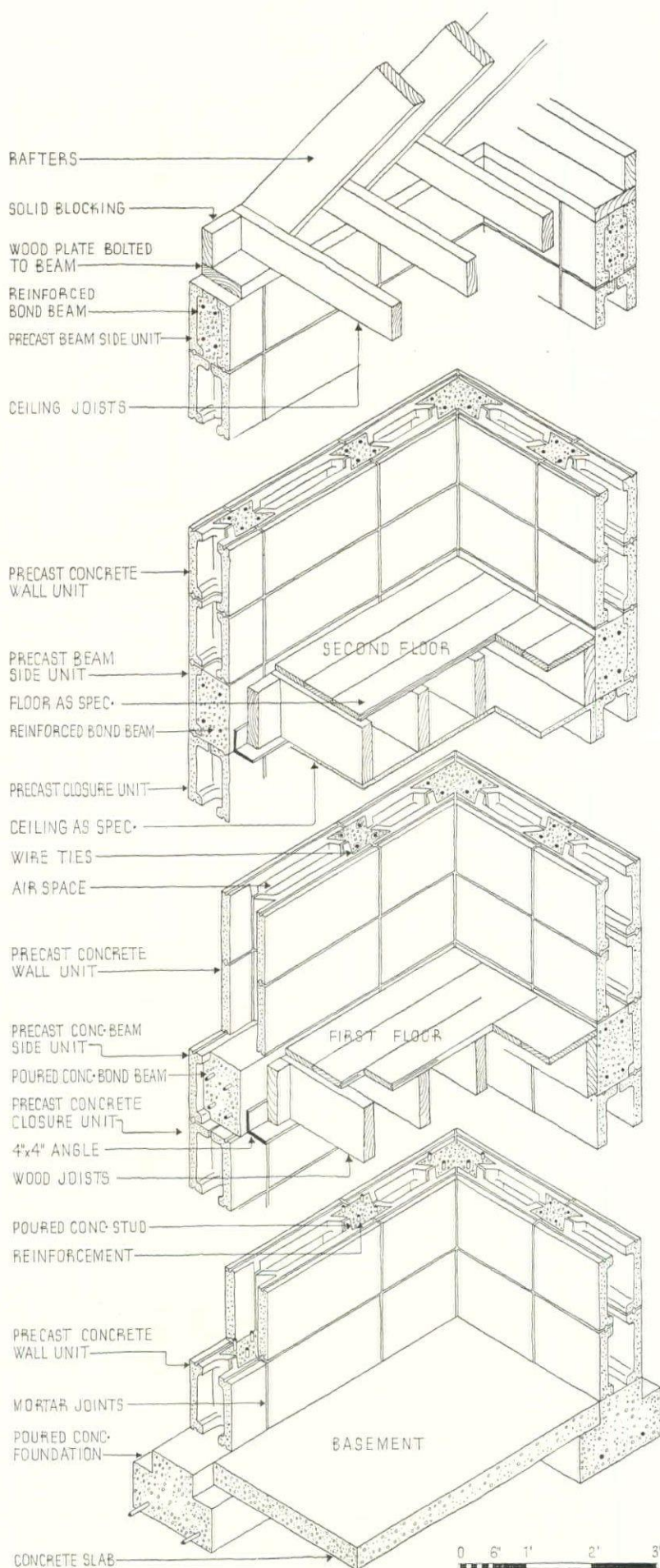
307 North Michigan Avenue, Chicago, Ill.

A patented system of house construction consisting of precast units, steel, and collateral materials. Walls: A precast reenforced stone sill, slotted to receive wall units. Studs of precast reenforced stone on 48" centers slotted to receive wall units. Wall units of precast stone, approximately 2" thick.

Interior finish may be of wallboard attached to wood grounds, lath and plaster, or other material specified. The interior of the wall contains a rock wool blanket for insulation, the wall, when completed, is approximately 8" thick and is load-bearing type. No exterior veneering is required.

Foundations are conventional type concrete. Floors are steel bar joists with concrete or wood floors. Roofs may be flat or pitched. Fireproof deck carried on steel. Fireproof deck carried on steel and waterproofed as specified.





UNDERDOWN SYSTEM OF REENFO CONCRETE STRUCTURES

Donald Underdown
Chapman Building, Los Angeles, Calif.

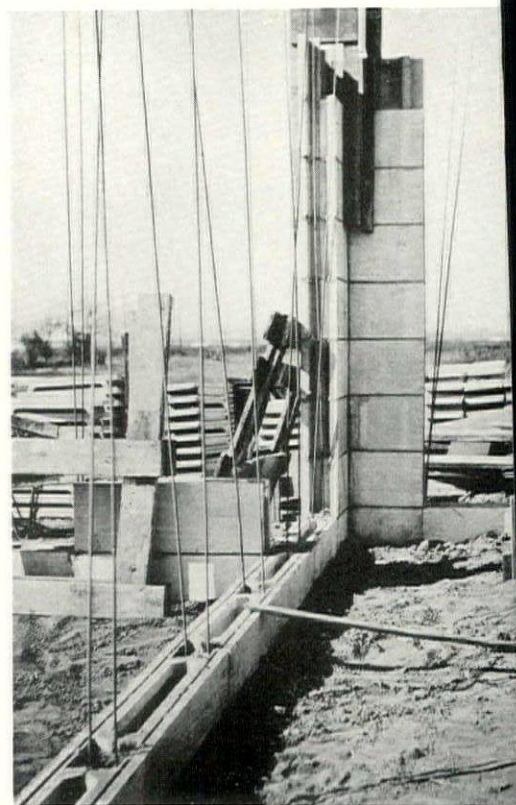
Walls: Wall construction is of precast slab erected in two rows with reenforced stud in place, tying the units together.

The units are 12" high, $1\frac{3}{8}$ " thick and vary 12" to 36" long in increments of 6". The vertical ribs from 3" to 4" from the end of unit canted to form a key into the stud. To bottom edges are flanged out to $2\frac{5}{8}$ " with gr mortar bed. Units are set in vertical align so that ribs and joints are continuous. In wall the ribs of the outer and inner units becoming a form for the reenforced stu wider walls 26-gauge galvanized iron sheets to shape are inserted as the form for the forced stud. There are closer units which fo shelf for the bond beam which is poured floor levels. These closers are also used at and wherever necessary.

Window and door jambs are framed by po half a stud. Frames, doors and sash typical struction.

Floors are typical, using wood, steel or forced concrete joists and corresponding u flooring or slabs.

Exterior and interior finish as desired.



UNIT PANEL CONSTRUCTION SYSTEM

H. H. Keller, Engineer, for Biting, Inc.
20 Exchange Place, New York, N. Y.

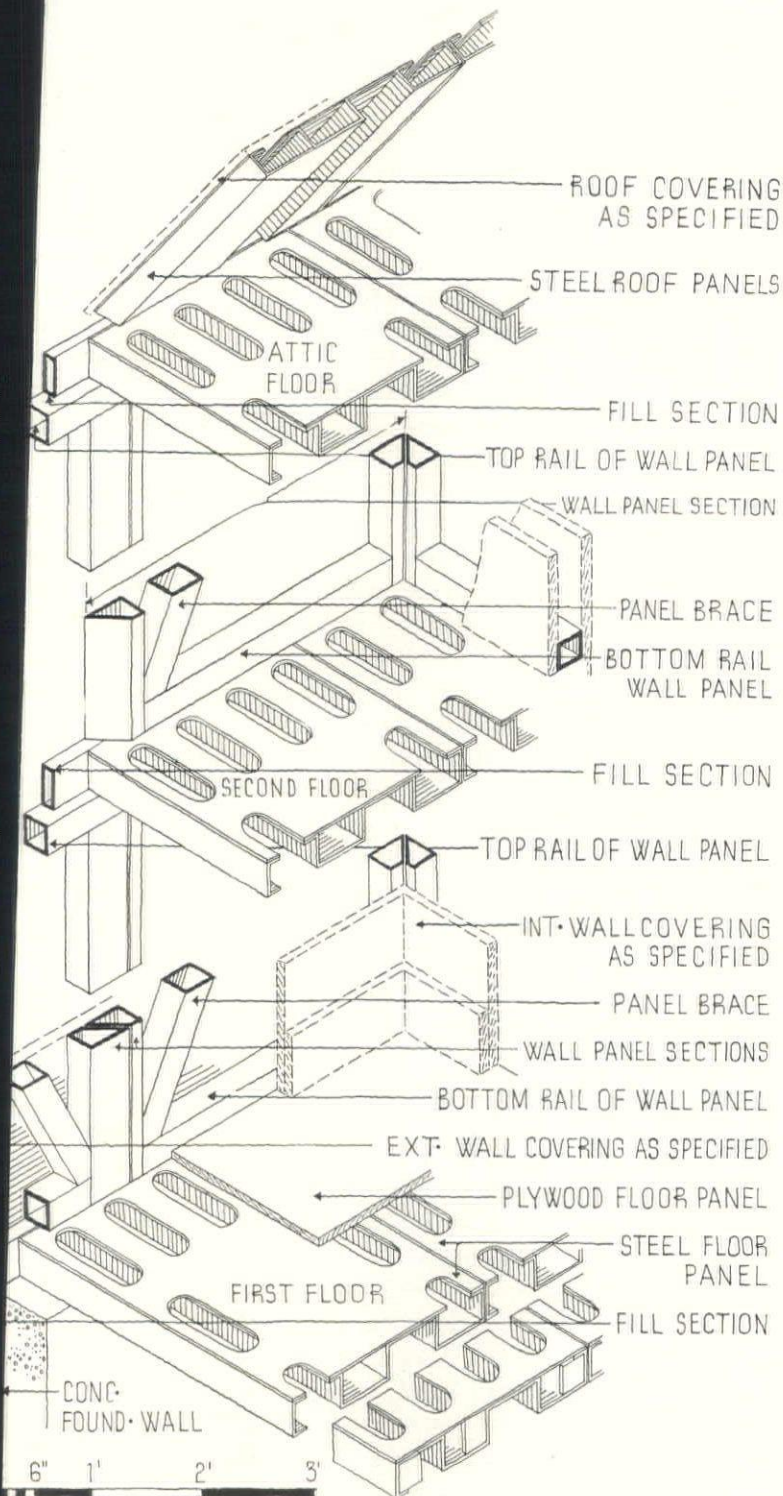
A unit steel panel construction system, composed of novel steel units, filler beams, accessories, etc. Foundation: Follows standard practice.

Floor: Self-supporting steel units combined to form a floor slab. Built up of two welded sheets of metal—the top sheet being flat while the lower forms a series of continuous rectangular cells. Units are made with large perforations in the top of flat sheets with corresponding slots in the lower sheet. These perforations provide access for bolting sections together and to permit other fastenings. Finish flooring is applied over approved insulating material.

Walls: Steel units are used as bearing walls, composed of tubular rectangular sections of strip steel diagonally braced. The vertical side or half stud is trapezoidal in shape and when combined with the next section forms a rectangle. These sections are butted tightly together and locked. The unit is factory covered on both sides with any approved panel material forming a complete wall unit. Units may be filled with insulation as specified.

Roof: Units are of similar design. A flat or a pitched type of roof may be fabricated. The roof deck may be covered with an approved insulation overlaid with specified waterproofing.

Sash: Special metal sash are designed to be included with the system, although old sash may be used. The special sash is of unique design with horizontally sliding members. The sash units are complete with all necessary fittings.



VAN NESS STEEL HOUSES

C. L. Van Ness

E. Exchange & Annadale
Akron, Ohio

Entire construction and finish, with exception of roofing and finish flooring, is light gauge steel. Wall and floor steel 20-gauge; channel 16-gauge.

Foundations are concrete piers 6'-0" on centers but could be standard. Only excavation is to accommodate the heater.

Continuous steel angle sill anchored to foundation, with similar girder member run through center of house.

Floor beams: 14-gauge channels, 5" deep, on centers, bolted back to back.

Floor pans have a depression $1\frac{1}{2}$ " deep at center forming a parabolic curve which acts as a lateral stiffener. The edges are crimped down between the webs of the floor channels. A molded rubber block dropped into each pan forms the finished floor.

The underside of each floor is closed by a steel plate. Insulation is fastened beneath and enclosed space becomes a heating duct.

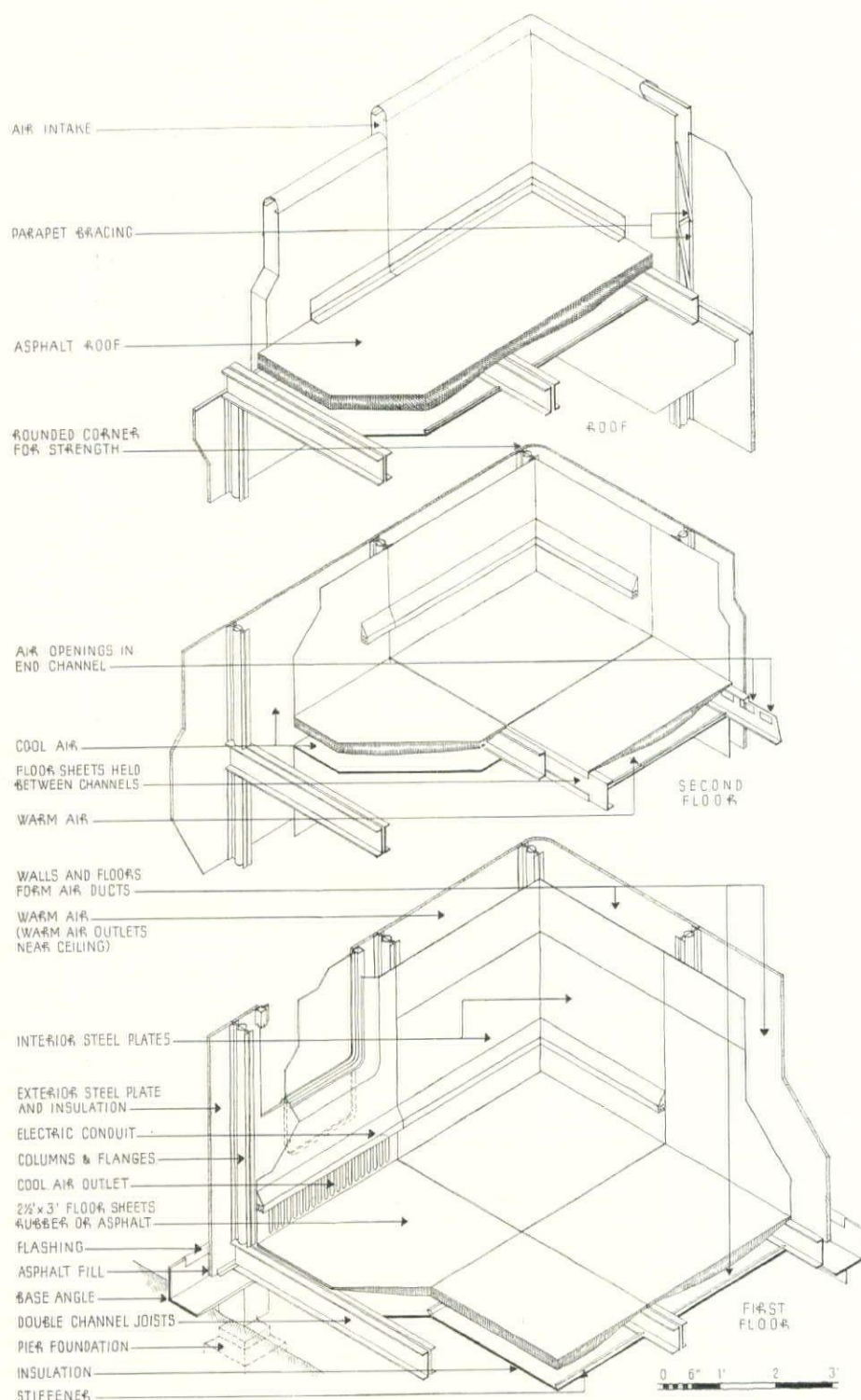
Columns formed by two special channels. They occur 3'-0" on centers on two sides and 30" on centers on other two sides of the house. Used in all partitions.

Wall sheets flanged and set between webs of channel columns. Insulation on inside. All members bolted. Similar sheet on inside, forming space used as heating duct as in ceilings. A feature of the design is that the exterior sheet is narrower than the interior sheet, an arrangement which throws the exterior sheet in tension. Second floor and roof formed like first floor. Channels rest on columns and another set of columns carries up. Roof has asphalt covering. Windows slide up and down into concealed pockets. Doors are a special design with bolt hinge and lock edge beveled about 45°. They achieve very light weight and the bevels prevent possibility of pinched fingers.

A molded raceway at base height contains electrical wiring and base receptacles; from here wiring is extended to the outlets.

Plumbing standard practice.

Heating special, the oil-fired furnace rises through kitchen floor and becoming the range. Heat is circulated under floors and through walls, returned to furnace and recirculated.



E. M. WINTER

15 Jacobus Place, New York, N. Y.

A structural steel frame welded or bolted, enclosed by a series of precast, interlocking, reinforced, light-weight concrete panels; the spaces between adjacent panels and columns are grouted to form a monolithic wall.

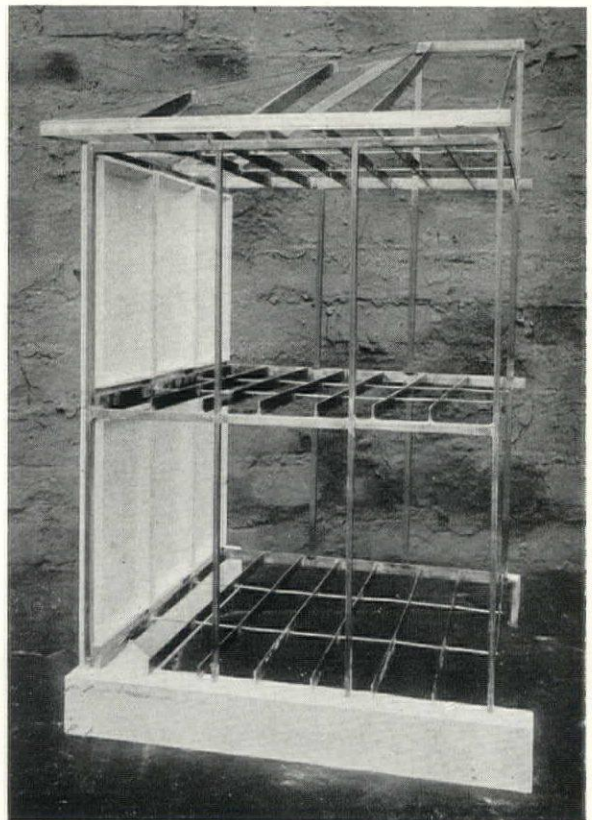
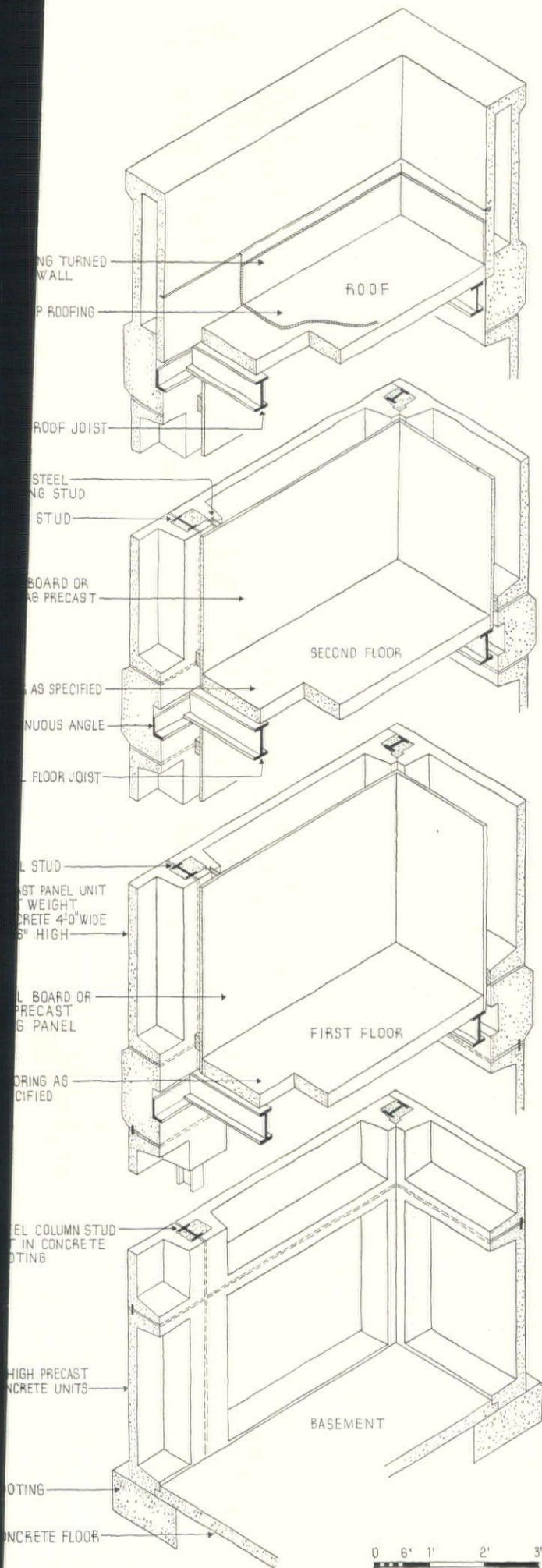
Foundation: Walls enclosed with precast concrete panel units approximately 3' in height and interlocked into the building frame to form the cellar wall.

Panel Units: Precast in light-weight concrete using blown blast furnace slag as aggregate. Units are 1½" to 2" thick x 48" wide x 9' 6" long, weighing between 200 and 300 pounds. The surface to be stuccoed after installation. Units act as stiffeners for the columns and sway-brace the entire structure.

Interior Walls and Partitions: Approved wall-board on precast panels ¾" in thickness. Studs Stran-Steel for nailing.

Floor: Floor beams Stran-Steel, Junior Beams or the like. Floor covering as specified.

Roof: For flat type, similar to floor construction and overlaid with specified waterproofing.



SUMMARY

TO PREFABRICATION STUDY

THIS description does not include such materials as fiber boards, plywood panels, plaster boards, cement and asbestos boards which may become prefabricated units if the modulus of the building is adapted to their stock size, or if they are factory cut to the dimensions required by the prefabricated system.

Floor planks and wall planks, made of gypsum or concrete, cement roofing tile, cement and asbestos boards are prefabricated materials which may be and often are used in prefabricated buildings.

Mention should also be made of synthetic finishes, such as Formica, Micarta, etc. At present their use is limited on account of cost. However, synthetic resin is an ideal material which, when the price has been sufficiently reduced, will undoubtedly find its market.

Interior partitions of various materials have been built on the prefabricated unit principle for a long time. As their use is limited to the inside of buildings, and as they are more adapted to commercial spaces, they have not been included in this study. Likewise, prefabricated units used for industrial buildings have been omitted.

Probably no unit fulfills all the requisites listed in the first part of this article.

Wood is a material familiar to everybody, easily handled and acceptable as a finish surface to a large majority. Its permanency is perhaps questionable. Wood processed into boards and plywoods glued and coated with synthetic resin open new fields of high possibilities.

Concrete is easily worked to meet the many conditions of design and strength. It holds a great advantage over most other building materials in regard to permanence and protection against fire and other menaces. Its acceptance as a finish in a home has met some opposition. The weight of the concrete units is a disadvantage.

Steel will undoubtedly lend itself to prefabrication, storage, handling, transportation and erection when mass production becomes a reality. In the meantime, it is readily acceptable for structural units but for a home the public seems reluctant to accept steel for finish surfaces, interior or exterior.

In conclusion, it must be realized that there are many other systems of prefabricated units not mentioned here. The number of names listed in preparing this article was really staggering but many systems have already been abandoned, many are only in the drafting room stage, and many are only ideas of inventors without any knowledge of the requirements of a building material.

In order to succeed, prefabrication must prove its worth and stability beyond a reasonable doubt, and show that the risk which is always present in something new and untried is more than offset by the better results or the savings which will be obtained.

AIR CONDITIONING

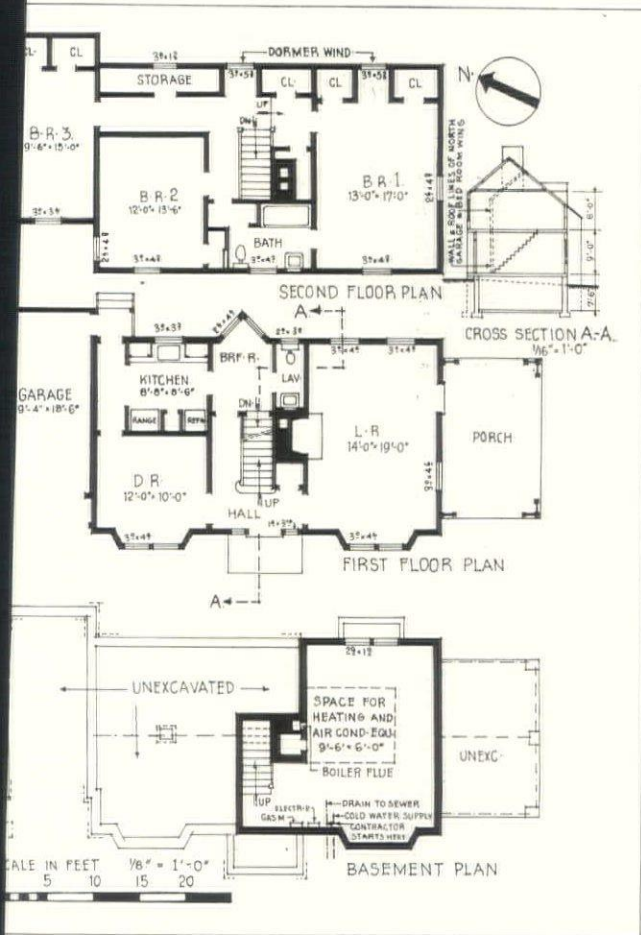
Industry as new as air conditioning could have developed uniformly of general opinion, much less standard practices. Different opinion exists even as to what air conditioning actually

Combination of these factors prompted THE ARCHITECTURAL Forum to include in its study of home building techniques a detailed examination of residential air conditioning. As a basis for study, THE FORUM selected a reasonably typical house and required all manufacturers of air conditioning equipment to design systems for the house, based on specific requirements. Included systems on which data were received up to press time. No interpretation should be placed on omissions.

To conduct its survey THE ARCHITECTURAL FORUM retained A. J. Canney, air conditioning engineer. The presentations of different systems proposed by the participating manufacturers prepared by Mr. Canney, unedited by THE ARCHITECTURAL FORUM.



AIR CONDITIONING STUDY BASED ON THIS HOUSE



In addition to the plans of the house, outline general specifications and detailed specifications for the air conditioning system were sent to each manufacturer. The house itself was a typical two-story uninsulated frame dwelling. The requirements for the system follow:

Bidders shall continue water, gas, electric and sewer waste from the points within the building shown on the basement plan.

A power panel and cost thereof, in excess of 4 KW panel, shall be included and the desired capacity specified by the bidder.

The hot water reservoir shall be of not less than 40 gallons capacity.

STEAM HEATING SYSTEM (ALTERNATE) (FOR RADIATOR-CONVECTORS)

The steam heating system shall be a straight one-pipe heating system, downfeed with main as high as possible and adequately pitched.

All pipes shall be well insulated.

HOT WATER SYSTEM (ALTERNATE) (FOR RADIATOR-CONVECTORS)

If hot water, a two-pipe overhead system shall be used. All pipes shall be well insulated. There shall be an expansion tank in the attic with overflow through the roof.

GUARANTEE

1. To heat and automatically maintain the occupied zone of each space to an average of 70° F. when the outside temperature is between zero and 65° F., excepting the garage.

2. The garage shall be heated to not less than 40° F. at zero outside.

3. To produce and automatically maintain during any period within the summer months the following atmospheric conditions in the occupied zone of each space except the garage which shall not be air conditioned, as follows:

a. An average of 80° F. dry bulb temperature simultaneously with a relative humidity not exceeding 50 per cent when the outdoor dry bulb temperature is 95° and/or the outdoor wet bulb temperature is 75° F.

b. Not to produce an air velocity exceeding 40 ft. per minute in the occupied zone of any room air conditioned by virtue of the supply air.

c. Automatically to change the average indoor temperature so as to increase or decrease respectively with the temperature outdoors approximately in the straight line relation of 1° indoors in the occupied zone to 2½° outdoors as between 70° and 90° indoors and 70° to 95° outdoors.

d. To supply air immediately beyond the outlets at a dry bulb temperature and wet bulb temperature not individually less nor greater than 68° and 61.9°, respectively, when meeting the maximum heat absorption load, within plus or minus 1°.

4. The sound energy increase due to the operation of the equipment shall not be disturbing to the average listener within the normally occupied above ground spaces when the quiet or "all equipment off" sound level is 24 decibels or above, threshold being hereby arbitrarily established at .00056 bars.

5. That 380 c.f.m. of outdoor air will be introduced within the limits of approximate anemometer measurement, at all times the system is permitted to operate and including all seasons.

6. Automatically to humidify during all seasons except summer to an average relative humidity in each room of not less than 45 per cent.

7. Automatically to preclude excessive condensation on the interior surfaces of windows.

8. The above guarantees are to be made with the understanding that they are contingent on the following:

a. Construction of the house as shown on the accompanying plans and specifications.

b. The keeping of windows and doors closed except for no normal usage of the latter.

c. That in addition to the weather influencing the summer heat absorption load together with the peak limitation imposed above thereon, no electric residence illumination or appliances or other heat producing sources shall be taken co-incidental with the meeting of the peak outdoor air conditions guarantee under paragraph 3-a.

d. That there will be not more than five persons in the conditioned spaces when the above guarantees apply.

9. That a kitchen exhaust fan handling 200 c.f.m. shall automatically run whenever the system is in use, on the summer switch specified herein below.

10. That the operation of the system will be fully automatic.

11. That there will be two remote push-button stations provided in the first floor entrance foyer, one station to stop and render "dead" the entire apparatus excepting that required for the provision of heat and the other switch for cutting out the means for cooling and dehumidification and otherwise rendering "dead" all appurtenant equipment thereto so that the fan alone will remain in operation. Provide one summer-winter switch wired to function properly and accordingly as designated on said push button station.

12. All the air delivered shall be filtered. Filters shall be located ahead of conditioning elements with respect to the air flow.

13. The humidifier under any proposal shall have a capacity of evaporation of not less than one gallon of water per hour when installed which

(Continued on page 579)

QUESTIONNAIRE AND REPLIES

NUMBER OF QUESTIONNAIRES RECEIVED FILLED IN—11

Q. What would be the approximate increase in cost if, in place of one central apparatus in the basement with distributing ducts, the cooling coils were split, the humidification split and possibly the heating also split, with half these elements in the attic space so as to avoid the architectural interference of duct risers to the second floor ceiling?

A. As it turned out, bidders were on the whole sufficiently careful to avoid architectural interference such as pilaster effects for furred-in duct risers.

No bidder split the equipment, mechanical apparatus on all plans being located in the basement. The consensus was that so doing would be both impractical and unnecessary on a job of this size.

Q. Or wouldn't the ducts have to go to the second floor ceiling?

A. This was answered according to the layouts. Some layouts require ducts in the attic space. One reply of particular interest was that ducts would not have to be run to the attic space for heating but that this would be necessary for cooling. Several proposals do not require ducts to run through the attic.

Q. If you have chosen to run one or more ducts in the attic space what did you insulate them with and what is the approximate applied cost of such insulation?

A. (Three replies.) In all instances where ducts were located in the attic 1 in. air-cell asbestos was employed for insulation.

Cost—Bidder "G"—5 cents per square foot.

Bidder "A"—\$3 per 5 ft. run of duct.

Bidder "E"—\$80 total.

Q. If we put a copper roof on this house, and added perforated distributing piping, recirculating piping and a recirculation pump to cool condenser water with, and thus reduced the refrigeration load, how would the annual carrying charges compare?

A. (Four replies.) Bidder "E" would reduce yearly cost.

Bidder "I"—Not justified this size house.

Bidder "G"—Refrigeration reduced $\frac{2}{3}$ ton, but increased condenser water quantity for the extra pump would result in about breaking even on costs, although it is feasible to do this.

Bidder "H"—Some reduction in cooling load would result but very slight, due to considerable pitch of roof, which rules the suggestion out as impractical.

Q. Or wouldn't this cool the condenser water?

A. Bidders "I", "G" and "H"—It would.

Bidder "E"—It would not.

Bidder "G" states that cooling of water would be effected to within 10° of the outdoor wet bulb temperature.

Q. If this would cool the water, would this reduce installed tonnage from what to what tons?

A. Bidder "E"—Reduction of $\frac{2}{3}$ ton.

Bidder "G"—Reduction of $\frac{2}{3}$ ton.

Bidder "H"—"Some" reduction of refrigeration.

Q. Would an attic ventilation fan with an opening others to receive air pressure relief louvers furnished and installed by you at the north end, and the fan to run constantly all summer with the summer switch "on," show an advantageous investment balance?

A. Bidder "A"—Not if roof is insulated.

Bidder "B"—Yes. The fan and wiring would cost installed and would reduce the refrigeration by ton.

Bidder "E"—No.

Bidder "G"—Not in this house.

Bidder "H"—No saving. Recommend natural cross-ventilation louvers.

Bidder "I"—No saving. Recommend natural cross-ventilation.

Bidder "K"—Not unless the 2nd floor ceiling is insulated.

Q. The man buying this house and your system that he and seven guests play poker at his home every Saturday night, and that they all smoke cigars. He wants to know if your system can bring in outdoor air in the amount of the full fan capacity as a purge. If he also wants to know whether this can be effected a separate switch on the foyer control panel, and how much extra money completely installed with automatic damper controls?

A. Bidder "A"—Yes, for \$75.

Bidder "B"—Would tell owner to use kitchen fan.

Bidder "D"—Yes, for \$75.

Bidder "E"—Included, but remote switch extra for \$5.

Bidder "F"—Yes, for \$50.

Bidder "G"—Yes, but ineffective unless means for egress be provided. (Add \$5 for switch.) (Without wiring).

Bidder "H"—Yes, for \$45 to \$50.

Bidder "I"—Yes, for \$100.

Q. If thermostatic controls were located on the first floor so as to secure manually any temperature or relative humidity desired within the limits of the equipment, how much would this cost additionally?

A. (Ten replies.) Included. No extra.

Bidder "I"—Included for temperature only, as no automatic humidity control instrument furnished. Could be furnished for approximately \$50 extra.

Q. Or were the controls already on the first floor your estimate?

A. Eleven answers (100 per cent replies)—Yes.

Where do you wish these instruments to be located?
 mark on plan.
 The favored location is the first floor passage adjacent to the stairway, off the foyer. The next favored location was the foyer. Some desired instruments in the living room or dining room.
 What design modifications do you recommend making in this house with the idea of showing a more favorable overall investment balance with air conditioning?
 Insulation?
 In replies, all rejected the idea of placing insulation on the underside of roof, all advocated insulation on attic sheathing over the second floor ceiling and all advocated insulating the walls.
 Most favored material was 4 in. rock wool for both these locations, and recommended heat conduction coefficients varied between .058 to .08 for the attic insulating material and .063 to .093 for the walls, these figures expressing Btu. per hour per degree temperature difference.
 Aluminum foil and exploded mica each received one bid.
 Thermopane?
 Advocated by three bidders without qualifying remarks.
 Advocated by three bidders.
 Advocated by two bidders with qualifying remarks, of which was that it was considered useful only during the heating season.
 Windows were advocated by four bidders.
 Double glazing was advocated by two bidders.
 Sunlight retarding glass?
 Six replies.) No—four.
 To be used—two.
 Paint roof white?
 Six replies.) One—Yes.
 —No.
 —Recommend aluminum paint.
 —Would lose sunlight reflecting value after becoming dirty.
 —Same as last reply, adding that owner would probably not repaint annually.
 Paint entire exterior white instead of gray?
 Six replies.) The consensus is that the difference between white and gray for sunlight reflection would be immaterial in practice because the white would lose its bright appearance by dirtiness.
 Use awnings?
 Seven replies.) Six favor the use of awnings without qualification.
 Letter "K"—Yes, possibly.

Q. What color or color region would you recommend for awnings?
 A. One—White preferred, but light tones of brown or gray satisfactory.
 Two—Tan.
 One—Color unimportant.
 Q. What do you think of the air space under the dining room? What would you suggest doing about it?
 A. Four—Seal tight.
 Three—Seal and vent to heater room during winter only.
 One—If sealed no insulation required under floor.
 One—Radiation from ducts and pipes will help to heat rooms above.
 Q. It has been suggested that the leaving condenser water could be run up to the roof and distributed thereon, and that some of it could run a garden fountain and lawn sprinklers by underground pipe distribution. We would be interested in having your reaction to this suggestion.
 A. Bidder "I"—Good but expensive.
 Bidder "K"—Possibly good but will increase installation cost somewhat.
 Bidder "A"—All right if water not recirculated.
 Bidder "G"—Too much water for a lawn.
 Bidder "E"—Only part of the water could be run for proper lawn sprinkling, otherwise suggestion acceptable.
 Q. If the first floor were humidified and the second floor only were to be cooled and dehumidified would the results be those intended in the specification? Would they be considered reasonably satisfactory?
 A. (Four)—No to both parts of the question.
 One—Would provide summer "relief."
 Q. If selective cooling for either first or second floor summer conditioning would show a lower investment, what would be the reduction in tonnage? The difference in cost from your preferred method?
 A. One—Cheaper.
 One—Small reduction in tonnage but increased cost of controls would make saving small.
 One—Selective cooling could be laid out for this residence and on account of lower first and operating cost would prove most interesting to the owner.
 Q. This is a \$12,000 residence. Is your preferred method the best in technical air conditioning practice in your opinion, or is it intended as a suitable compromise to the income of the man who on the average pays this sum for a house?
 A. Nine replies—Best in technical practice.
 One—The best and most suitable.
 One—The preferred method is the best, whereas our alternate is more suitable.

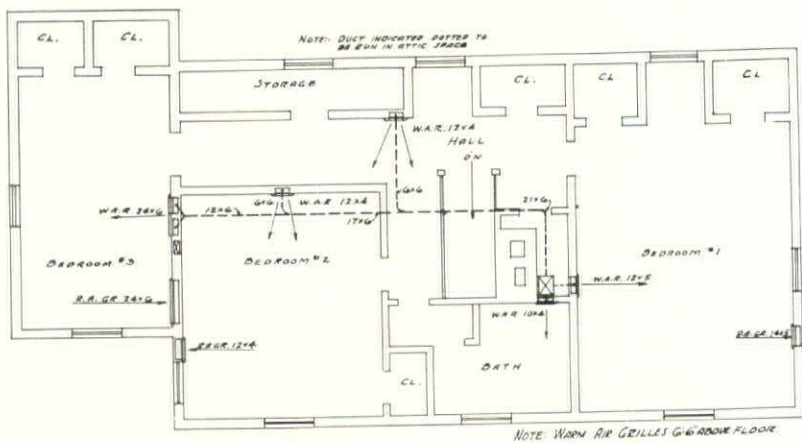
(Continued from page 577)

ponds approximately to the addition of 69 grains per hour per lb of room air.
 All workmanship and materials shall be guaranteed for one year from date of acceptance.
 All workmanship and materials shall represent the best type and quality for high grade residence practice.
 The location of the house is to be Tuckahoe, Westchester County.
 The garage shall be heated only

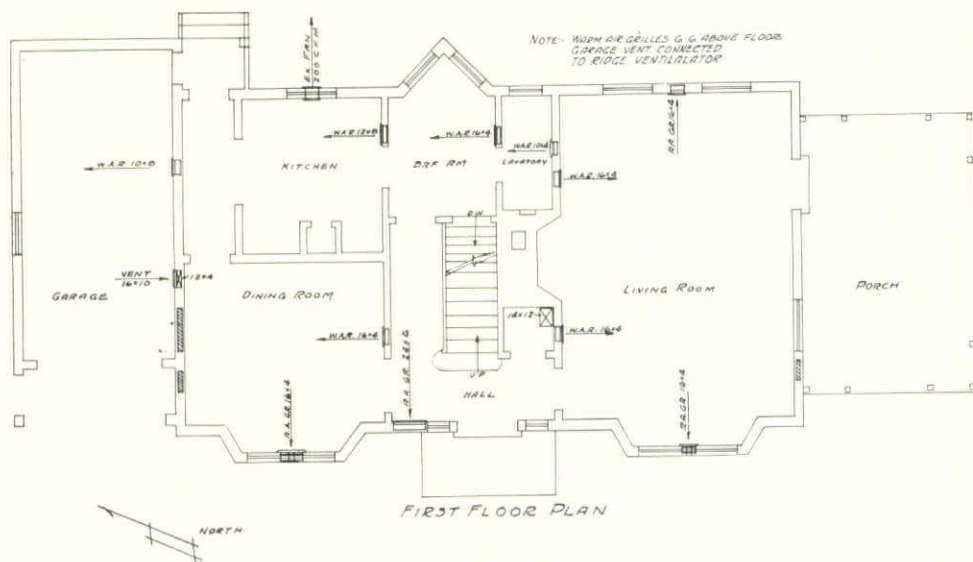
BASIS FOR UNIFORM COST REPORTS

Coal—\$13.00 per ton
 Fuel Oil—6¢ per gallon
 Gas—50¢ per 1,000 cu. ft.—530 B.t.u. per cu. ft.
 Electrical Energy—4¢ k.w.h.
 Water—\$1.00 per 1,000 cu. ft.
 Duration of operation of cooling and/or dehumidifying agent—1,400 hrs.
 Load factor for same—40% over total operating time
 Operation of fan—8,000 hrs. (91.5% of the total yearly number of hours)

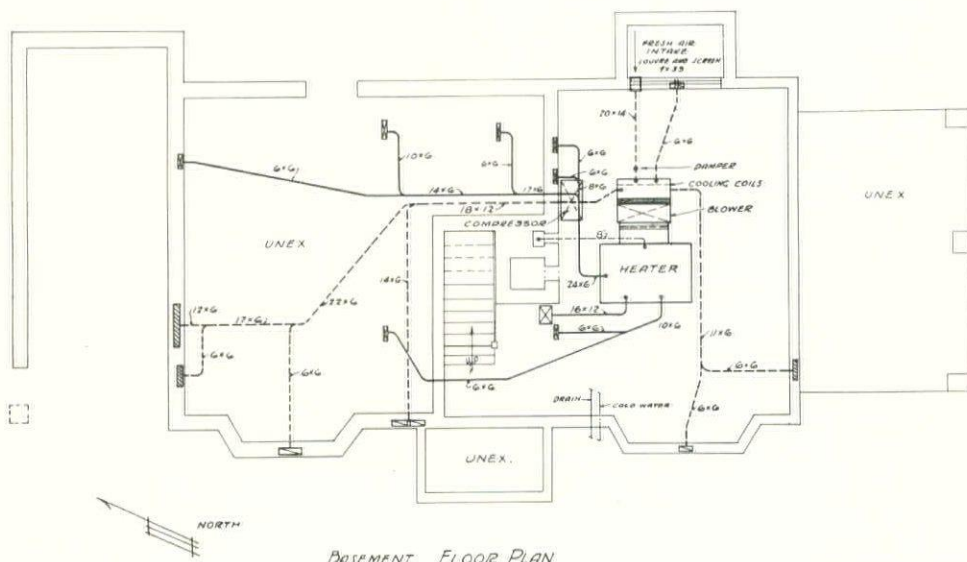
YEAR ROUND AIR CONDITIONING SYSTEM



SECOND FLOOR PLAN



FIRST FLOOR PLAN



BASEMENT FLOOR PLAN

RAL COMMENT

proposal is not only in complete conformation with the specifications with exception (eliminating the indoor-outdoor summer compensating temperature control) but shows better than average judgment in the strategic arrangement of supply and return air grilles for securing uniform conditions, particularly in very cold weather. The proposal excepts the coming control just mentioned, which was specified to change the inside temperature one degree for every two and one-half degrees outside above 70° and outside, on the grounds that experience has shown it to be necessary.

is, however, difference of opinion. Overcooling is the greatest potential summer air conditioning, a possible cause of illness and a probable of discomfort. Because of this, despite the low cost of the house (\$12,000), "refinement" was specified.

felt that such a device protects an already very high outlay. However, is no quarrel with the common sense view that the owner of a \$12,000 simply cannot normally afford all the refinements.

ARY DATA

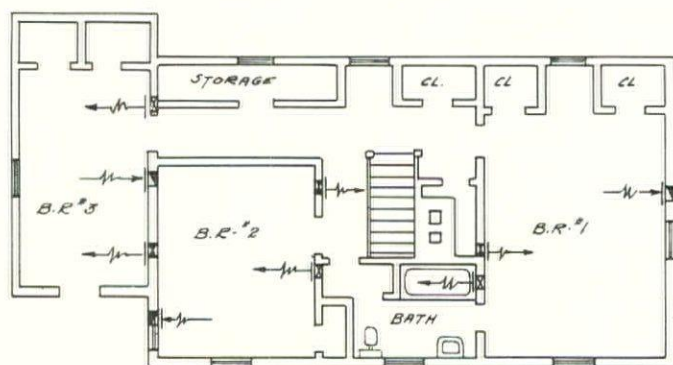
ELLED COST \$2,153
 AS HEATING
 ELLED COST 2,263
 IL HEATING
 MENT RETAIL COST—GAS 1,343
 MENT RETAIL COST—OIL 1,453
 AL OPERATING COST—not furnished
 ated \$400—\$500.
 S used for all functions all seasons.
 C FEET OF AIR delivered—1,830 per
 cations.
 OUTDOOR AIR—380 c.f.m. per speci-
 ns.
 eration—1 2-ton Freon reciprocating
 nsing unit.
 ING—Air contact with metallic coils.
 UMIDIFICATION—Air contact conden-
 on metallic coils.
 RATION—Replaceable dry type or per-
 nt type if desired.
 IDIFICATION—By motor-driven atom-
 One and a half gallons per hour to
 ain 45 per cent relative humidity at
 outdoors with 380 c.f.m. outdoor air.
 PORATIVE CONDENSER—Not in-
 d in above price, but if street water not
 able can be installed for \$250, so as to
 e refrigeration.
 WASHING—Only when humidifier oper-

SPECIFICATION DATA

FOR GAS (Note: The following are covered
 in the retail price).
 1—June-aire No. 310 W
 1—45 gallon gas fired water heater
 1—set of controls
 1—200 c.f.m. kitchen exhaust fan
 1—cooling coil with expansion valve
 1—2 hp. Freon compressor
 FOR OIL
 1—H 56030 Climate Maker
 1—60 gallon Oil Burner Hot Water Heater
 1—set of controls
 1—200 c.f.m. kitchen exhaust fan
 1—cooling coil with expansion valve
 1—2 h.p. Freon compressor
 FOR GAS
 Gas heater is of tubular type, all cast iron,
 168,750 B.t.u. per hour capacity, is fully
 insulated with full set of safety controls.
 FOR OIL
 Oil burning unit employs steel heater with
 vertical blower washer, filters, and
 square, baked-on colored casing; is of
 210,000 B.t.u. per hour capacity.
 1—gun type oil burner with oil tank and
 stack safety controls.

TECHNICAL COMMENT

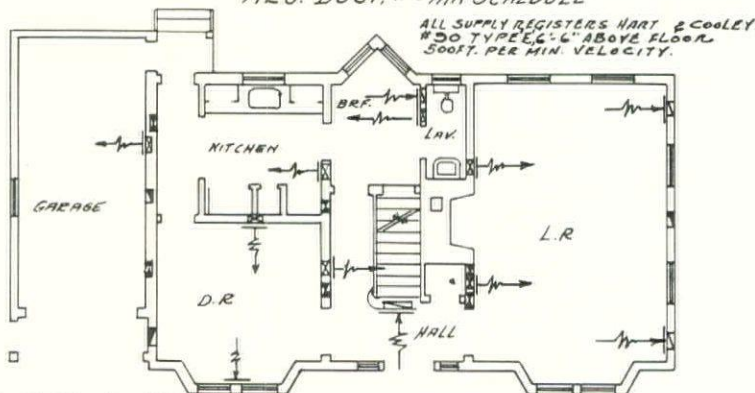
This company proposes to furnish a humidi-
 fier having one and a half G.P.M. capacity.
 The specifications called for one G.P.M. ca-
 pacity for the purpose of limiting humidifier
 capacity to avoid condensation on the win-
 dows. While this alone would not be a suffi-
 cient safeguard with single glass at all times,
 the point is that one G.P.M. capacity would
 be ample, with single glass, and the humidi-
 stat would have to be set for a lower relative
 humidity in cold weather.
 With double glass, such as Thermopane, the
 capacity of one and one half G.P.M. recom-
 mended by the American Foundry and Fur-
 nace Company to maintain 45 per cent is
 correct.
 Specification paragraphs 6 and 7 are actually
 conflicting if read independently. Automatic
 prevention of window condensation is an
 important and very desirable accomplish-
 ment. Specification paragraph 7 is unusual,
 but should be enforced to prevent inadver-
 tent damage. No bidder construed the two
 paragraphs together properly, which is to
 say, paragraph 7 as a rider on paragraph 6.
 The water volume may be inexpensively
 limited automatically.
 With the high out-door air volume and with
 a limited water volume, paragraph seven of
 the specifications would be met by a lower
 relative humidity than 45 per cent and win-
 dow condensation thereby prevented.
 This company is to be thanked for stating
 their tonnage.



SECOND FLOOR

SUPPLY			RETURN	
C.F.M.	STACK	REG.	C.F.M.	INTAKE
140	18x3½	14x6	185	14x6
130	18x3½	14x5	130	14x6
290	18x3½	14x6	290	36x5
110	12x3½	12x5		
90	12x3½	12x5		

SECOND FLOOR
REG. DUCT, AND AIR SCHEDULE



NOTE: ALL RETURN AIR INTAKES, IN
BASEBOARDS, HART & COOLY
#90-TYPE 'A'

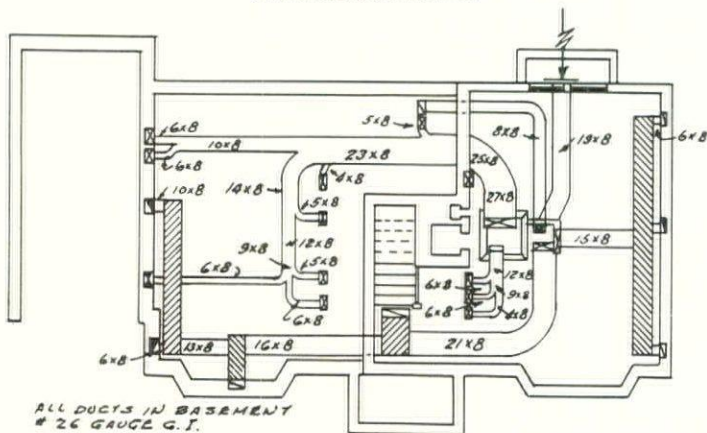
FIRST FLOOR

SUPPLY			RETURN		
C.F.M.	STACK	RWG.	C.F.M.	INTAKE	
310	10 x 3 1/2	14 X 6	155	16 X 6	
100	12 x 3 1/2	12 X 5	255	30 X 5	
120	12 x 3 1/2	12 X 5	120	14 X 5	
80	12 x 3 1/2	12 X 5			
75	12 x 3 1/2	12 X 6	205	14 X 6	
40	12 x 3 1/2	10 X 4			

FIRST FLOOR
DUCT, REG. AND AIR SCHEDULE

160	18x3 1/2	14x6			
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GARAGE SCHEDULE



ALL DUCTS IN BASEMENT
26 GAUGE G.I.

BASEMENT

WINTER AIR CONDITIONING SYSTEM

DESCRIPTION

This is a winter air conditioning which can be installed complete for \$1,000, which is about half the cost of a year-round system, and of which \$300 is for duct work. The functions provided are ventilation, heating, filtration, and humidification without manual control. Hot water tank piping are not included in the price. Although the delivered air quantity is 380 c.f.m., as much as 700 c.f.m. can be supplied from outdoors as an intended aid to summer comfort. During the heating season 380 c.f.m. of outdoor air is recommended, just falls short of the specification figure of 380 c.f.m.

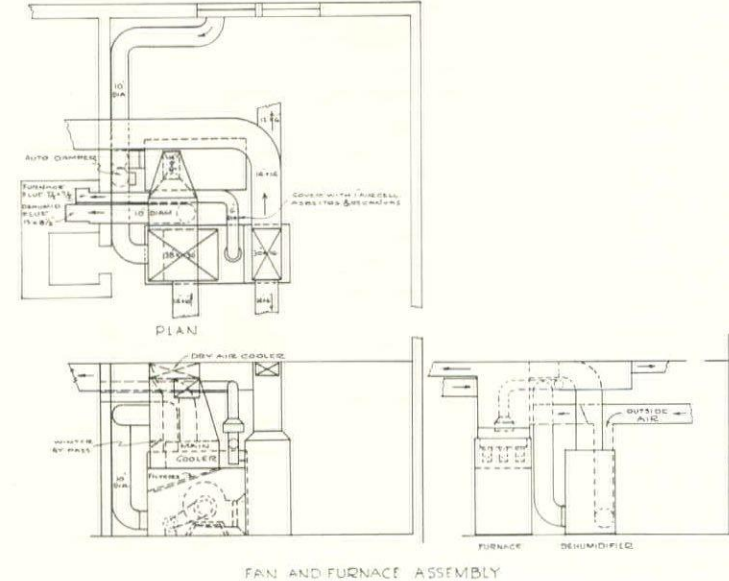
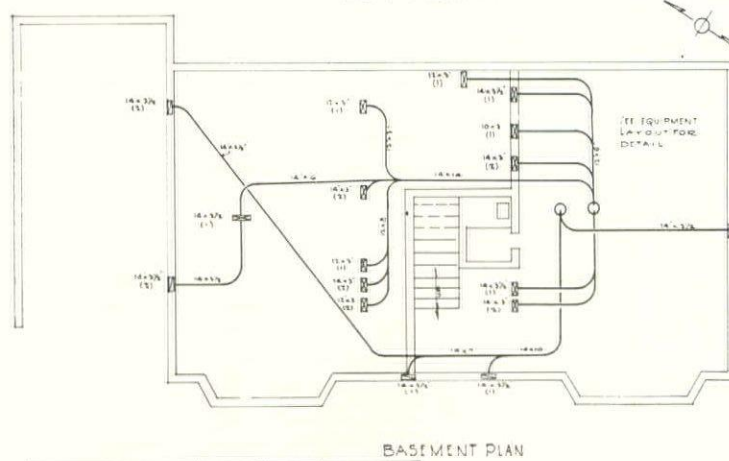
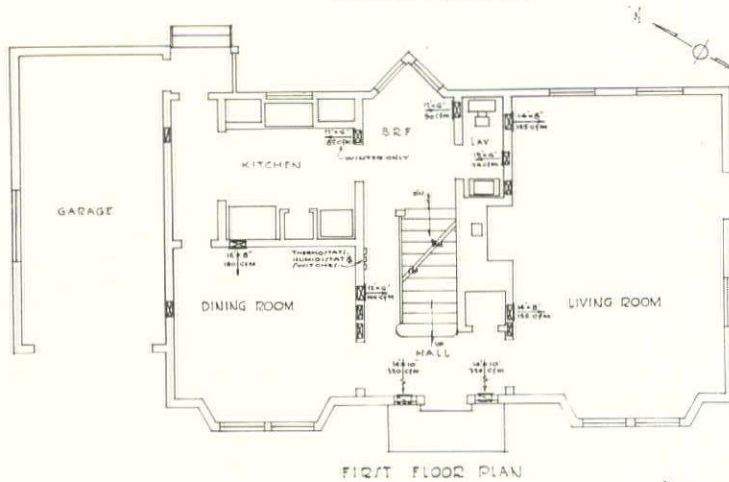
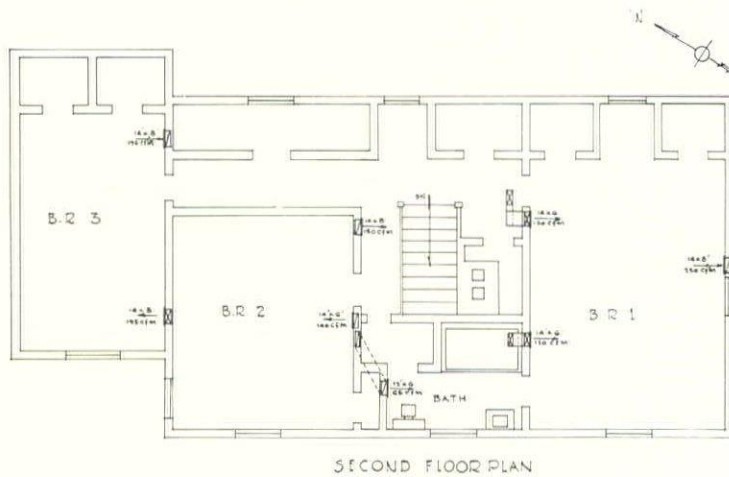
A "header" type of return air duct system is employed which is of special merit. However, the distributing system is proper. 100 per cent indirect heating in that the air is not only discharged toward the outer walls but is returned near the window. This had been carried out in all rooms by means of either supply grille located in the ceiling or directional louvres as in bedroom No. 2. In this instance, where this was not done, the design would have been improved.

Return grilles may well have been dirtier under windows in practically all cases, increasing cost of ducts but producing worthwhile improvement of results.

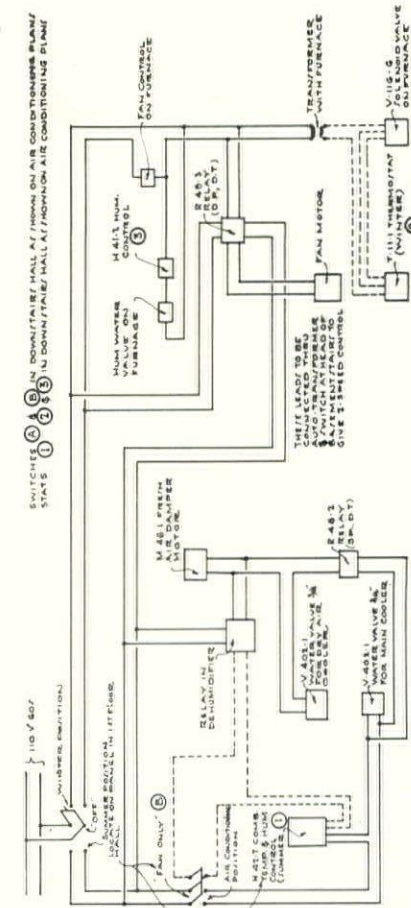
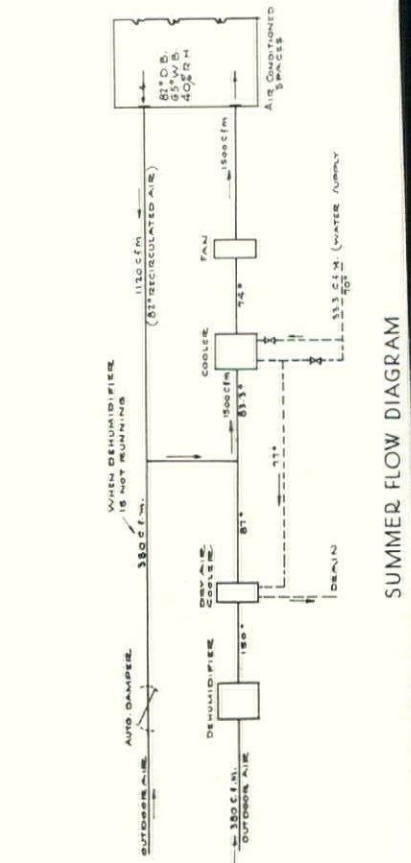
Humidification is secured by direct application of furnace heat. Double glass such as Thermopane and wall insulation having a transfer coefficient of .069 are recommended as insulation on the underside of the roof having a value of 0.1. Filters are of replaceable type.

Timken Air Conditioning Oil Furnace 232 is recommended.

The total cost of oil per winter is state be \$180 and electrical power \$16.80 du this season, making a total annual estim operating cost of \$196.80.



YEAR ROUND AIR CONDITIONING SYSTEM



GENERAL COMMENT

system differs from the others and is unique because artificial refrigeration is required and it employs gas year round for winter heat and in summer for dehumidifying and reactivating the silica gel which removes the humidity by chemical adsorption. This method of humidification is supplemented by the use of street water through coils for temperature reduction which performs the cooling function under independent control. The system is 100 per cent indirect, the method of dispensing with radiators entirely. Heating and dehumidifying is secured by means of a standard, gas-burned air furnace. The garage should be heated which can be handled by a hot water radiator. The relative humidity of 40 per cent is recommended, a higher than customary indoor temperature which is equivalent if not improved comfort in that it is far from hot outdoor summer conditions is nearly obtained. The higher temperature enables the elimination of artificial refrigeration in this system, providing it is desired per se artificially to secure a temperature reduction below appreciably 80° out of doors. The method takes proper advantage of the fact that humidity and air movement are two important variables influencing comfort as well as temperature. It assures freedom from reciprocating compressor noise as an advantage, and while minor technical details of the specifications are waived the method is to be considered one of the best and has wide application where either electric rates are average or where gas is available. We quote the following interesting data from the com-

ments of the Bryant Heater Company: "If the house is not insulated, the estimated annual increase in heating cost is:

GAS, 205 M.C.F. at \$.50/M.C.F.....	\$102.50
POWER	8.92
	<hr/>
	\$111.42

and the estimated increased investment in heating equipment is \$100."

"The effect of insulation on the cost of cooling equipment and its operation is not evaluated, since it is not considered advisable to install summer air conditioning in a house of this character and price unless measures, such as the use of insulation and awnings, are taken to bring the initial investment and the operating cost within bounds.

"Insulation, then, is to be considered not only as a fuel saver but also as almost an economic necessity if summer air conditioning is contemplated. It is no longer a question of whether insulation should or should not be included in the specifications for a modern house, but rather which type or kind of insulation will ultimately predominate. The effect of double windows is not considered separately, since their use is necessary if excessive condensation on windows is to be prevented in very cold weather."

The suggested modifications in the house construction specifications are directed toward the securing of low overall costs of winter and summer air conditioning.

FACTORY DATA

ESTIMATED COST—\$1,925.
ANNUAL OPERATING COST—\$300 (including year-round ventilation), (based on 70° F.)
FAN, CIRCULATED—1,200 winter, 1,500 summer.
FUEL—SILICA GEL AIR CONDITIONING SYSTEM
HEATING—Used for all functions all seasons.
FUEL—Manufactured gas.
COOLING—Street water.
DEHUMIDIFICATION—Adsorption by Silica Gel
FILTRATION—Replaceable dry filters.
CONTROL—Temperature and relative humidity independently controllable automatically.
INDOOR AIR SUPPLY—Introduced by supply fan in specified amount of 380 c.f.m.
DEHUMIDIFICATION—Impingement type supply with street pressure.

4. Desire house to be completely insulated with 4" rock wool and windows to be double glazed.		
5. Guarantee modification from air conditions specified:	Specified	Bryant
Dry bulb	80	82
Relative humidity .. .	50	40
Wet bulb	66.6	65.4
Effective temperature ..	74	73.6
6. Breakdown of operating cost (with house insulated and double glazing).		
HEATING		
Gas, 305 m.c.f. at \$.50 m.c.f. ..	\$152.50	
Power, 892 k.w.h. at \$.04 k.w.h.	35.68	
Water, negligible		
	<hr/>	\$188.18
COOLING AND DEHUMIDIFYING		
Gas, 44.8 m.c.f. at \$.50 m.c.f. ..	\$22.40	
Water, 18.7 m.c.f. at \$1.00 m.c.f.	18.70	
Power, 560 k.w.h. at \$.04 k.w.h.	22.40	
	<hr/>	\$63.50

VENTILATION ONLY
Power, 1,200 k.w.h. at \$.04 k.w.h. \$48.00
(1) Based on 5,040 hours of fan operation, which is that portion of the specified 8,000 hours of fan operation represented by seven and one half months of cooling and four and one half months of air conditioning or ventilation. One thousand two hundred c.f.m. circulated at 0.50" S.P.
(2) Five hundred sixty hours of operation (1,400 hours at 40 per cent load factor).

- (3) Five hundred sixty hours of dehumidifier operation and 560 hours of coincidental fan operation.
- (4) Based on four and one-half months' portion of the specified 8,000 hours of fan operation, diminished by the 560 hours that is coincident with dehumidifier and cooler operation.

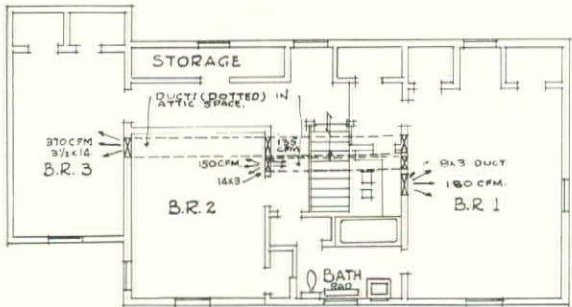
SPECIFICATION DATA

HEATING, HUMIDIFYING, CIRCULATING AND FILTRATION
Bryant No. 3-F-76 warm air furnace complete with 1/2-hp. motor.
COOLING—Young Radiator Company W-29-D cooling sections eight rows deep.
DEHUMIDIFYING—No. 5 Bryant Silica Gel Dehumidifier complete.
PLUMBING—Three-quarter inch water lines except to humidifier which is 3/8".
DUCT WORK—In accordance with Code of Minimum Requirements of the A. S. H. & V. E.
Supply and return ducts lined with approved sound absorbing material for a distance of five feet from apparatus.
GRILLES—Supply grilles "Uniflow" or "Independent." Supply grilles set in side walls with lower edges 7' above first floor and 6' 6" above second floor. Return grilles bronze plated with 3/4" square holes and grilles to be in baseboard. All supply grilles to be provided with adjustable dampers.

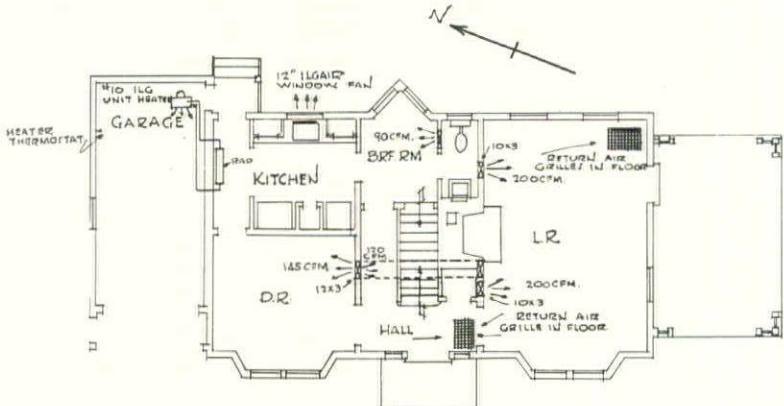
TECHNICAL COMMENT

No artificial refrigeration necessary.
Claim automatic indoor-outdoor compensating controls not necessary.
Air enters 8° below room temperature in summer in place of specified temperature lead of 12° which is all right.

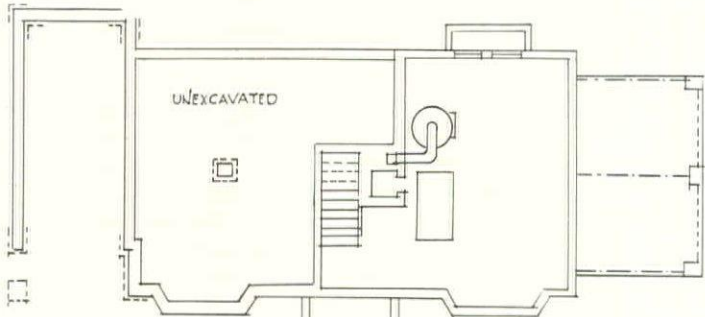
YEAR ROUND AIR CONDITIONING SYSTEM



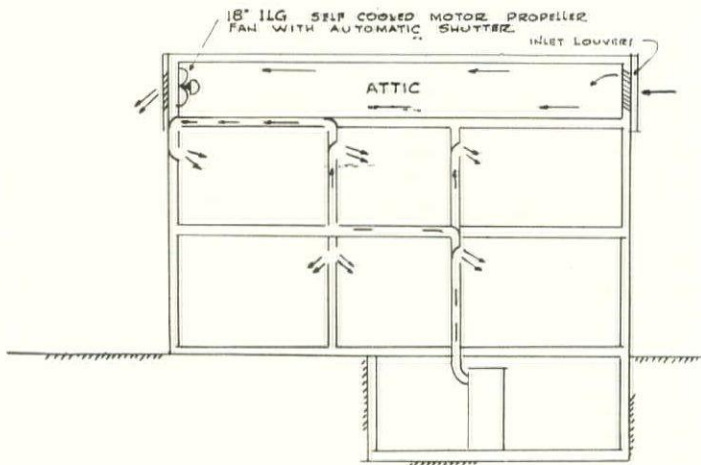
SECOND FLOOR PLAN



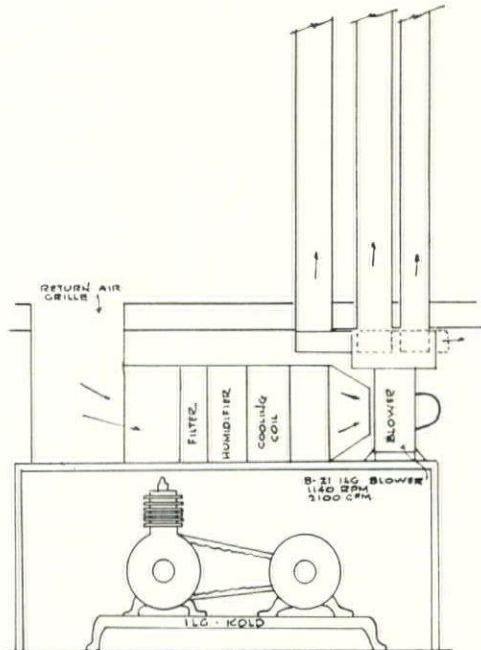
FIRST FLOOR PLAN.



BASEMENT PLAN



SIDE ELEVATION



AIR CONDITIONING UNIT

GENERAL COMMENT

System is an interesting approach to an economical one by the use of an attic fan which, in the opinion of the author, will reduce the installed refrigeration by nearly 25 per cent, which is to say by about 25 per cent if the house is well insulated.

Use of an attic fan in an existing house is a more suitable and less expensive method of reducing refrigeration than that from impingement of sunlight on the roof than the other method. The approach is therefore of greater value to existing houses.

Precaution of placing the refrigeration compressor in a soundproof compartment is good, the use of a unit under thermostatic control for the garage is commendable and the radiators in the kitchen and second bath are to be considered correct practice unless extra-than-average precautions are taken to seal the door and to employ double glazing in those rooms particularly.

Idea of securing fresh air by infiltration due to suction created by the kitchen exhaust fan is not to be considered ideal practice, as the only saving effected is the use of a fresh air inlet duct in the basement. Moreover, the air must be introduced into the house much cooler, making air distribution in summer rather precarious.

PRIMARY DATA

INSTALLED COST—\$2,000.

ANNUAL OPERATING COST—\$450.

Ducts for all functions all seasons except unit heater in garage, radiators in bath and kitchen.

FUEL—Manufactured gas or oil.

DEHUMIDIFICATION—Simultaneous with cooling with same coils, of fin type.

COOLING—By surface contact metallic coils.

FILTRATION—Replaceable dry filters.

CONTROL—Full automatic all seasons except summer. Humidity controlled within prefixed limits.

OUTDOOR AIR SUPPLY—By exhaust fan only causing infiltration.

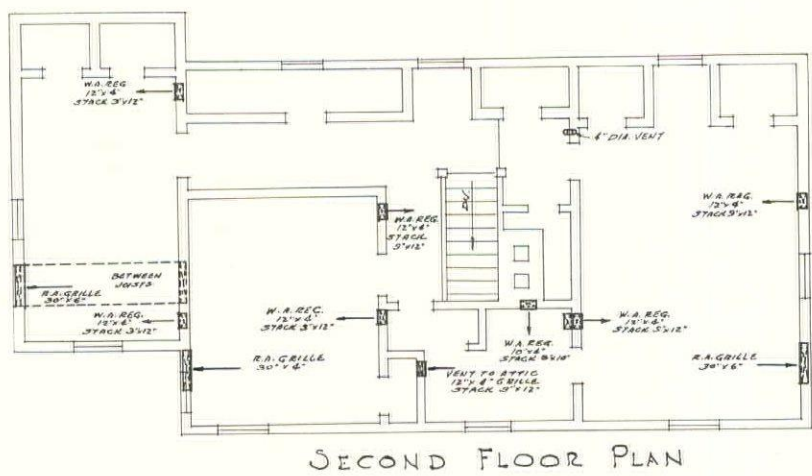
HUMIDIFICATION—By static water in pan.

TECHNICAL COMMENTS

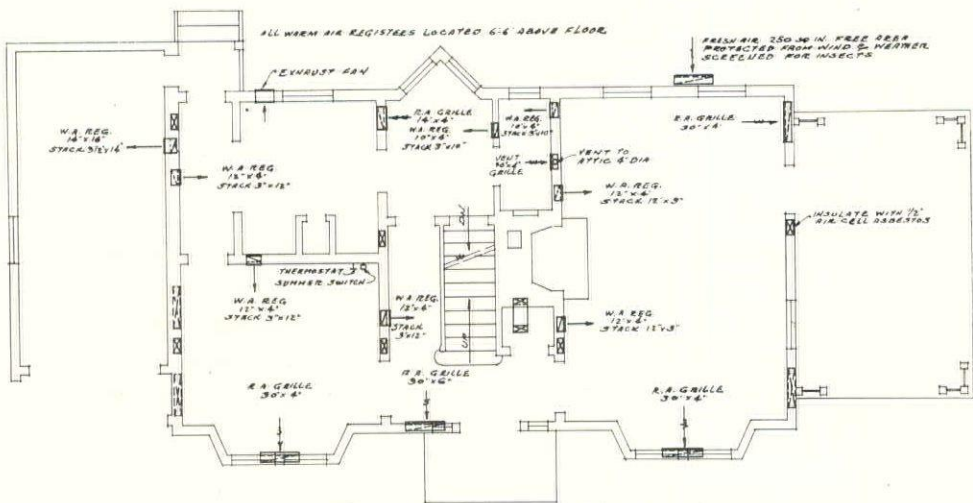
The Ilg Company's proposal contained an alternate worthy of note, which is the location of a 30" fan in the attic handling a large volume of air, some of which would be drawn across the attic space from the attic inlet shown in the section on the opposite page, and the balance of some 5,000 c.f.m. drawn upward through open windows on both the ground and second floors.

Of course, while doing so is relatively inexpensive, costing only \$300, by comparison, and whereas enormous benefit would be secured relative to no summer equipment, it should be realized that complete air conditioning in all its phases provides a "quietized" house, together with major savings against depreciation of contents by a large volume of filtered outdoor air.

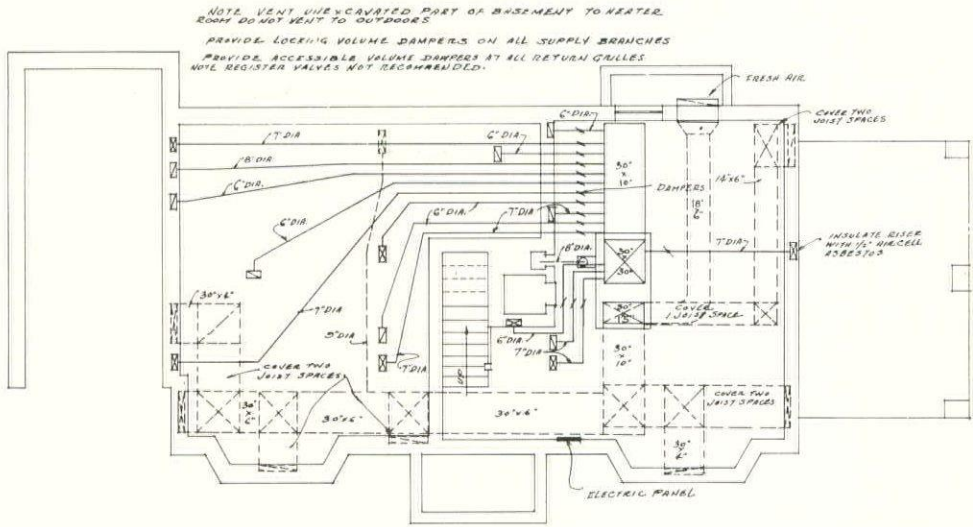
WINTER AIR CON-
DITIONING SYSTEM



SECOND FLOOR PLAN



FIRST FLOOR PLAN



BASEMENT PLAN

GENERAL COMMENT

A winter air conditioning system has obviously been designed with considerable experience in warm air distribution for heating, the supply air being directed toward exterior walls and the return grilles being located near the windows in nearly every room. The large ducts in handling air inaudibly, a commendable point, as well as low power consumption for the fan. The specification guarantees are fully guaranteed" insofar as they apply to winter air conditioning with two options. First, it is stated that a relative humidity of 30 per cent cannot be guaranteed unless "adequate insulation be added to prevent condensation in cold weather." This is correct. Either the humidistat (which this layout does not furnish) must be set down to a very low percentage, insulation provided, or a cut-out control provided. The value of insulation is readily disclosed in the following figures set forth below. Their second objection to the guarantee "automatically to preclude excessive condensation on the interior surface of windows" on the ground that the introduction of heated air at and directed toward the windows would be of excessive first and operating costs, which is correct as far as the cost of this method is concerned.

PRIMARY DATA

	House Uninsulated	House Insulated 4" Rockwool
Installed cost		
Hot water heater	\$1,010.80	\$917.80
Winter operating cost	150.00	75.00
Subtotal \$150 for omission of hot water heater.		
Winter heating, humidifying, introduction of 80 c.f.m. of outdoor air, circulation and distribution.		
circulation of air in summer from outdoors in amount of full fan capacity (\$50 for each room included in the above prices).		

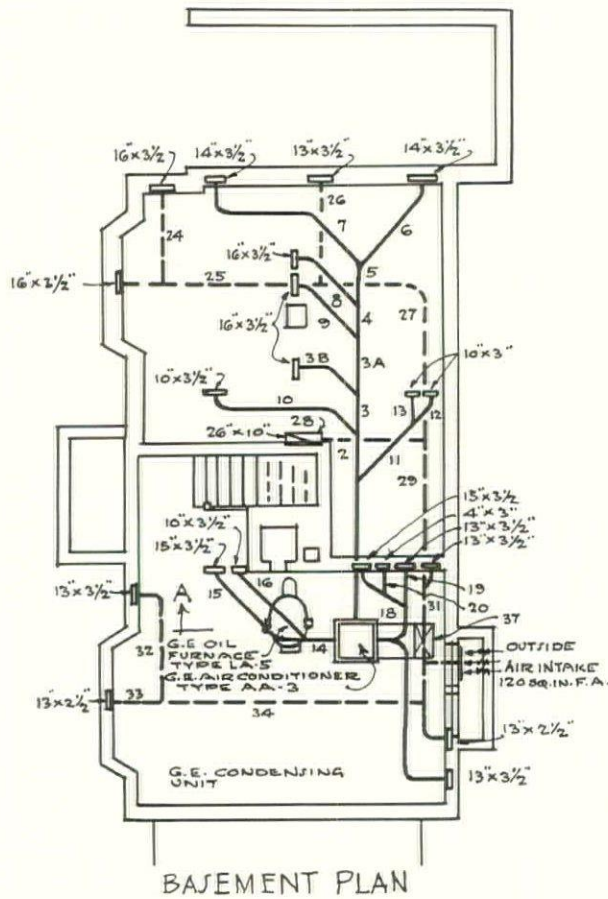
SPECIFICATION DATA

- UNINSULATED HOUSE
- 1 No. 140 E Superflex with No. 30 H blower.
- INSULATED HOUSE
- 1 No. 120 E Superflex for a model No. 140.
- 1—275 gallon storage tank in basement.
- 1—Superflex automatic oil burner, hot water heater No. 492 connected to 1—80-gallon hot water reservoir.

TECHNICAL COMMENT

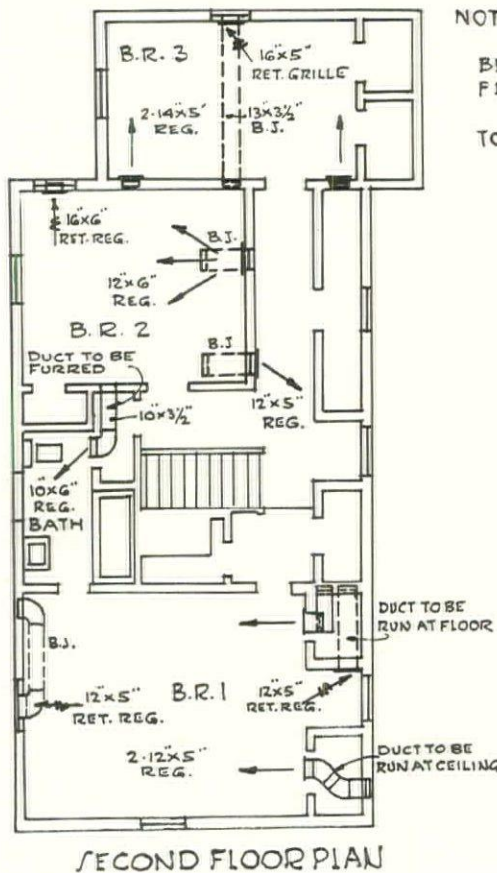
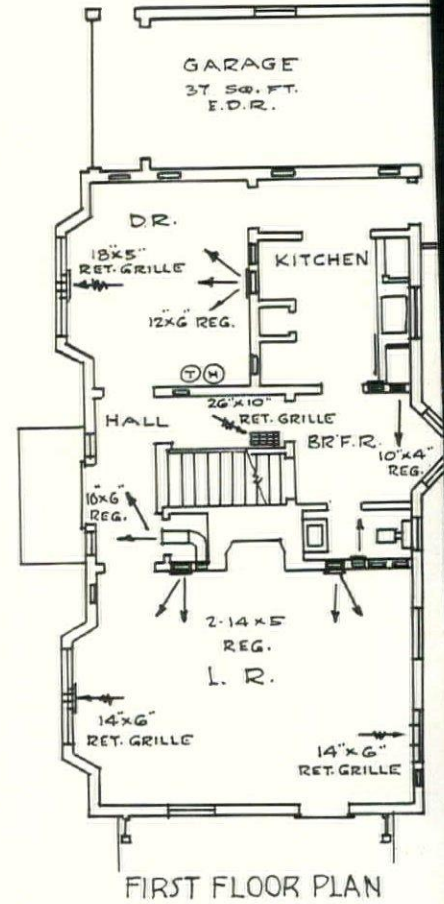
According to the Perfection Stove Company, if storm doors, storm windows and window weatherstripping be added the savings in reduced oil consumption for heating would amount to \$27 per winter season. This company states that double glass is only partially effective if steel sash is used due to conduction along steel. The inclusion of an electric switch and damper controls for introducing outdoor air in summer in amount of the full fan capacity is a sound approach to air conditioning, because a surprising improvement in comfort is effected over and above the unequipped house. Moreover, most people can only afford to begin air conditioning this way, adding cooling later on.

YEAR ROUND AIR CONDITIONING SYSTEM

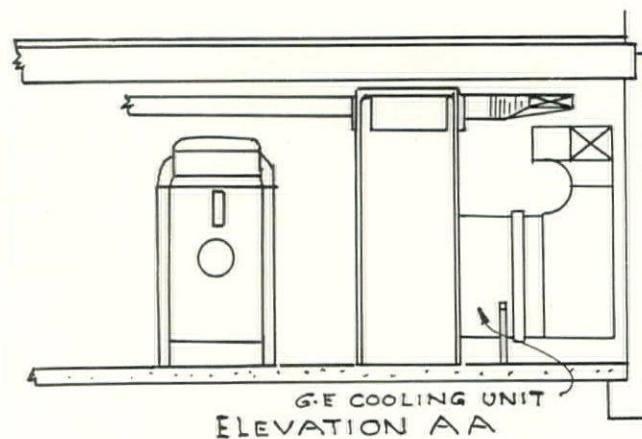


SCHEDULE OF DUCT SIZES

1	23 x 10
2	20 x 10
3	19 x 10
3A	19 x 9
3B	19 x 3 1/2
4	19 x 8
5	14 x 8
6	14 x 3 1/2
7	14 x 3 1/2
8	12 x 5
9	11 x 5
10	10 x 4
11	8 x 6
12	8 x 3
13	10 x 3
14	13 x 5
15	13 x 3 1/2
16	10 x 3
17	12 x 8
18	13 x 6
19	13 x 3
20	13 x 3
21	13 x 3 1/2
22	13 x 3
23	16 x 3 1/2
24	16 x 3 1/2
25	16 x 7
26	13 x 4
27	16 x 10
28	20 x 10
29	29 x 10
30	13 x 3 1/2
31	33 x 10
32	13 x 3 1/2
33	13 x 2 1/2
34	13 x 6
35	13 x 2 1/2
36	12 x 10
37	34 x 12



NOTE:
ALL SUPPLY OUTLETS TO BE LOCATED + 7'-0" ABOVE FLOOR.
ALL RETURN OUTLETS TO BE LOCATED AT FLOOR.



t alternate proposals are offered which vary essentially in three respects: 1) The kind of fuel, 2) The use of winter and summer air conditioners separate or in combination and 3) The use of an air conditioner which is either mounted on the floor (of the vertical type) or suspended from the ceiling (of the horizontal type). The vertical type affords more better headroom conditions in the basement. The same duct distributing system serves any alternate scheme proposed.

Layout for air distribution is very good and the location of a supply grille in the entrance hall with a directionally split grille is particularly commendable, as the correct air conditioning practice for offsetting gains losses at their source is employed.

results-guarantees of THE FORUM's specifications are mainly complied with. Exceptions are: 1) the non-cooling of the kitchen; 2) the non-introduction of outdoor air under positive supply in winter. The manufacturer makes the following comments with reference to THE FORUM's specifications that "the maintenance of this high humidity (45 per cent in winter) may at times be impractical because of condensation on windows" without double glazing. Regarding item 2, data received from this company state: "In winter it is not thought advisable to provide ventilation air through the air conditioner, as the infiltration through all of the windows and doors, plus the fact that conditioned air is circulated throughout the entire enclosure, will provide ample dilution and diffusion of any odors."

stress the importance of designing integrated air conditioning systems. The soundness of approach by this company is disclosed both by design and the designation "coordinated systems" to General Electric air conditioning systems composed of matched units tied in by studied automatic controls.

THESE SCHEMES cover all air conditioning functions, namely, cooling, dehumidification, ventilation, filtration and circulation in summer and heating, humidification, filtration, and circulation in winter, infiltration being relied on for winter ventilation.

THE SAME DUCT SYSTEM AND FAN
perform all air conditioning functions during
all seasons.

THE LAYOUTS and all schemes cover equipment using oil for fuel, although schemes Nos. 2 and 6 cover gas.

REFRIGERATION in all eight schemes is effected with a Freon condensing unit.

FILTRATION is by replaceable type dry
rs.

TEMPERATURE AND RELATIVE HUMIDITY is under automatic control during seasons except summer, when relative humidity is kept satisfactorily within predetermined limits as in all duct evaporating coil methods.

OUTDOOR AIR is secured by supply fan
all seasons except winter.

8. HUMIDIFICATION is accomplished by a hot water coil special for this duty.

The tabulation below includes a 275-gallon oil reservoir tank, but no hot water tank, garage radiator or duct work. Prices were those received from the General Electric Company. For comparison approximately \$350 should be added to the tabulated initial cost prices.

SCHEME No. 1—Oil heater unit separate. This combination is covered by the layout shown opposite for the separate oil heating unit which contains the coil and controls for hot water supply the year round.

SCHEME No. 2—Gas heater.
While heating is accomplished by gas, the layout for Scheme No. 1 applies except for the domestic hot water hook-up. There is no provision in the gas furnace to heat the water. An auxiliary water heater must therefore be added.

SCHEME No. 3—Combination warm air conditioner with cooling unit.

The basement plan on the following page

covers the layout for this installation which is very similar to that for Scheme No. 1 in so far as the duct work is concerned, and on the upper floors duct work is identical with Scheme No. 1.

No steamfitting is necessary with this layout. A hot water coil can be furnished so as to secure hot water during the heating season. For summer use an auxiliary hot water heater must be added. With this system the garage will be heated with warm air. The following combinations (Nos. 4 to 8 inclusive) are based on an insulated house in accordance with data in the technical data section on the page following.

SCHEME No. 4—Oil heater unit separate. Same as Scheme No. 1 except heating and cooling equipment of lower capacity. Ducts will be the same size as Scheme No. 1.

SCHEME No. 5—Oil heater unit separate. Same as Scheme No. 4, except that the air conditioning unit (which excepts the heater and refrigeration compressor) is of the suspended ceiling type, and while the duct layout is the same as that shown for Scheme No. 1, the sizes would be slightly smaller.

SCHEME No. 6—Gas heating—Floor type conditioner.
Same as Scheme No. 2, except equipment smaller due to insulation.

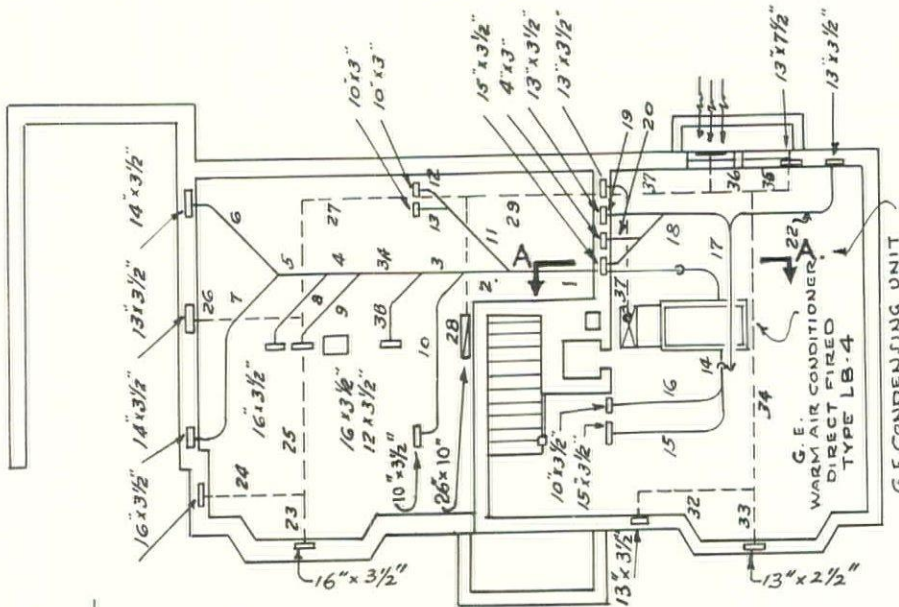
SCHEME No. 7—Gas heating—Ceiling type conditioner.

Same as Scheme No. 2 except duct sizes would be slightly smaller and as indicated the conditioning unit is suspended at the ceiling.

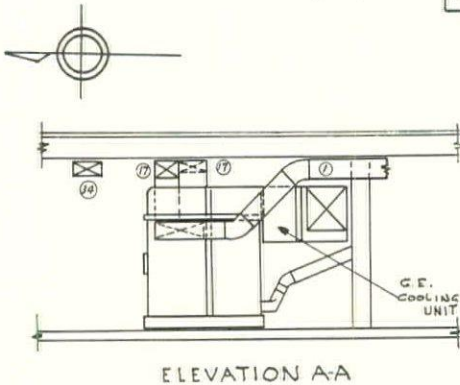
SCHEME No. 8—Oil-fired combination warm air and cooling conditioner.

Same as Scheme No. 3, but equipment smaller for the insulated house.

	UNINSULATED HOUSE		INSULATED HOUSE	
HEAT	INITIAL	OPERATING	INITIAL	OPERATING
	SCHEME No. 1		SCHEME No. 4	
Floor Cooling Unit	\$2,500	\$275	\$2,100	\$217
			SCHEME No. 5	
Ceiling Cooling Unit	—	—	\$1,900	\$217
	SCHEME No. 2		SCHEME No. 6	
Floor Cooling Unit	\$1,900	\$397	\$1,650	\$294
			SCHEME No. 7	
Ceiling Cooling Unit	—	—	\$1,400	\$294
	SCHEME No. 3		SCHEME No. 8	
RM AIR AND COOLING UNIT ..	\$1,900	\$253	\$1,650	\$195



BASEMENT PLAN



ELEVATION A-A

SPECIFICATION DATA

SCHEME No. 1

- 1—LA-5 Oil Furnace
- 1—AA-3 Air Conditioner with Cooling Unit
- 1—CM-81W 3-hp. Condensing Unit

SCHEME No. 2

- 1—RM-25 SA Gas Furnace
- 1—AA-3 Air Conditioner with Cooling Unit
- 1—CM-81W Condensing Unit

SCHEME No. 3

- 1—LB-4 Warm Air Conditioner with Cooling Unit
- 1—CM-81W Condensing Unit

SCHEME No. 4

- 1—LA-4 Oil Furnace
- 1—AA-3 Air Conditioner with Cooling Unit
- 1—CM-61S Condensing Unit

SCHEME No. 5

- 1—LA-4 Oil Furnace
- 1—HD-1 Air Conditioner
- 1—CM-61S Condensing Unit

SCHEME No. 6

- 1—RM-24 SA Gas Furnace
- 1—AA-3 Air Conditioner with Cooling Unit
- 1—CM-61S Condensing Unit

SCHEME No. 7

- 1—RM-24 SA Gas Furnace
- 1—HD-1 Air Conditioner
- 1—CM-61S Condensing Unit

SCHEME No. 8

- 1—LB-4 Warm Air Conditioner with Cooling Unit

1—CM-61S Condensing Unit

In addition to the equipment listed under any of the above schemes, and aside from the numerous controls and auxiliary electric products used which are made by the General Electric Company, the following additional products are incorporated to make up the General Electric coordinated systems listed:

- 1—GE mixing valve for domestic hot water
- 1—GE power and control panel CR 7861-E1A.

- 1 set GE anti-vibration pads for mounting condensing unit.

Also are included in the prices one 66 gallon hot water storage tank and one Excelso Klearway flushing valve.

TECHNICAL COMMENT

Equipment combinations four to eight inclusive are based upon the specified construction (full specifications covering frame construction for this house having been sent all companies) "plus insulation in all exposed walls, walls between garage and house, second floor ceiling and the floor of bedroom No. 3—all of sufficient thermal efficiency and thickness to bring the wall coefficient down to approximately .07 B.t.u./sq. ft./hr./degree F. These combinations of four to eight inclusive are based upon weatherstripping on all windows and doors in the house."

It is not certain whether the prices include a kitchen exhaust fan as specified.

The non-inclusion during winter of outdoor air supply is doubtless reasonable in a house of this character and size, insulated, but Schemes No. 4 to 8, weather-stripped windows and doors, well have included the forced introduction of a constant outdoor air volume, using kitchen fan in conjunction therewith purging.

Operating figures are favorable partly because the fan automatically stops in winter when the thermostat does not call for it. There are a great variety of ways or means of air conditioning. In the check list of cooperating manufacturers for this scheme we listed 33 different methods, one of which is considered supplementing an indirect heating, ventilating and humidifying plant with self-contained room coolers. General Electric Company regrets that lack of time prevented compiling price and layout data on this widely applicable method.

G. E. SPECIFICATIONS ACCORDING TO CONTRACTING TRADES

GENERAL CONTRACTOR

1. This specification together with accompanying plans is intended to cover all labor and materials required to install the General Electric Air Conditioning system complete.
2. It shall be the responsibility of the general contractor:

A. To see that these specifications are carried out in complete detail.

B. To set and level all major equipment in locations shown on plans.

C. To secure all permits and have inspections required by local ordinances to see that all equipment is installed in accordance with local codes and regulations.

3. All pipes, covered or otherwise, shall be painted to conform to the color of the trim gray trimmings on the oil furnace and conditioner.

4. All exposed duct work shall be painted with GE No. 1212 Glyptal (an aluminum waterproof paint), thinned with GE No. 1 Thinner.

5. The general contractor shall have the entire system checked for proper adjustment by the General Electric Air Conditioning Dealer.

6. The general contractor shall affix metal tags stamped with identifying numerals on all water, steam, and refrigerant valves and on all quadrant dampers in the duct system. He shall prepare a descriptive list for the numbers and mount it in a glazed frame in a suitable location.

STEAMFITTING CONTRACTOR

1. The steamfitting contractor shall connect the furnace to the air conditioner and all other heating equipment as shown on the drawings and similar to that shown in Installation Diagram GP-110-29.

2. It shall be the responsibility of this contractor to have all pipes running in furnaces, ceilings, partitions, in floors and under floors.

free of leaks before and after ceilings, and partitions are finished and insulated and applied.

Where pipes enter or leave a wall, ceiling or in finished rooms they shall be protected with nickel-plated floor plates.

The steam connection from furnace to conditioner shall be a 2-in. pipe made to that shown on Installation Diagram GP-110-29.

Return from air conditioner to furnace shall be a 1½-in. pipe made similar to that shown on Installation Diagram GP-110-29.

Steam supply and return piping shall be protected with 1-in. of air cell asbestos.

The air vent valve (supplied with the air conditioner) shall be mounted on a 4 to 5 ft. long leg of ¾-in. pipe connected to the return pipe immediately adjacent to the steam chest.

¾-in. cold water supply line provided with a ¾-in. globe valve shall be run and connected to the boiler.

After the installation is complete, the contractor shall have the boiler and heating system cleaned. The system shall be added clean when the boiler water line is in operation with the air furnace operating between zero and five pounds gauge pressure. The furnace shall be connected to the masonry chimney with 8-in. 26-gauge galvanized iron pipe. Each joint shall be secured with four sheet metal screws. Pipe shall be cemented into chimney and joint shall be air-tight.

Boiler Jacket shall be uncrated and assembled on furnace.

Radiator of type and size indicated on drawing shall be furnished and installed in place as indicated on the drawing.

Supply piping between furnace and radiator in garage shall be installed with hand valve with air vent valve on radiator.

Radiator and boiler accessories shall be furnished and installed.

PLUMBING CONTRACTOR

Arrangement of piping and details of installation shall be similar to that shown on Installation Diagrams GP-110-8, -10, -29.

Unless specified in detail herein, the use of brass, copper, galvanized or black iron pipe shall be at the discretion of the supervising architect.

A drain cock shall be furnished and installed on the boiler.

Connections to domestic hot water short-tank are similar to those shown on Installation Diagram GP-110-10.

AIR CONDITIONER

A ¾-in. brass water line shall be run from the nearest source of cold water to the 1-in. water inlet connection on the steam chest of the air conditioner.

A ¾-in. needle valve shall be furnished and installed in the above water line, at a point near the water inlet connection on air conditioner.

A ¾-in. brass drain line shall be run from water drain connection on air conditioner to an open drain or sink, as required by local code.

A ¾-in. drain line shall be run from the

cooling unit into an open drain, as required by local code.

OIL TANKS AND OIL PIPING

9. Furnish and install a 550-gallon oil storage tank, Underwriters' laboratories labeled. The tank shall be located and buried underground in accordance with local codes and Underwriters' regulations. Back filling shall be such that the ground will be level on settling.

10. Furnish and install oil suction line of ¾-in. copper tubing, from tank to burner buried under floor where indicated.

11. A GE screen valve (furnished with the oil furnace) and a manual or safety shut-off valve (as required by local code) shall be installed in the suction line at the point where it passes through the exterior wall.

12. Furnish and install a vent line of standard 1¼-in. pipe with proper cap fitting, in accordance with local and Underwriters' regulations.

13. Furnish and install a 2-in. fill line with fill box as directed by the supervising architect, and in accordance with local and Underwriters' regulations.

CONDENSING UNIT

14. A ½-in. water supply line, with gate valve at the unit, shall be run, as directed, from a suitable source of supply to the condensing unit.

15. A ½-in. drain line shall be run, as directed, from the condensing unit water outlet connection to an open drain in accordance with local code.

REFRIGERATION PIPING

16. Run one ¾-in. O. D. soft seamless copper tubing liquid line from liquid connection on condensing unit to the one ¾-in. flare liquid connections on cooling unit.

17. Run one 1½-in. O. D. soft seamless copper tubing suction line from cooling unit to the suction connections on condensing unit manifolded at the condensing unit.

18. All lines run under the floor and in partitions shall be a single piece and there shall be no connections or joints in the floor or walls.

19. All joints shall be of the soldered or flared compression type.

20. All pipes shall be thoroughly cleaned internally with carbon tetrachloride.

21. The suction lines shall be insulated with 1-in. of air cell asbestos or equivalent with seams sealed and the entire covering waterproofed.

SHEET METAL CONTRACTOR

Sheet metal work shall be constructed and installed in accordance with plans, Sheet Metal Specifications G-E Form DS-325, Detail Sheet Form DS-324, which are included as a part of this specification, and, in addition, shall conform to and include the following:

1. Where dampers in branches would be inaccessible, friction dampers shall be installed back of registers and grilles, even though there are shutters in the registers. They shall be accessible through the grilles. Such damper shall not interfere with the shutter which is an integral part of a register.

2. All supply ducts in unexcavated spaces under the house and in unheated basements shall be insulated with 1-in. air cell asbestos, covered with 6-ounce canvas, tightly drawn and neatly pasted. Where summer cooling will be performed, the canvas shall be painted and waterproofed with GE No. 1212 Glyptal, thinned with GE No. 1500 Thinner.

3. All return ducts in unexcavated spaces under the house and in unheated basements shall be insulated with ½-in. air cell asbestos applied as directed in specification sheet DS-325.

4. All other ducts shall be covered with a single thickness of asbestos paper (12 lbs. per 100 sq. ft.) except the outdoor air intake and all return ducts, including those covered in 3, above.

5. All return ducts shall be lined from air conditioner to points indicated on drawings, with ½-in. of air acoustic, as manufactured by Johns-Manville Company, or equivalent.

6. Grilles and registers shall have 74 per cent free area and shall be located as shown on the drawings; sizes given on the drawings are dimensions of duct openings. The supervising architect shall specify their size and type.

ELECTRICAL

1. The contractor shall set the air conditioning power and control panel flush in the wall at a point indicated in the drawing. (If wall thickness does not permit setting panel flush, it shall be recessed as deeply as wall thickness permits.)

2. The contractor shall run power circuit from the main building service entrance switch to air conditioning electric panel. Circuit shall be for 3-wire 220/110 volt, single phase, 60-cycle power.

3. The contractor shall mount in positions indicated on drawings the following:

- A. Thermal Control
- B. Humidistat

4. Conduit, BX, and Greenfield, shall be used as permitted by local ordinances.

5. The general contractor shall leave chases in the walls and floors, to permit running the following circuits. These circuits shall be connected to the devices covered in the following paragraphs and to the proper terminals in Air Conditioning Power and Control panel.

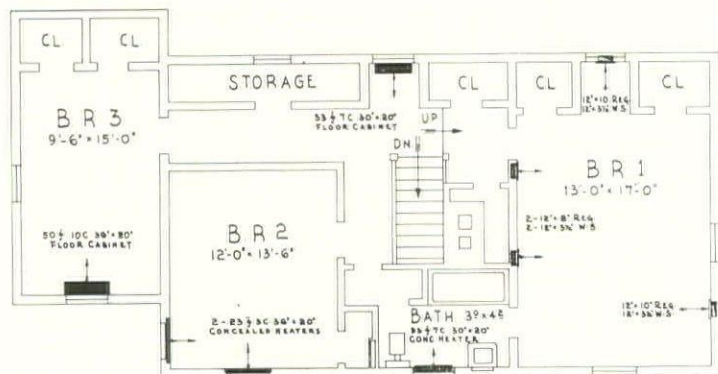
LOW VOLTAGE CIRCUITS

- a. One 4-wire low voltage circuit from panel to oil furnace.
- b. One 4-wire low voltage circuit from panel to thermal control.
- c. One 2-wire low voltage circuit from panel to air conditioner solenoid valve.
- d. One 2-wire low voltage circuit from panel to humidistat.

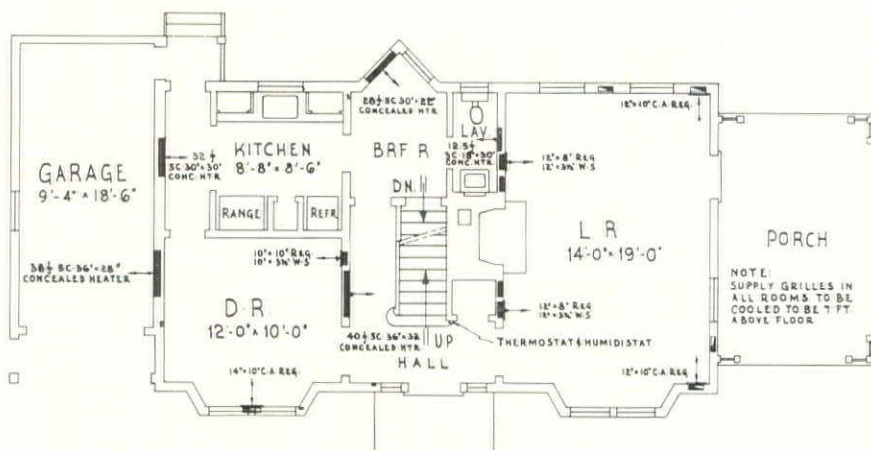
HIGH VOLTAGE CIRCUITS

- e. One 110 volt single phase circuit from panel to oil furnace.
- f. One 110 volt single phase circuit from panel to air conditioner motor.
- g. One 110 volt single phase circuit from panel to condensing unit back-pressure control.
- h. One 220 volt single phase circuit from panel to condensing unit motor.

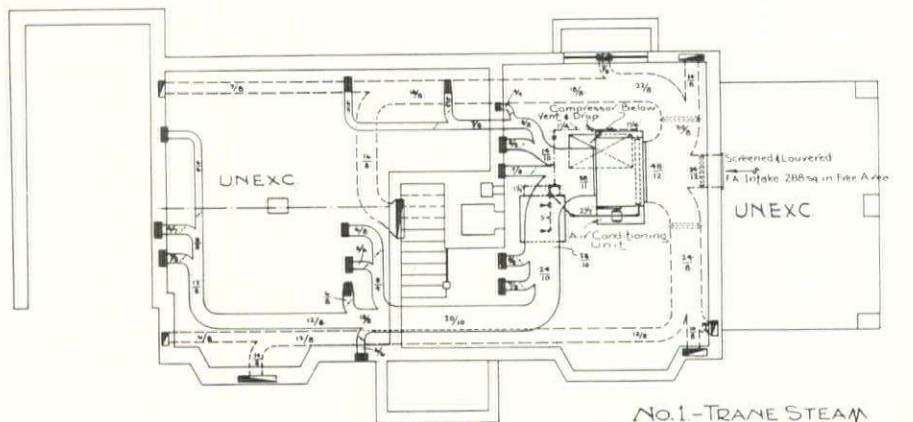
SCHEME 1



SECOND FLOOR PLAN



FIRST FLOOR PLAN



BASEMENT PLAN

NO. 1-TRANE STEAM CLIMATE CHANGER SYSTEM

YEAR ROUND AIR CONDITIONING SYSTEMS

Three designs are proposed by The Trane Company. The costs of these systems are estimated to be \$1,800 for scheme No. 1, \$2,100 for scheme No. 2 and \$1,700 for scheme No. 3.

Following are the retail prices for the equipment:

SYSTEM NO. 1

No. 3A climate changer
 3-Row D.E. coil
 AW2002 compressor 41° suction F-12
 2 tons 75° condenser water
 Float vent
 Low voltage controls

SYSTEM NO. 2

No. 1 direct fired climate changer with oil burner
 3-Row D.E. coil
 AW2002 compressor 41° suction F-12
 2 tons 75° condenser water
 Float vent
 Low voltage controls

SYSTEM NO. 3

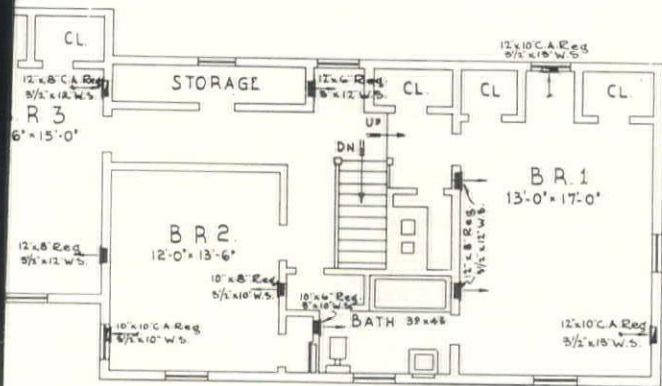
No. 1 climate changer
 3-Row D.E. coil
 AW1002 compressor, 2 tons
 Float vent
 Low voltage controls
 Convection heaters

Note—Exact prices for your locality will be furnished by The Trane Company on request. The plans for schemes two and three are on pages 595 and 596, while scheme No. 1, which Trane recommends as their preferred method, is shown at left.

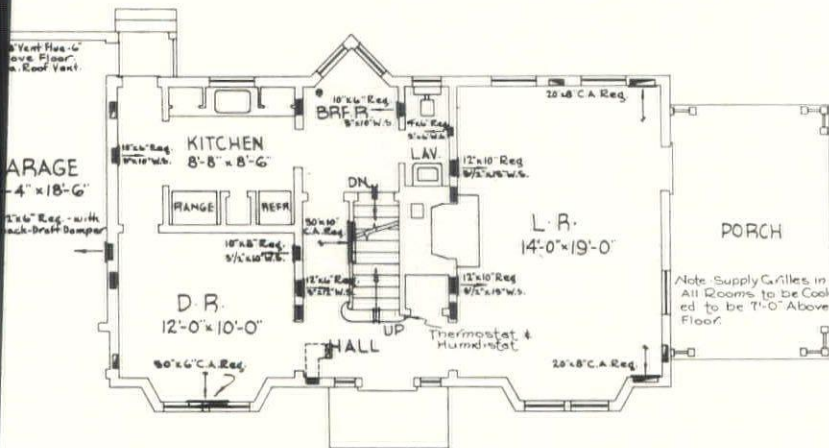
Oil is used as the fuel, the systems conform with the specifications, filters are of the replaceable dry type, control is full automatic and humidification is secured by air passing over a static pan-type water surface. SYSTEM No. 1 is a steam-water system. SYSTEM No. 2 employs a direct fired unit. SYSTEM No. 3 is of particular interest because this alternate cools only the principal rooms of the house. Moreover, convection heaters are used in conjunction with the Trane Orifice System in the remainder of the house.

According to The Trane Company this method is desirable when well water may be available at temperatures below 60° cooling. In such a locality the compressor is claimed to be unnecessary.

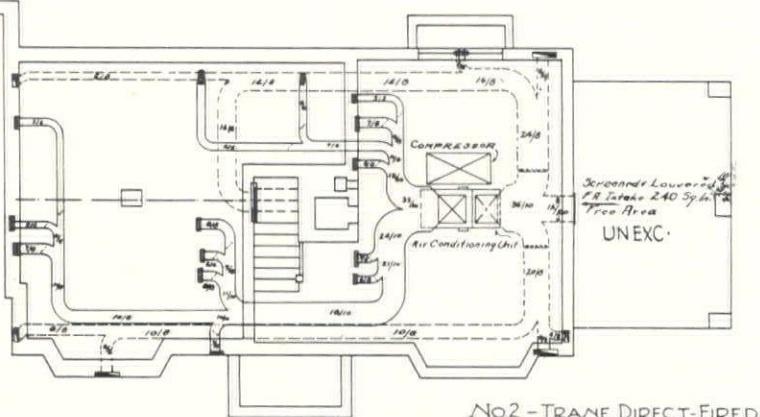
EME 2



SECOND FLOOR PLAN



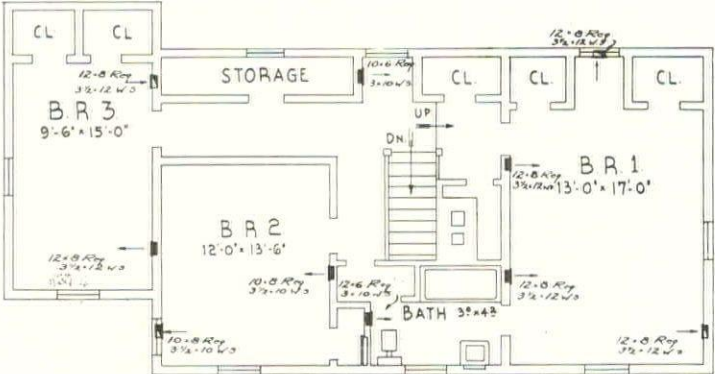
FIRST FLOOR PLAN



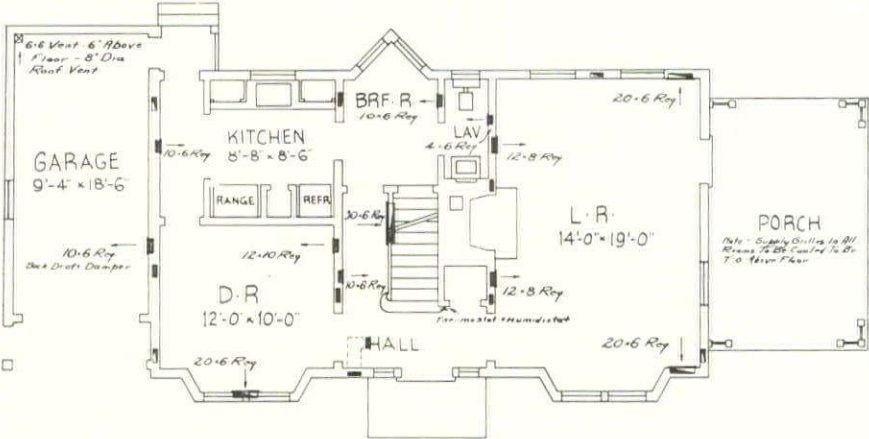
BASEMENT PLAN

NO2 - TRANE DIRECT-FIRED CLIMATE CHANGER SYSTEM

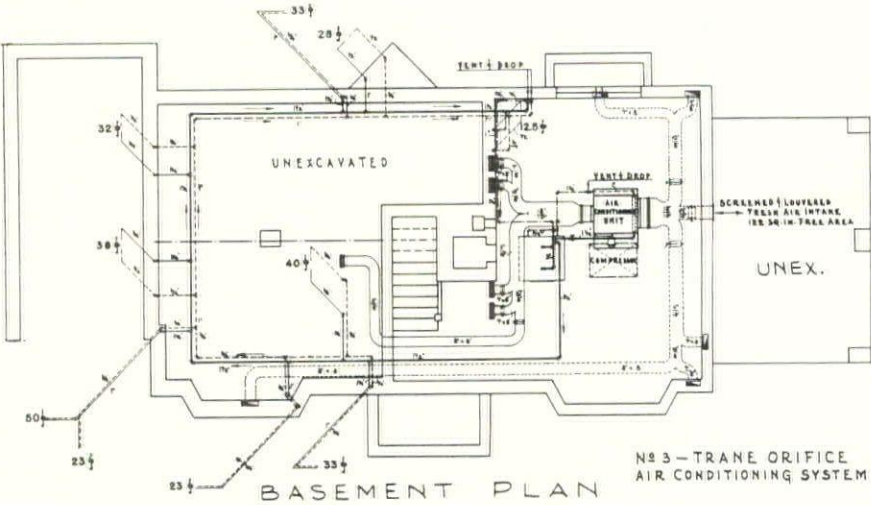
SCHEME 3

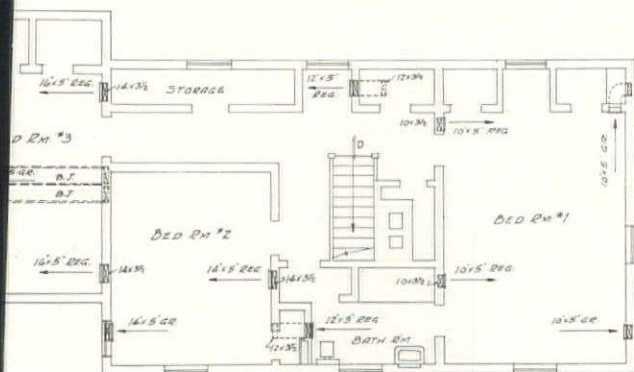


SECOND FLOOR PLAN

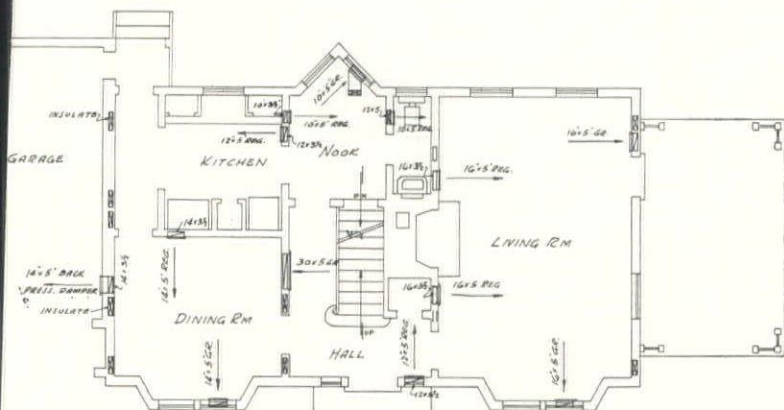


FIRST FLOOR PLAN

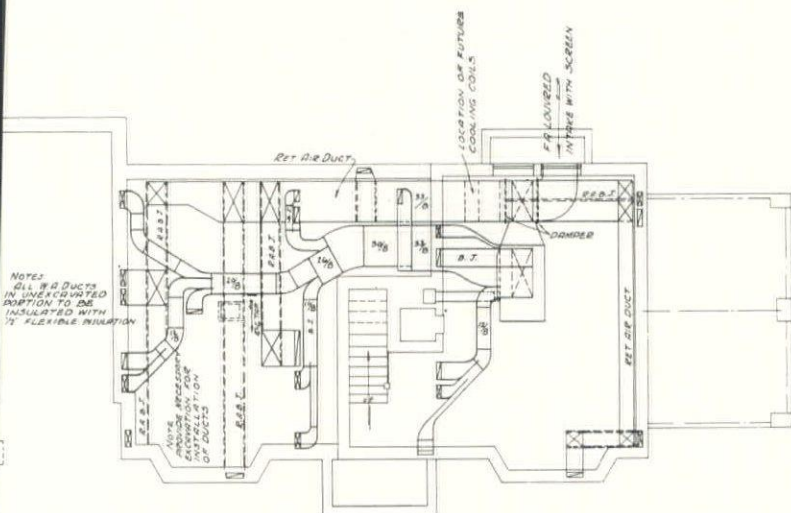




SECOND FLOOR PLAN



FIRST FLOOR PLAN



-BASEMENT PLAN-

WINTER AIR CONDITIONING SYSTEM

This system would cost \$1,150 installed in the chosen location of Tuckahoe, N. Y.

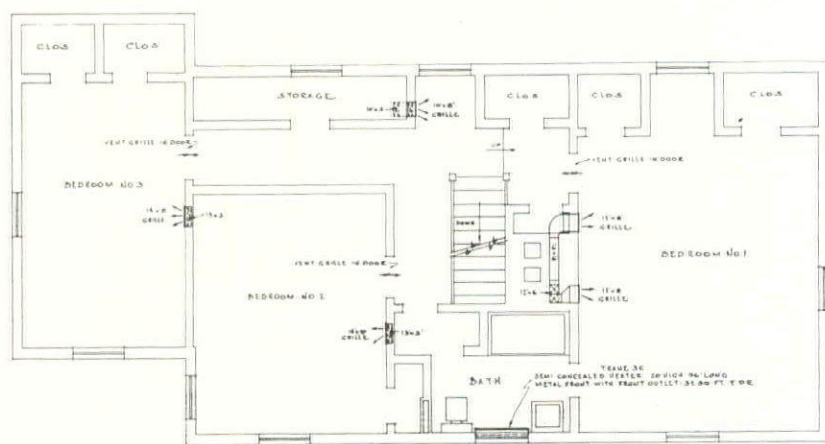
This system, for the above price, filters, warms, humidifies and circulates in winter. According to information received the system is sized so that cooling coils and refrigeration may be added for summer conditioning.

We note that excavation for ducts under the living room is called for. These could be run in the space under the living room and covered with 2" of insulation, although it is possible that some trenching might be necessary, according to the topography.

The air distribution is good for a 100 per cent indirect system and the plans clean cut in appearance.

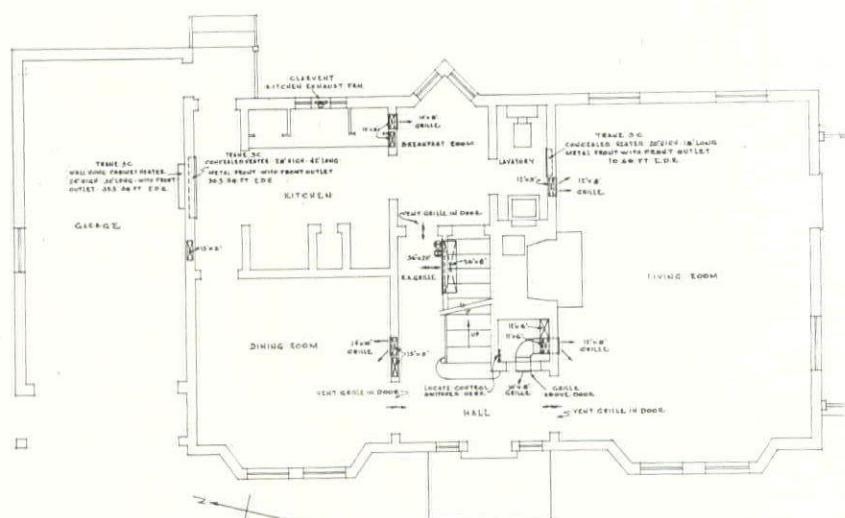
GENERAL COMMENT

It is interesting to observe the differences in approach to air distribution. Here we have a first class method of air distribution with return grilles in each room. It will be noted in this study that one or two bidders return all the air delivered on the second floor through a grille in the hall of the first floor. Aside from distribution, which return air grille location does influence in these small rooms, the omission of a return grille will reduce the supply air volume materially with the door closed, a matter for consideration in bedrooms. Criticism of many matters in air conditioning such as this on purely engineering grounds involving anything but a highly scientific and technical discussion is apt to be ridiculous, as the momentary moods, whims and health of a user usually has considerable to do with satisfaction. We, therefore, cannot always anticipate and explain in advance the probable differences in satisfaction to individual air conditioning buyers for this reason. Hence, if an architect asked representatives of two companies why the plan of one shows return air grilles in each second floor room and why the plan of the other omits second floor grilles he would probably receive indefinite replies leading to confusion. The simple answer is that the company sponsoring the individual grilles believes it advisable to "penalize" the owner by \$50 or so for a little more duct work in order to play more safely with resulting continuous satisfaction in the face of the unknown factors outside of that company's control—the whims, moods and future health of a human being.

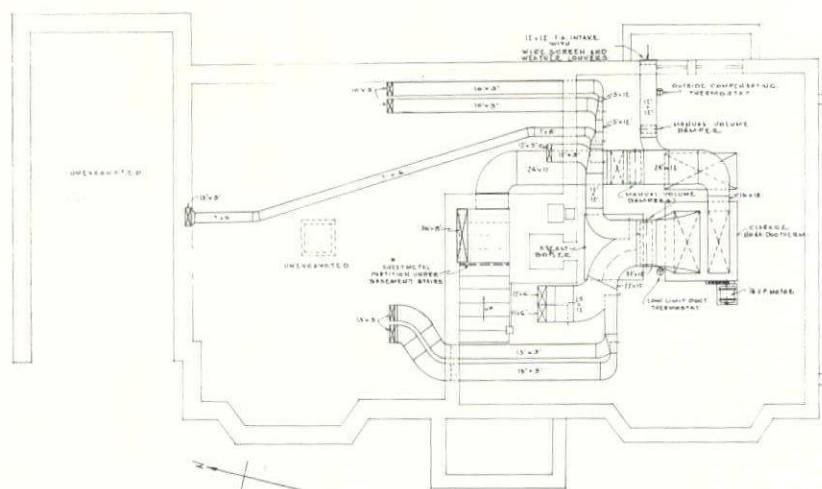


SECOND FLOOR PLAN

ON THE USE OF STEAM AS WE HAVE
FIGURED CONDITIONING UNIT ON THE
BASIS OF EMPLOYING STEAM FOR HEATING

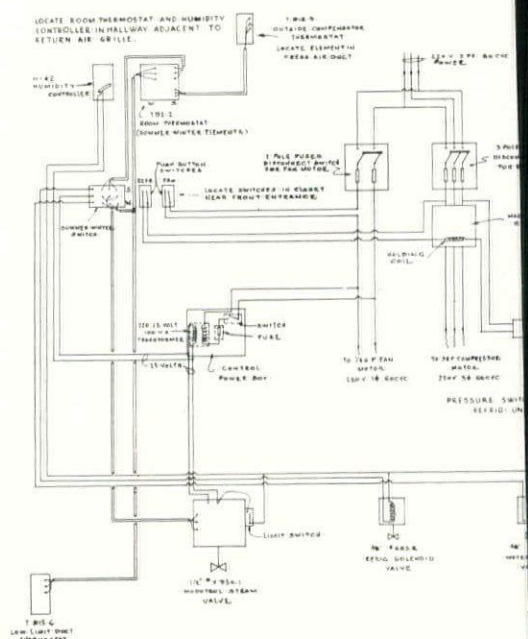
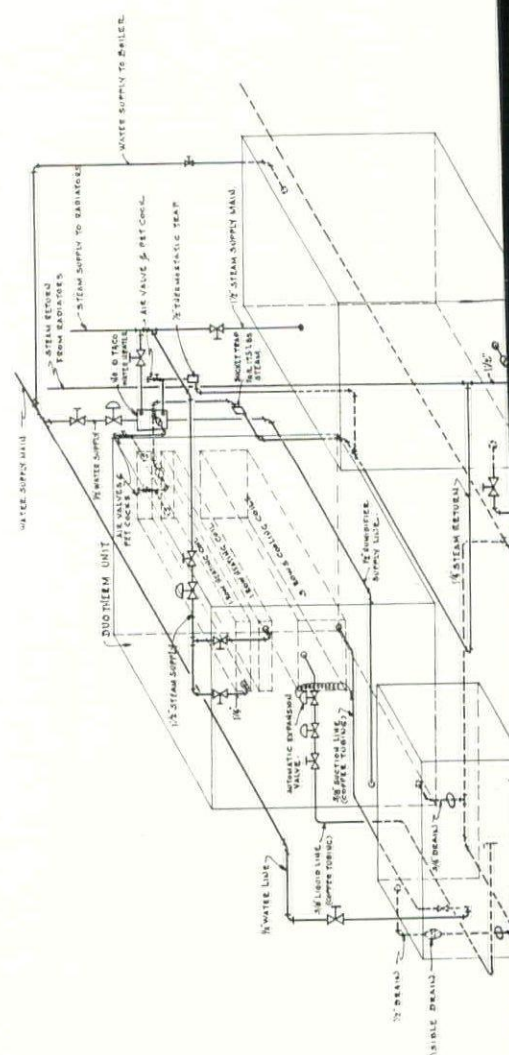


FIRST FLOOR PLAN



BASEMENT PLAN:

YEAR ROUND AIR CONDITIONING SYST



GENERAL COMMENT

is one of the most complete proposals received covering all equipment other than heating. The layout and plans are very good. The diagrams provide a good idea of what it really takes to put a complete air conditioning system in a building however small. This system is complete in intent but somewhat more thorough in scope than some of the other year 'round proposals.

The company raises an important point regarding the use of indirect heaters in ducts. We quote from their communication the following:

With reference to the heating equipment, the conditioning equipment which we recommend necessitates the use of a steam boiler in order to secure the proper heating in the conditioner. With this arrangement due to the low ceiling height in the basement it will in all probability be necessary to put the boiler so as to provide a difference

in height between the coil outlet and the water level in the boiler. If, however, it is more desirable to use a hot water heating plant, then in order to secure the proper heating in the conditioning unit it will be necessary to provide some type of circulator to force the water through the coil." Guarantee: "We guarantee the equipment to operate in accordance with the specifications and to maintain the specified conditions within the variations or limitations as given. We, however, wish to point out that we cannot guarantee to prevent condensation on the interior surfaces of the windows provided a condition of 45 per cent relative humidity is maintained under periods of winter operation unless double pane window construction with dead air space between is employed." (See Technical Comment under American Furnace & Foundry Co.)

PRIMARY DATA

Estimated price for all equipment including installation services but exclusive of the cost of the piping—installation of the heating equipment, the running of steam supply and return lines to the several radiators, the furnishing and installation of the steam boiler or stoker equipment or oil burner, the furnishing and installation of the hot water heater, and the plumbing work involved in connection with the air conditioning system, such as the running of the water supply line and drain connections to the conditioning unit as well as to the refrigeration condensing unit, \$2,160.

OPERATING COST—approximately \$375 per year.

SPECIFICATION DATA

"CONCEALED RADIATORS—in first floor lavatory, second floor bath and garage.

"Ducts for all functions, all seasons, in remainder of house.

"RADIATORS have thermostatic controls.

"No 44-5 CLARAGE DUOTHERM CONDITIONING UNIT, capacity of 1,600 c.f.m., against .3 in. external resistance when operating at a speed of 450 r.p.m. and requires .19 B.h.p. This unit equipped with $\frac{1}{4}$ -hp., single phase, 60 cycle, 220 volt, 1,800 r.p.m. constant speed fan motor.

"This unit is further equipped with two one-row copper finned type heating sections having a capacity to heat the 1,600 c.f.m. from an entering mixture temperature of 53° to a final temperature of 134° when supplied with steam at atmospheric pressure, and having a heat capacity of 141,000 B.t.u. per hour.

"THREE-ROW SECTION EVAPORATOR COIL having a capacity to cool 1,600 c.f.m. from an entering condition of 83½° dry bulb, 68.85° wet bulb to a leaving condition of 66° dry bulb and 62° wet bulb with an evaporator temperature of 48° and a capacity of 36,000 B.t.u. per hour.

"In addition to the heating and cooling coils the Conditioning Unit is equipped with double casing, fan, Owens-Illinois Dustop type filters and spray type humidifier consisting of atomizing nozzles employing water at city pressure.

"1—AW-3003 Universal condensing unit as manufactured by the Universal Cooler Corporation, Detroit, Mich.

"This unit complete with 3 hp., 3 phase, 60 cycle, 220 volt, 1,800 r.p.m. constant speed motor with magnetic type starter. This unit is also furnished complete with condenser, compressor, receiver, motor, V-belt drive, safety devices, all mounted on common cast iron base plate. This unit to have a capacity of 42,100 B.t.u. per hour (3.5 tons) when operating at an evaporator temperature of 48°, and when supplied with 4.92 g.p.m. of 75°

condenser water, requires 3.71 kilowatt hours power input to motor.

"1—Automatic expansion valve.

"1—Liquid solenoid valve.

"1—Set of refrigeration piping and fittings for making high and low side connections between condensing unit and evaporator coil.

"Installation of refrigeration equipment including electrical wiring and installation of refrigeration piping.

"'Clarvent' kitchen exhaust fan, complete with built-in wall cabinet arrangement for installation in kitchen wall above window.

"1—Electric system of temperature and humidity control as shown on drawing. This equipment to be as manufactured by the Minneapolis-Honeywell Corp., and is furnished complete for automatic temperature and humidity control at all times except summer, when humidity is prefixed in limits.

"Complete system of sheet metal duct work as shown on drawings and consisting of approximately 1,300 lbs. of galvanized iron ducts, supply and return air grilles, vent grilles and manual dampers and splitters for the adjustment and distribution of the air. All duct work to be completely installed and all ducts with the exception of the return ducts to be insulated with 1 in. thermal blanket securely wired in place and covered with mastic cement.

"Installation of conditioning unit including the furnishing of cork base and the setting of unit and motor.

"Installation of temperature and humidity control including the wiring of the electrical control and the wiring between fan and compressor motors and starters.

"Installation of the kitchen exhaust fan including the mounting of fan and electrical wiring of motor.

"In addition to installing the equipment listed above there will be furnished the services of an engineer to test and adjust the equipment at the completion of installation and to set same in operation."

TECHNICAL COMMENT

If an oil burner is employed the control of the burner could be interlocked with the temperature control equipment in such a manner that steam would be available whenever the burner valves were in an open position."

This quotation from Clarage data is a reminder that the size of a space for air conditioning does not seemingly reduce the technical complexities in the problem.

YEAR ROUND AIR CONDITIONING SYSTEM

Installed cost using street water for summer refrigeration—\$1,980.

Installed cost using an evaporative condenser in place of street water \$2,165.

OPERATING COST approximately \$450 per year based on twenty-four hour operation every day in the year.

EQUIPMENT COST (for use with street water)—\$1,180

INSTALLATION COST, including duct work, approximately—\$800.

Ducts and forced circulation are employed for all year round functions.

FUEL—manufactured gas.

REFRIGERATION—two ton Freon condensing unit.

COOLING AND DEHUMIDIFICATION—metallic coils.

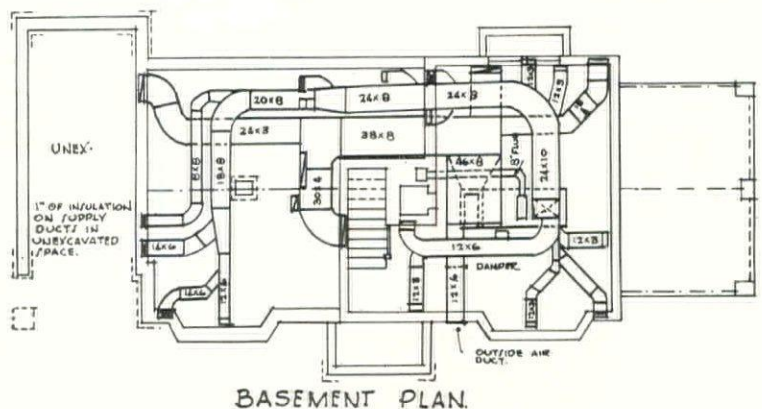
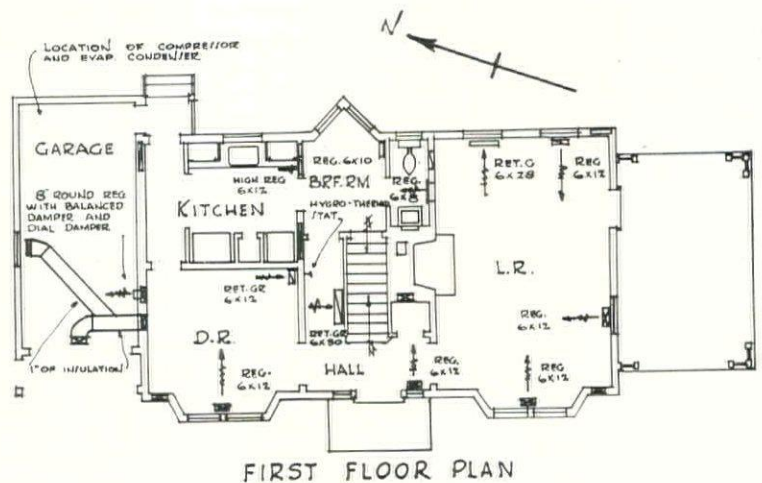
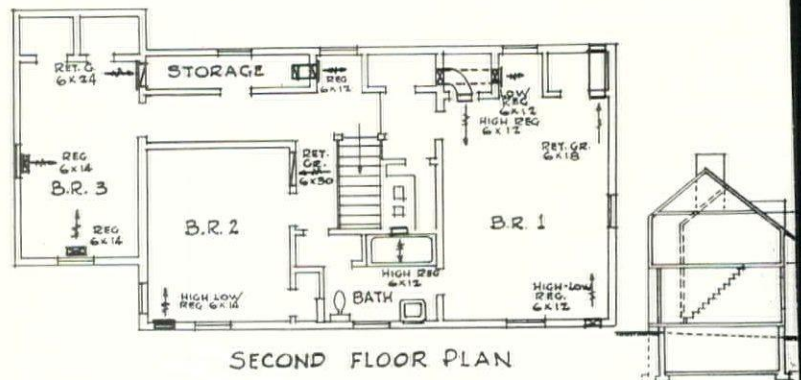
FILTRATION—replaceable dry type filters.

OUTDOOR AIR—By supply fan.

CONTROL—completely automatic from thermostat for temperature and a hygrostat for humidity. In summer the humidity varies within pre-fixed limits, which is satisfactory.

HUMIDIFICATION—by water static surface to which is applied separately controlled gas heat, which is a very good arrangement. One of the most commendable features of this design is the use of supply outlets at two levels in bedrooms. This practice might well be carried out in every room in every residence design employing a 100 per cent indirect system. Architects would do well to institute such practice. With this method, supply outlets along the outside wall give much more satisfactory results. We also endorse highly the location of the compressor at the rear of the garage.

Equipment consists of one direct gas-fired Weathermaker of 1,500 c.f.m. 150,000 B.t.u. per hour capacity, 480 r.p.m. fan with $\frac{1}{2}$ hp. motor. Controls include day and night automatic operation over and above the specification which is a very good suggestion.



INSULATION is not new. Cork has been used for a very long time, and there are houses in New England in whose walls seaweed and eel-grass were placed 300 years ago. In 1849 a man in Edinburgh made a crude form of rock wool; his difficulty was that he didn't know what to do with it. The German experiments in the 1860's turned to spun glass and decorative uses. One of the earliest installations of mineral wool, if not the first, was made in New Jersey in 1887. Insulation on a large scale, however, did not begin until late 1920's. In spite of the rapid growth of the industry there is still a huge untouched market. About 90 per cent of existing houses are uninsulated, and a recent check of new houses revealed that only half were insulated.

There are two reasons for using insulation: greater comfort in summer and winter, and economy. Cold walls and leaky windows are common causes of discomfort, and heat losses are frequently as high as 40 per cent. The price paid for comfort is limited only by the owner's means; where economy is the major consideration, however, a careful balance must be worked out between savings on reduced heating costs and the added expense of the insulation. Insulation should pay for itself in not more than eight years.

The theoretically perfect insulator would be a complete vacuum between two perfect reflecting surfaces; practically, the best obstacle to the transfer of heat by conduction and convection is a dead air space. All so-called insulating materials will conduct heat more readily than air, and consequently the principle involved is the creation of many small dead air spaces, separated by some material whose conductivity approaches that of air. The prevention of heat loss by radiation is a newer development, and will be discussed under aluminum foil.

REDUCTION OF HEAT LOSSES

A Bureau of Standards publication, "Thermal Insulation,"* gives the following data the percentages showing fuel savings for a house without insulation or weatherstripping:

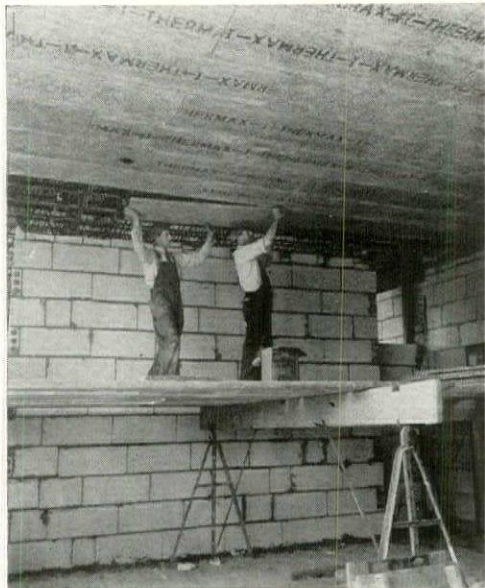
- Weatherstripping 15% to 20%
- Same plus double windows 25% to 30%
- $\frac{1}{2}$ " insulation—not weatherstripped 20% to 30%
- $\frac{1}{2}$ " insulation—weatherstripped about 40%
- $\frac{1}{2}$ " insulation—with double windows about 50%
- 1" insulation 30% to 40%
- 1" insulation—weatherstripped about 50%
- 1" insulation—with double windows about 60%

The above table indicates that weatherstripping is most desirable, since for a low cost a considerable saving may be made. Attic floors or roofs should be considered first when only part of a house may be insulated, since a large part of the heat losses take place there. Double glazing (storm windows) should also be considered, since this will result in a saving of 10 to 15 per cent, and will make the interior more comfortable in cold weather.

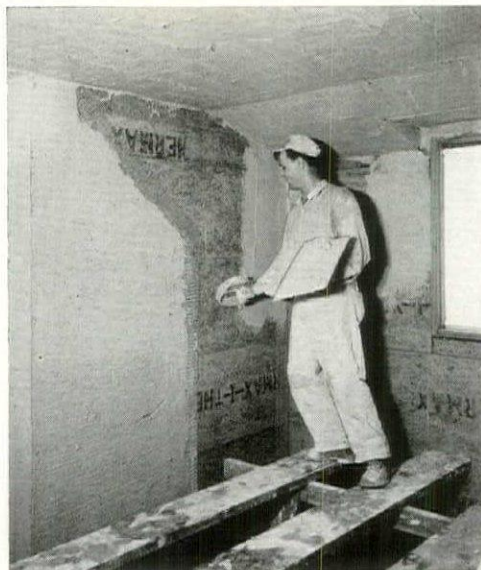
*Dept. of Commerce, Bureau of Standards, Letter Circular L. C. 227.



INSULATING BOARD ON WOOD FRAME



INSULATING BOARD AS CEILING INSULATION



PLASTER ON INSULATING BOARD BASE

INSULATING PROPERTIES OF MATERIALS

Two factors are involved in a consideration of the insulating properties of a material: the insulating value of the material itself, and the method of fabrication. As noted above, it is dead air spaces, rather than the material, which provide insulation; consequently the method of fabrication is important. For example, if copper were used as an insulating material it would be one of the worst possible materials; if it were shredded into a fine wool, however, its insulating properties would increase several hundred times, due to the creation of many dead air spaces, not to any change in the material itself. Wood is an excellent natural insulating material due to its cellular structure; when broken down into fibers and made into a board or blanket it is better.

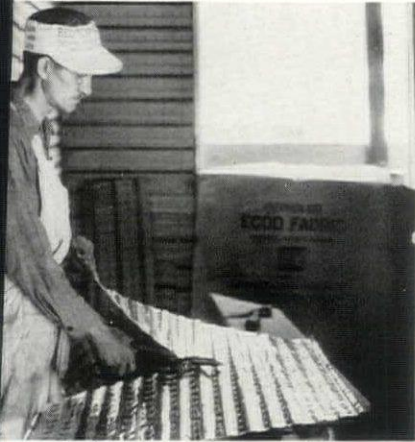
From the point of view of insulation only, the question of thickness is important. No very thin material (omitting metal foils) will provide an appreciable amount of insulation and as the thickness is increased the insulation increases, although not in the same degree. One inch of insulation will, for example, save 20% to 30% fuel consumption in a house where it has not been substituted for any other materials such as sheathing. Adding another half inch will save from 30% to 40%; the second half inch costs more than the first, and it depends entirely upon the severity of the climate whether it is worthwhile to pay more for the additional protection.

It should be noted that the real cost of an insulating material is not the cost per square foot of commercial thickness but rather the cost per unit insulating value of the commercial thickness. The architect who wishes to obtain information on unit insulating values of various materials will find the publications of the U. S. Bureau of Standards of great assistance.

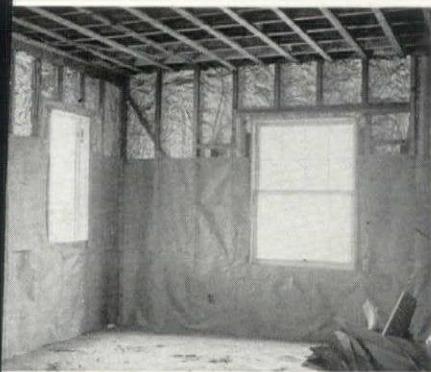
TYPES OF INSULATING MATERIALS

There are many products on the market at the present time; they may, however, be grouped as three general types; rigid, flexible, and fill.

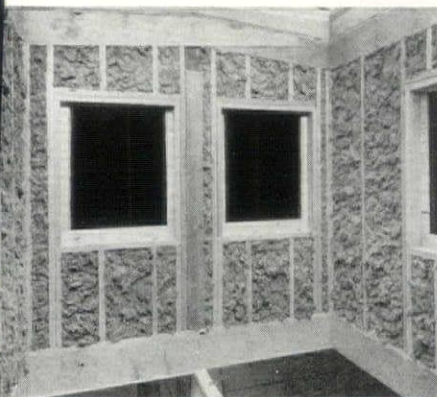
RIGID INSULATION must not be confused with wallboard, which, while frequently made from the same materials, is more densely packed and is thinner. Insulating board is furnished in panels that are commonly 4' in width, 6' to 12' in length, and $\frac{7}{16}$ " to 2" thick. Blocks 3" thick are also available, and have sufficient structural strength to be used as partitions. Basic materials are generally wood or vegetable fibers, with cement, gypsum, or resin binders; many boards have no binder at all. Due to its strength, rigid insulation is used for sheathing, but when used in this way should not be considered a substitute for insulation. Board is also used as a base for plaster and as a finished interior wall surface. Many of the boards now come with textured and patterned surfaces, forming an agreeable finish which needs no painting. While there are slight variations in products due to different methods of fabrication, moistureproofing, and waterproofing, practically all the boards meet the requirements outlined in the commercial standard for fiber insulating boards issued by the Bureau of Standards.



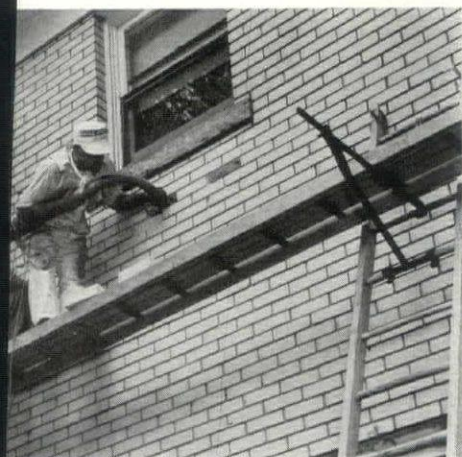
-BACKED METAL LATH



MINUM FOIL INSULATION



LOOSE WOOL PACKED BETWEEN STUDS



LOWN DRY FILL

FLEXIBLE INSULATION is of two kinds: fibrous material loosely felted, covered with paper or fabric, and known as blanket or quilt insulation, and metallic foil. Quilt is relatively inexpensive, comes in rolls up to 250 feet, and can be easily installed. It is available in thicknesses of about $\frac{1}{8}$ " to 1". Aluminum foil operates in a way radically unlike that of any other insulating material. Heat is transmitted by conduction, convection, and radiation, and the purpose of a metallic foil is to reflect the invisible heat rays which make up a considerable part of the heat losses. *If the reflecting surface retains its brightness*—and here is the crux of the matter—aluminum foil will reflect about 95% of the radiant heat which strikes it, making not only for savings in winter, but summer comfort as well, since the sun's heat is entirely radiant. Claims as to the durability of foil, and the performance of its reflecting surface, vary widely, and it will probably be several more years before the question is definitely settled.

The material is usually laid in several crumpled layers, and to prevent convection currents from arising it should be fastened at intervals by horizontal members as well as on the studs. It is agreed that under certain conditions foil will be attacked and decompose, and in such cases the manufacturers recommend a high-purity foil, lacquered foil, and special precautions to avoid electrolysis should also be taken.

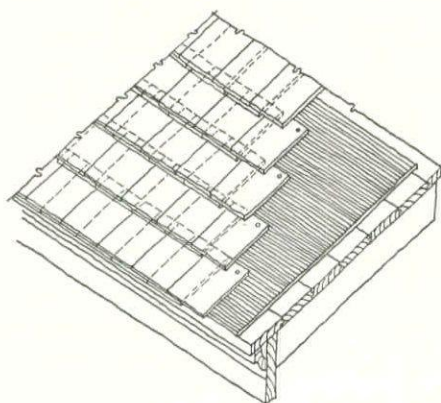
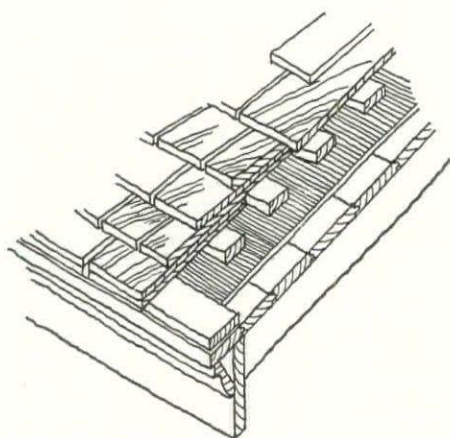
In addition to sheets of foil there are also combinations on the market. Paper, covered on one or both sides, is available, its primary advantage being strength; to equal the efficiency of a single sheet of foil the paper must be covered on both sides. It is also produced in combination with metal lath, and as a backing on wallboards, and there will doubtless be other developments in the near future. A recent use of foil is as a shield behind radiators to reduce the heat loss through outer walls which takes place at these points.

DRY FILL in a loose form was developed primarily for the insulation of existing houses, where some method of installation that did not involve ripping off the entire exterior or interior wall faces was required. It is customarily installed by blowing and consists of a mineral or fiber product in powdered, granulated, or shredded form. There is a trend towards the use of granulated fill, which is considered to have the least likelihood of settling. When used in houses under construction it is installed in the form of bats, loosely packed, and placed between the studs, usually occupying the entire thickness of the wall.

The indications at present are that no radical changes in insulating methods are likely to take place in the near future. Improved methods of fabrication have reduced the conductivity of fibers where it is comparable, for all practical purposes, with that of air, and unless some unforeseen material makes an appearance the present raw materials will probably continue in use with only slight modifications. The important developments to be awaited are likely to be in combinations of structural and insulating materials in prefabricated panels, and in the production of more varieties of insulating boards with specially treated surfaces to render them suitable for wider use as interior finishes.

ROOFING

For three centuries the pitched roof has been the standard covering for all U. S. houses except those in the southernmost portions. Problems of rain and snow disposal have been most effectively solved by the simple expedient of sloping the surfaces on which they fell. It was the industrial and commercial building that forced the development of the flat roof which was strong enough to hold snow loads, tight enough to keep water from coming through. The modern house was created partly because technological advances made possible the development of some of its most characteristic features and partly because the younger generation demanded a restatement of the problem of the house in terms of modern life. They seized upon the flat roof because of the freedom in planning it permitted and because the use of flat decks materially extended the living facilities of the house. The pitched roof, however, is still by all odds the most common way of covering the house and will remain so for some time to come.



PITCHED ROOFS

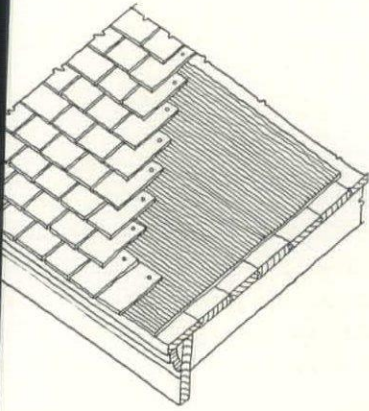
SHINGLES

Wood shingles of cedar, redwood, and cypress are still the cheapest satisfactory roof covering, with pine and spruce occasionally used. Shakes, heavier and longer than shingles are used in localities where the material is plentiful and cheap or where a special effect is desired. Minimum slope is 6" to the foot.

Composition shingles are made of asbestos and of asphalt. The asbestos shingles are durable and fireproof; many types imitate the texture and color of wood shingles. There are several standard methods of laying; in all of them the shingles are laid on felt over sheathing. Minimum slope is 6" to the foot. Asphalt shingles are less expensive than asbestos, are cut as individual shingles or in strips. Like asbestos they are laid on felt and sheathing, although the felt may be omitted. A new development in these shingles is the tapered shingle, which, like wood, is thicker at the butt. An asphalt shingle with a layer of cork on the bottom is also now available, and is claimed to have higher insulating value than other types.

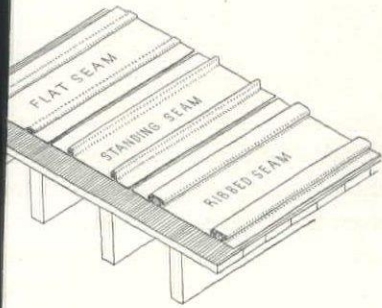
SLATE

Like wood, slate is a natural material which still stands comparison with newer products. It is laid on felt and sheathing or on nailing concrete if construction is fireproof. Minimum slope is 4" to the foot.



TILE

The numerous types of tiles, variously known as Greek, Roman, Italian, French, Spanish, Mission, and English include some of the oldest roofing units in use, and their selection is customarily made on a basis of style. Shingle tiles are an excellent product in which great pains have been taken to reproduce the appearance of weathered wood; they are very popular among architects who want to get the effect of an old wood roof without waiting for natural aging. Tiles of cement asbestos, Portland cement, and metal are also available.

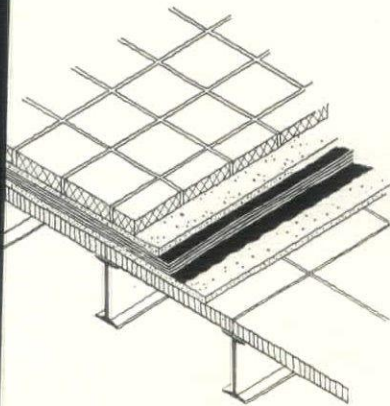


SHEET METAL

Tin roofs consist of iron or steel sheets coated with pure tin or a mixture of lead and tin. Joints are flat, standing seams, or batten seams. Flat joints must be soldered if the slope is less than 4" to the foot. Building paper is used, but since condensation must be considered, no tar or tarred paper may be used.

Copper shows less chemical activity than any other commercial metal. It is laid like tin. The customary weight is 16 oz., but a new copper sheeting for residences is now available which weighs only 10 oz., bringing down the price on this type of roofing. Lead-covered copper is cheaper and lighter than lead and is used as a substitute for this material.

Lead is adaptable to curved surfaces because of its pliability. A hard lead with a lower expansion coefficient than ordinary lead has been developed.



FLAT ROOFS

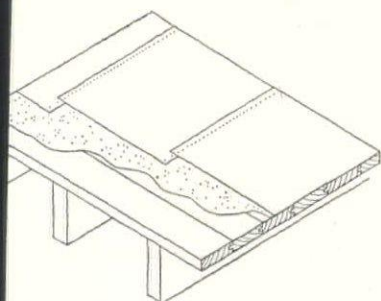
Built-up roofing consists of layers of felt, intermediate mopings of a bituminous compound, and a finish. This type has been used largely on commercial buildings, but is applicable to the house. Coal tar roofs are in common use, and require a layer of slag or gravel to protect the tar from the sun. Recently a new form of copper, known as Electro-sheet copper, has been used instead of felt. The copper is very light, weighing only 2 oz. per square foot. It seems like a most promising roofing material. This copper sheeting is also furnished bonded to asbestos felt.

ROOF DECKS

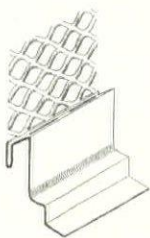
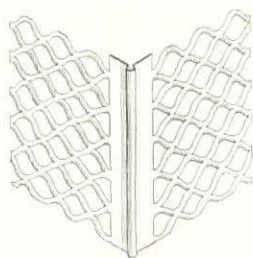
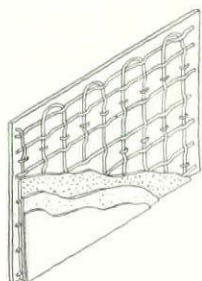
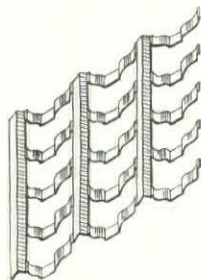
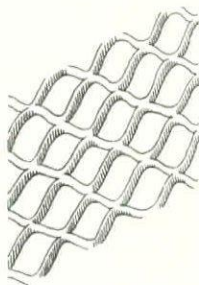
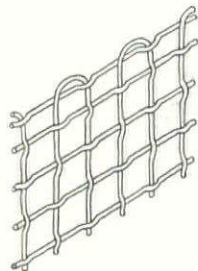
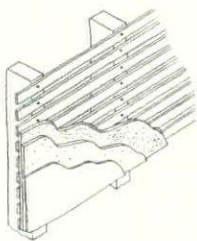
The methods described above must receive a protective coating if they are to be used extensively. Promenade tile laid in 1" cement mortar is a common method.

Canvas is frequently employed where wood framing supports the roof. Ordinary canvas can be used, but especially prepared roof canvas is more suitable. It is laid on an adhesive paste of white lead and linseed oil, with 1½" laps. Special bedding paints may also be used. Copper nails 1" on centers hold it securely, and after setting a coat of lead and oil and a heavy coat of spar varnish are applied.

The method of laying precast cement blocks on a bed of gravel without mortar in the joints is widely used in Europe, but has not been adopted in this country.



LATH AND PLASTER



LATH

WOOD LATH. Spruce, pine, cypress and fir are used for lath. The strips are $\frac{1}{4}$ " thick, $1\frac{1}{2}$ " wide and 32" or 48" long. lath comes in two grades; No. 1 should be used to obtain satisfactory results. If the lath is wetted before applying pieces which show warping should be discarded. It is applied horizontally with $\frac{3}{8}$ " spacing for lime plaster and $\frac{1}{4}$ " for sum plaster; if used for ceilings, the strips are fastened in one direction only.

WIRE LATH. Woven or welded, furnished with and without rod or channel stiffeners. Painted or galvanized. Heavy wire lath is used for reinforcing concrete.

EXPANDED METAL LATH. Made out of flat metal sheets. Slits are cut into these sheets and by pulling them apart, the slits are opened up forming a perforated mesh. This type of lath comes in various gauges, 18" to 24" wide and 8' long.

EXPANDED RIBBED METAL LATH. Metal sheets are perforated and pressed in such a fashion that V-shaped ribs with a projection of $\frac{3}{8}$ " or $\frac{1}{4}$ " from the surface run the long way of the sheet at intervals of about 4". The metal between the reinforcing ribs is bent so it gives the plaster a solid grip. The ribs, besides reinforcing the lath, keep the lath away from the surface it is nailed on and allow the plaster to get a good grip of the lath.

COMPOSITION WIRE LATH. Wire lath is backed with heavy paper (sometimes corrugated) preventing the plaster from leaking through. If it is to be used on outside walls, 3-ply waterproof backing is used consisting of one layer of waterproof paper, one layer of waterproof compound and one layer of fibrous felt insuring a solid bond with the plaster. This waterproof metal lath comes in rolls 49" wide or in sheets.

Wire lath combined with an aluminum foil mounted on paper acts as plaster or stucco base, insulation and weatherproofing.

LATH ACCESSORIES

CORNER BEADS AND PLASTER STOPS, pressed out of galvanized metal forming sharp corners or bullnose shapes. They come with wings of expanded metal welded on. They give a solid bond between bead and plaster and reinforce at the same time the adjoining plaster. The so-called old style corner bead is pressed out of one narrow strip of metal which is perforated so the plaster can get a grip.

CONCEALED PICTURE MOLDINGS are made in the same way as corner beads. They leave only a narrow slot visible in the plaster wall.

FLUSH METAL BASES are manufactured in connection with wings of expanded metal lath. They insure a more solid bond between plaster and base.

Chair rails, window sills, door bucks and other metal trim fall under this classification.

ING BOARDS

Chapter "Insulation" deals with building boards as of insulation.

ing boards come in plank form and in board form. Planks are usually 20" wide and vary in length 2" to 64". Some manufacturers furnish them in lengths. Boards usually come 4' wide and in up to 12'.

R BOARDS use either wood shreds, wood, cane or fibers. These shreds or fibers are compressed and together in different ways and to varying density. The fibers are closely interwoven and interlaced, giving a board of uniform tensile strength thus preventing buckling and cracking. Fiber boards are also available in laminated form, one board of this type is of several layers with asphalt between, producing a highly waterproof board.

TER BOARDS: Gypsum plaster is embedded in layers of tough paper which is turned over on the and sealed. The gypsum is treated so that air cells while setting, giving the board higher insulating and more rigidity. For building boards covered aluminum foil see "Insulation." Plaster boards, as of the fiber boards, have excellent fire resisting qualities.

PLICATION: The boards and planks are nailed to strips or to studs. Manufacturers usually provide information for the selection of nails. Where building is used for furred ceilings or fire resisting conditions in which metal channels are the structural members, special clips are furnished. Joints between ing boards can be reinforced with metal lath or special reinforcing strips of cotton or aluminum. If desired, the latter treatment can replace a three coat plaster job since plastic paint will make the joints invisible.

STER

E PLASTER uses common, granulated, pulverized hydrated lime as a base. The lime may have a high calcium or magnesium content, and no preference can be given to one over the other, but foreign substances harmful to a good plaster and a careful selection of product has to be made. The lime is slaked at the of the building into putty form. The lime putty is mixed with a good grade of coarse sharp sand, with or fiber being added to act as a binder. This type of plaster is applied in three coats over wood or metal, or masonry. The first two coats are called scratch and brown coats. The last or skim coat is composed of graded lime putty to which plaster of Paris is added before application. Over metal lath a small quantity of Keene's or Portland cement may be added to get a stronger base. Over concrete the first coat should be a

specially prepared bond plaster followed by a brown coat and skim coat.

GYPSUM PLASTERS are made by driving off water of crystallization from gypsum rock through a calcination or heat process. When this plaster is mixed with water it recombines with the same amount of water as was driven off during calcination and sets to a hard homogeneous plaster within two to six hours. After drying, which takes about 36 hours, no more sweating occurs. Gypsum plasters have a low coefficient of expansion, therefore they remain inert and do not expand even when exposed to heat. Different kinds of gypsum plaster are made by varying the calcination process and by adding other materials. The results are plasters serving special purposes.

BASE COAT PLASTERS

HARD WALL PLASTER (called cement plaster) is the standard gypsum plaster used for scratch and brown coat in ordinary plastering. It comes fibered with hair and sisal fiber or unfibered. The sand is mixed in on the job.

SANDED PLASTER contains the same gypsum plaster as hard wall does. The sand is mixed to it in the mill. It is used where good sand is rare or where an exact proportioning is required to obtain a perfect plaster.

WOOD FIBER PLASTER contains finely shredded wood fiber. It is used where a high degree of fire resistance is desired and where sand is not easily obtainable. This plaster comes also ready mixed with sand.

CONCRETE BONDING PLASTER is an especially made wood fiber plaster. It has higher cohesive and adhesive properties than ordinary plaster.

FINISH PLASTERS

SAND FLOAT; fine sand is admixed, giving a semi-rough surface, furnished in gray and white.

PREPARED TROWEL FINISH is more satisfactory than ordinary lime putty finish. It has better working and spreading qualities.

GAUGING PLASTER is admixed to the ordinary lime-putty. It prevents shrinkage of the lime.

MOLDING PLASTER, mostly called plaster of Paris, is used for plaster molds and ornamental work.

KEENE'S CEMENT is made from gypsum rock of great purity. It is used for high grade work where a very hard and durable wall is required. It generally comes in two grades, (a) regular; (b) superfine. Also used for imitation tile wainscoting, columns and pilasters, etc.

SPECIALLY PREPARED FINISH COATS are obtainable in dry form, to which only water is added, or in putty form. These finishes can generally be applied over the ordinary brown coat so as to give a smooth, rough or textured effect.

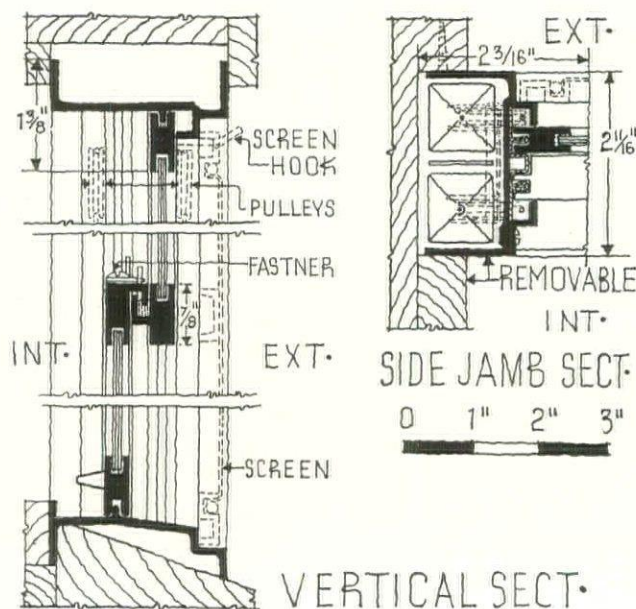
WINDOWS

ALONG with some other things in the house of the 1930's, the window is changing. Only a few years ago the wood double hung window with pulleys and sash weights, and, to a lesser degree, the wood casement, were standard on all residences. Today the wood double hung window can be had with integral weatherstripping, metal tracks, spring balances or with weights so narrow as to be unnoticeable. Now metal has entered the residential field, and steel, aluminum, and bronze windows are playing an increasingly important part as production rises and prices go down.

The window has been influenced by the great interest in improvements in heating, and the consequent focusing of attention upon the problems of insulation. No type is likely to survive unless it in some way includes weatherstripping and the ultimate possibility of double glazing. The strides made in window design of all kinds have left the advocates of each with stronger arguments than ever. One thing is fairly certain: whatever kind of window is used, the house is going to have more of them.

The modern house has imposed new problems of fenestration, and one solution, the horizontally sliding window, might well be considered by manufacturers. Long available to architects abroad, these windows have yet to be produced in appreciable quantities in America, in spite of the fact Europe has found them eminently satisfactory. The stock objection, aside from the fact that there are not enough modern houses to furnish a market, is that this type of window cannot be satisfactorily weatherstripped. U. S. manufacturers, however, have overcome far greater obstacles than this.

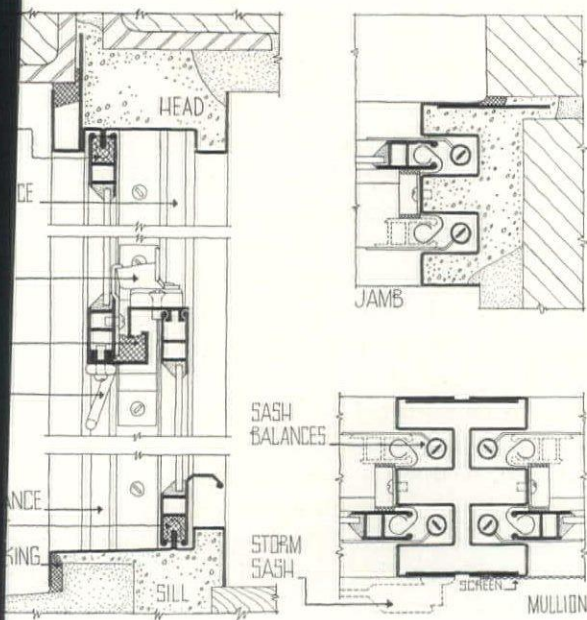
The windows illustrated below constitute a selection of types, not a catalogue. For most of them, any one of a dozen similar products would serve equally well.



DOUBLE HUNG METAL WINDOW

A high quality double hung window of extruded aluminum or bronze. While not cheap in relation to wood windows, it has many advantages. Thin muntins and meeting rails improve appearance and visibility. Operation is easy. There is no maintenance cost. Integral weatherstripping materially reduces heat losses and fuel costs. The window is sold as a unit, complete with sash weights, weatherstripping, and glazing. Glass is "quality window glass or $\frac{1}{8}$ " plate. Kawneer Co., Ni Mich.

See illustrations on opposite page (609)

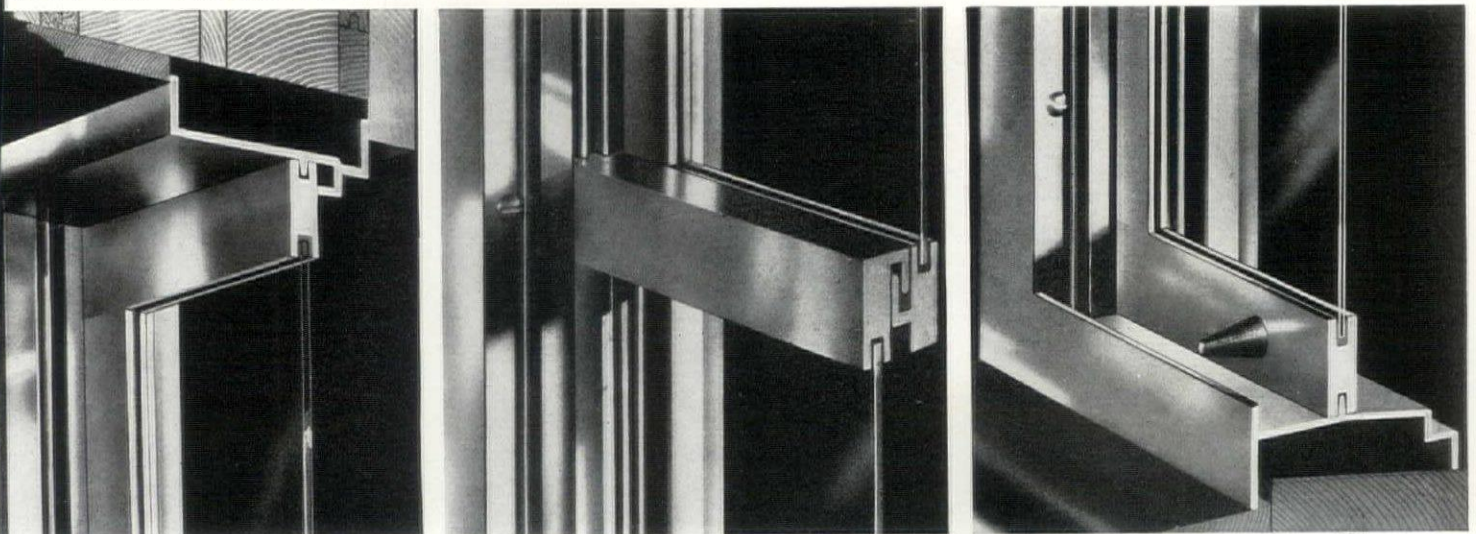


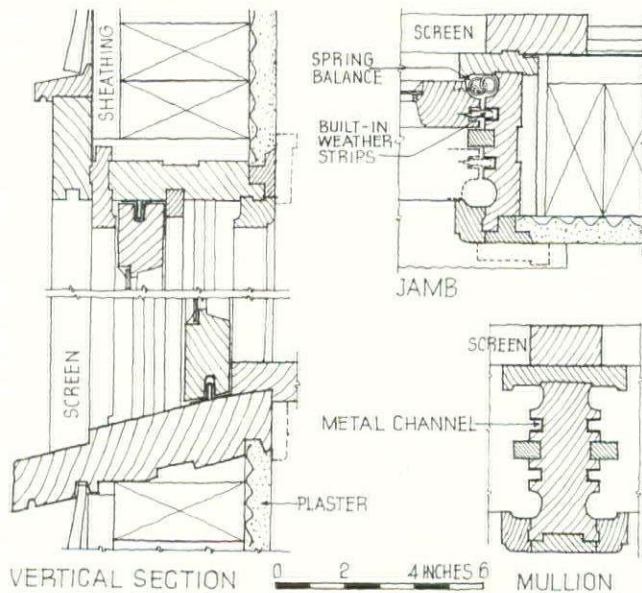
DOUBLE HUNG METAL WINDOW

A new double hung window. Sash of aluminum or bronze, frame to match or of steel with aluminum sash. Price compares favorably with that of ordinary wood windows. Special features are spiral balance, eliminating weights, pulleys and chains; light weight; integral pull across whole width of sash; felt gaskets at rails; outside screen replaceable by storm sash when desired. Crittall Manufacturing Co., Washington, D. C.



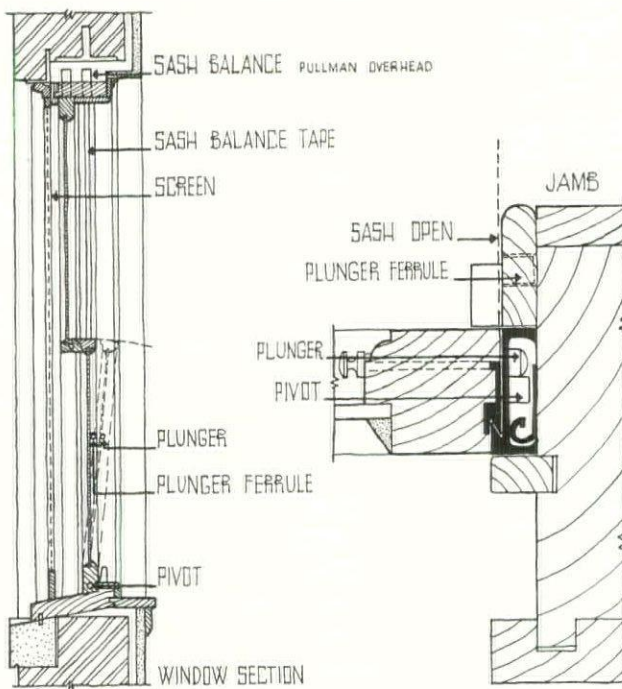
DETAIL AND DESCRIPTION ON OPPOSITE PAGE (608)





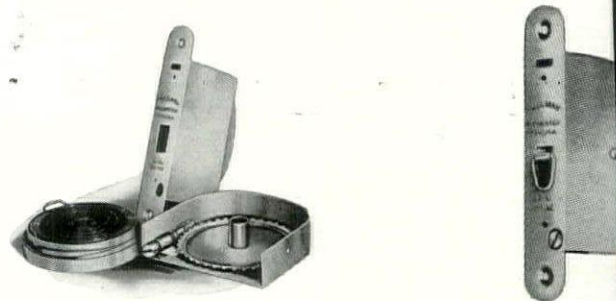
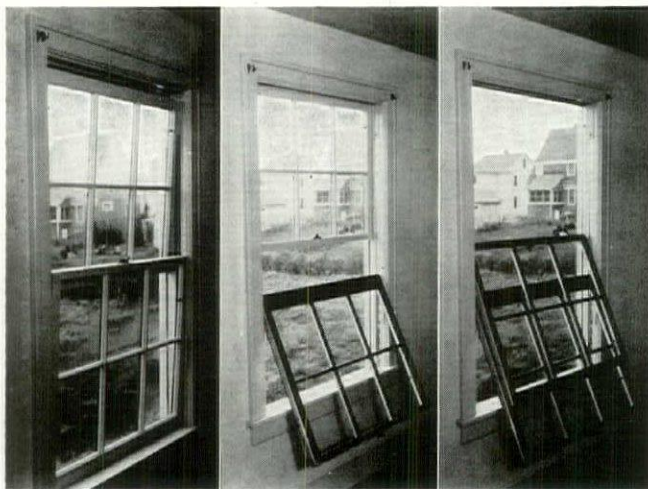
WOOD DOUBLE HUNG WINDOW

A wood window unit, complete with frame, sash, screen and storm sash suitable to any type construction. Frame is carefully detailed to provide plaster water drips, running clearances, etc. All parts are machined and fitted in factory and shipped in complete frame and sash are treated with wood preservative. Sash is glazed with Lustra glass, translucent to violet rays. Hung on spiral springs fastened to sash with special hooks and to jamb with screws. Springs may be adjusted or replaced without removing trim. The design eliminates noisy weights, and permits narrow muntins and trim. Ample clearances make for ease in opening and leakage being prevented by springy metal weather stripping. Tested at Pittsburgh Testing Laboratory and in field installations in 25 States. Curtis Company, Inc., Clinton, Iowa.



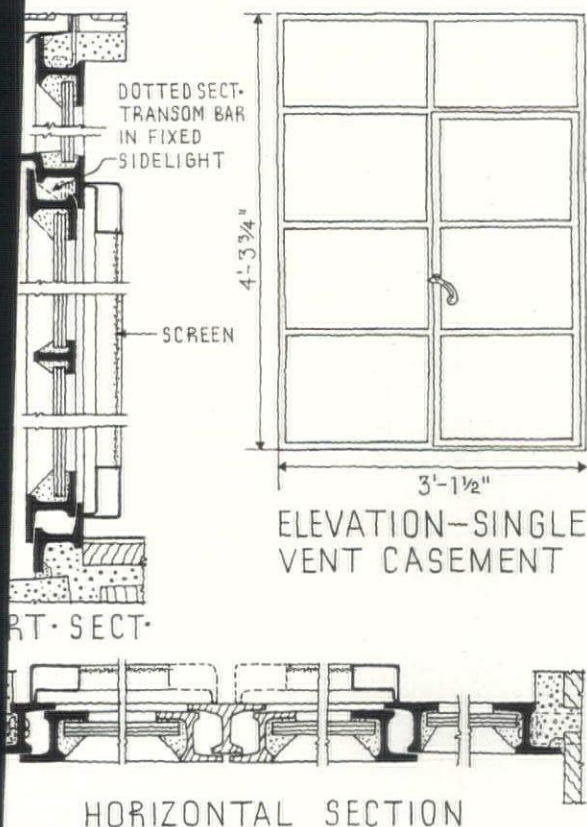
WOOD DOUBLE HUNG WINDOW

A new double hung window set in the usual type window frame, but equipped with special hardware which permits each sash to be pivoted horizontally as well as raised or lowered in the ordinary way. The pivots and plungers which permit this action constitute the special feature of this product. New York Universal Window Co., Inc., Ithaca, N. Y.



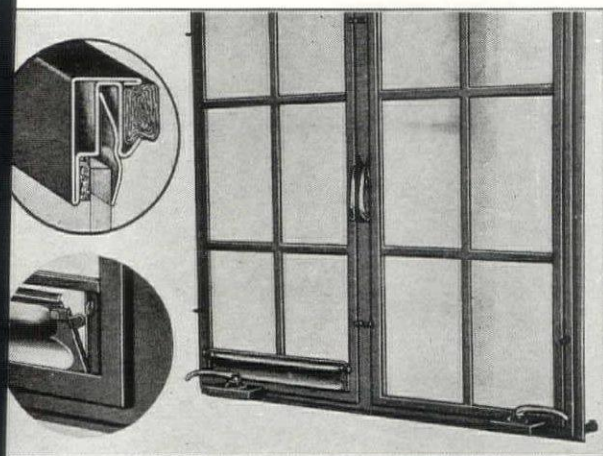
ADJUSTABLE SASH BALANCE

A spring sash balance which is equipped with a device permitting the tension of the balance to be adjusted or re-adjusted at any time after the balance is installed. Adjustment is made with an ordinary screw driver. In other respects the balance is similar to preceding products. Pullman Manufacturing Corporation, Rochester, N. Y.



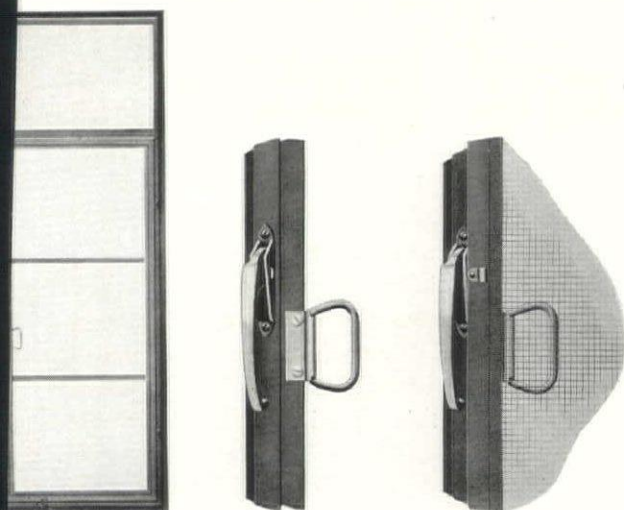
STEEL CASEMENT

In the lowest price class for metal casements. Solid rolled steel sections. Side hung leaf has heavy friction hinges with oil-impregnated bronze bushing washers, bronze studs and nuts. Locking handles are of rust-proofed iron (bronze can be furnished) and are flat in design so that screen and casement swing may be closed simultaneously without interference. Hinged screen set flat against inside of casement. Screen frames cold-rolled steel tube, mitered and butt-welded; cloth 16-mesh oxidized bronze wire. For economy vertical muntins are omitted, transom is fixed, only one leaf of window opens. Detroit Steel Products Co., Detroit, Mich.



DOUBLE WINDOW

Storm sash for metal casements, set on inside, replacing screens with same fastenings. Where under-screen operators are used, outer sash may be opened as usual. Tilt-in ventilator is optional on inner sash. Is in effect double glazing of window, which eliminates drafts, cuts down heat loss and condensation. Frames are enameled steel, with glass held against cork cushion by bronze spring spline. The Everhard Manufacturing Co., Canton, Ohio.



STEEL CASEMENT

The Home Development window is a low cost casement type with horizontal muntins and a nominal glass size of 16" x 12" which is claimed to result in a considerable saving in glazing costs. The screen is side hinged, fitting tightly against the window even when the window is closed. The locking handle is attached to the frame and locks through the window section, cam action insuring the tightness of the fit of frame and window. Cleaning type friction hinges are used. Truscon Steel Co., Youngstown, Ohio.

GLASS

Glass has played about as unimaginative a part in the design of the small house as any single element that can be found. When it first came into use it was restricted to small panes because there was no known way of making large ones. Today our factories turn out glass sheets of practically any size and then promptly cut them up into little panes for a better reason than the fact that they have always done so. Since windows are designed primarily to let light in and to permit clear vision, this procedure appears to be one that might possibly be questioned.

The advent of the modern house and its effect upon window design is too well known to require more than passing mention; here the window comes into its own, taking full advantage of the developments in manufacturing processes and the trend definitely away from stylistic restrictions, and in the direction of increased livability, it is safe to predict that glass will be used in larger sizes, and be more efficiently distributed in houses of the present and future.

TRANSLUCENT GLASS

Translucent glass, with frosted, ribbed, hammered, pebbled, and other surfaces, has been extensively employed, both in the home. Screens of translucent glass have long been used abroad to give apartments greater privacy without cutting out too much light, and a similar use of it has been made in a few isolated cases in the U. S. This glass, and certainly the use of wired glass, might well be employed in the house for decorative as well as practical uses.

ULTRA VIOLET GLASS

The standards of the American Medical Association require that ultra violet transmitting glass should permit not more than 25 per cent of these rays to pass through after solarization has taken place. One of the standards makes claim for an initial transmission of 60 per cent which is reduced to a permanent transmission of 40 per cent. The glass is both means cheap, and its installation depends entirely on who one is willing to pay for the 25 per cent to 40 per cent of solar ultra violet radiation it allows to pass through.

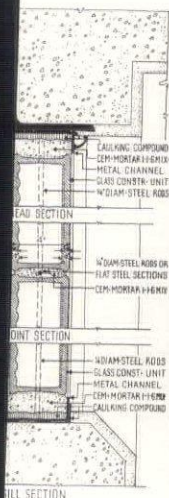
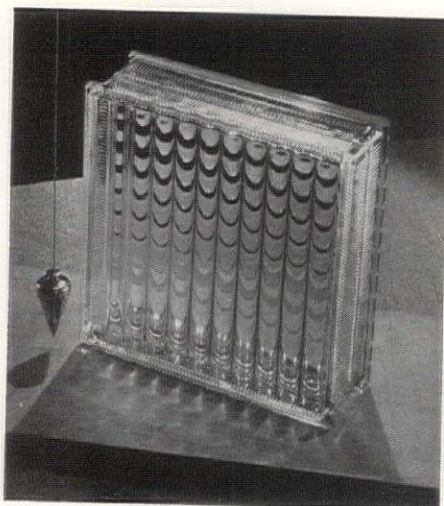
HEAT-ABSORBING GLASS

A new possibility for residential use is the so-called heat absorbing glass, whose special chemical composition has the property of absorbing infra red rays. It is somewhat green in color, and costs more than plate glass. Developed primarily for commercial uses, as for store windows where perishable goods are displayed, it has applications in the house where the extra cost of the material can be afforded. It makes possible the use of large areas of glass where hitherto it has been inadvisable on account of the heating effect of the sun's rays. The extent to which this glass is adopted for residential use will depend largely on how well it stands the test of use and particularly on future revisions of price.

The glass industry has contributed much to present-day architecture; it has produced nothing, however, that is destined to have more far-reaching effects than the glass block. Used abroad for many years, particularly in Holland, this medium is finally winning a deserved, if rather belated acceptance in the U. S. It has remarkable structural and insulating properties, and its decorative possibilities are virtually limitless. Used as wall or window, glass bricks give ample, diffused light, complete privacy, keep out a large percentage of sound, reduce heat losses. Glass brick will have a very definite influence on the appearance of buildings because it lends itself less readily to stylistic adaptations than any building material that has yet appeared.

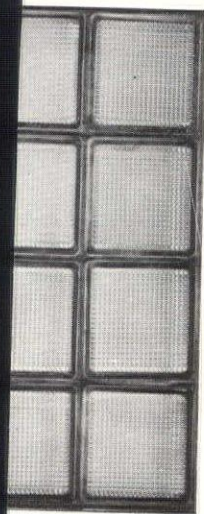
"PYREX" GLASS CONSTRUCTION UNIT

A clear, white glass with an extremely low coefficient of expansion. Glass-sealed dehydrated air chamber with high insulating value. Fluting on interior surfaces produces a high diffusion of light, and eliminates the possibility of a lens effect. Joints may have steel reinforcing where required. Size: $11\frac{3}{4}" \times 11\frac{3}{4}" \times 4"$. Corning Glass Works, Corning, N. Y.



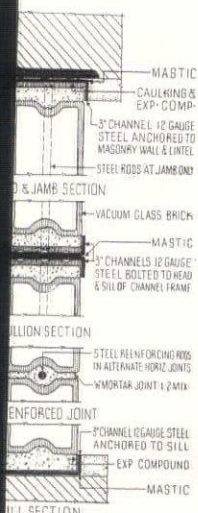
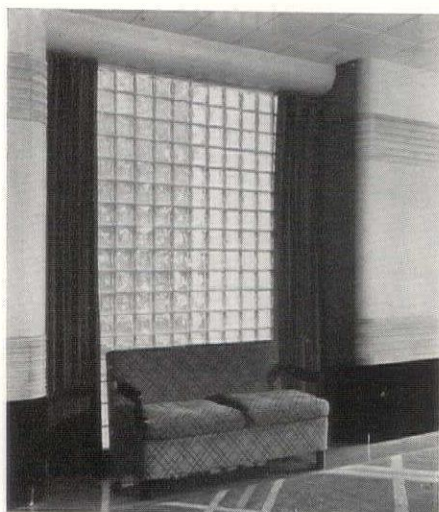
INSULUX BLOCKS

Hollow, partially evacuated blocks of pressed glass. Tests indicate safe working load of 200 lbs. per sq.in. Enameled and roughened sides increase bond with mortar. Prismatic inside cuttings. Heat and sound insulating. Sizes: $4\frac{7}{8}" \times 8" \times 3\frac{7}{8}"$, $7\frac{3}{4}" \times 7\frac{3}{4}" \times 3\frac{7}{8}"$, $5\frac{3}{4}" \times 5\frac{3}{4}" \times 3\frac{7}{8}"$, with rounded corner blocks, etc. Owens-Illinois Glass Co., Muncie, Indiana.

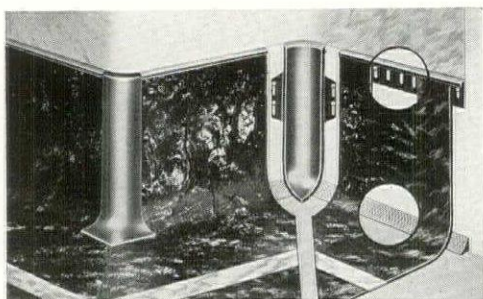


GLASS BRICK

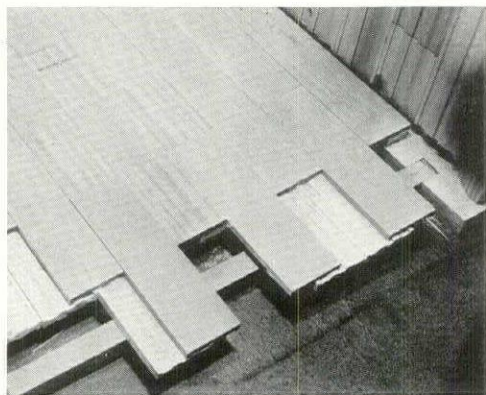
The size of this unit has been increased to $5\frac{7}{8}" \times 5\frac{7}{8}" \times 2\frac{5}{8}"$. Both hollow and solid brick are available. Machine-pressed, with glass-sealed partial vacuum in hollow blocks. Block is smooth outside, with rough finish inside to reduce transparency. Structural Glass Corporation, New York, N. Y.



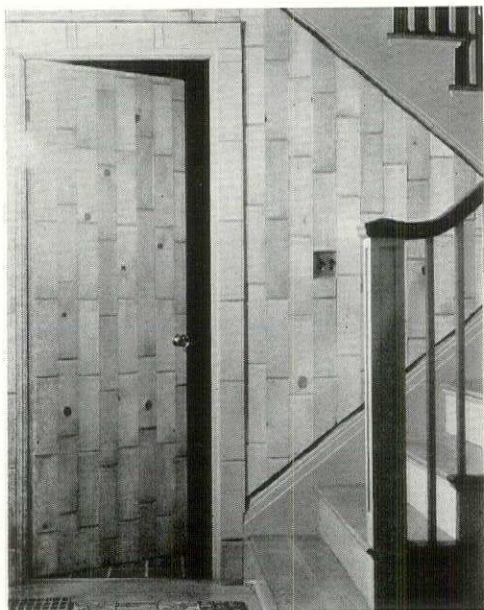
FLOOR AND WALL COVERINGS



Linoleum coves and bases for use with resilient floors. They consist of a metal binding strip, a fillet strip, inside and outside metal corner pieces, and sufficient linoleum to extend from the flooring to the binding strip. Armstrong Cork Products Co., Lancaster, Pa.



Illustrating a method of making wooden panels for walls or floors consisting of two layers joined together, thus obviating any free play between the sections. See illustration below for wall treatment. Woven Wood Laboratories, Portland, Oregon.



FLOORS

LINOLEUM: A combination of powdered cork, linseed gum, pigments, and burlap, forming a durable and resilient floor surface. Available in five gauges, of which the standard is most commonly used in residences. Laid directly on cement or gypsum plank; for wood floors a layer of felt is required. The newest development in linoleum is Armstrong Sealex, a light weight linoleum which has a layer of adhesive on the back; application consists of wetting the adhesive with a brush and laying the linoleum directly on the floor. No felt is required. Advantages claimed are economy due to saving on labor, and simplicity and rapidity of application.

CORK CARPET differs from linoleum in that the cork has a larger grain. It comes in $\frac{1}{4}$ " thickness and 6' wide rolls. Available in natural, dark brown, and green the available colors. It is more resilient than linoleum, and laid in the same manner.

CORK TILE is made of cork which is compressed in a mold and baked, the natural gum of the cork acting as the binder. Three shades: natural, medium, and dark. Sizes vary from 2" to 36", square and oblong. Special bases and coves of the same material are made. Laid in the same way as linoleum.

RUBBER TILE: pure rubber vulcanized under pressure with the occasional addition of cotton and mineral fillers. Good quality rubber tile has a non-fading pigment and adhesive so that the color does not change as the tile wears down. The adhesive is a special cement which should be approved by the manufacturer. When laid on concrete, the floor must be perfectly dry and free from grease; wood floors require a layer of asphalt-saturated felt. Sizes: 4" to 18" squares, oblong from 9" x 18" to 18" x 36". Coved bases, stair treads, risers available. The material can be used for desk and counter tops, drain boards, etc.

ASPHALT TILE contains natural asphalt, asbestos fiber, and pure mineral pigments. Usually laid with waterproof cement. Coves and bases of same material. Asphalt tile makes a durable, fairly resilient floor.

MAGNESITE FLOORING is composed of calcined magnesite, magnesium oxide, magnesium chloride, and a filler. Installed in two coats to wood or concrete, sometimes in combination with metal lath for wood floors. Marble chips can be bedded in the composition which is ground smooth after setting. Fire- and waterproof, resilient. Satisfactory for kitchens, bathrooms, basement floors.

TERRAZZO, a granolithic flooring in which top surface is composed of marble chips embedded in cement grout, rubbed with stones and brushes to a smooth surface. Laid directly on a slab, or on a sand bed covered with felt. Little used in homes, the material is one which has excellent decorative possibilities where a hard smooth floor is desired.

WALLS

WOOD, whether for walls, or floors, is too well known to require any description. An interesting development in fabrication is known as Woven Wood, a process of cutting and channeling short lengths of wood which dovetail together, forming large units of considerable strength which have numerous decorative possibilities due to the limitless combinations which can be made.

PLYWOOD has been greatly improved, both by the application of fine exterior veneers, and by the use of phenolic resins instead of casein glue. This new development produces a panel which is absolutely waterproof, making it possible for this material to be used for exterior finishes. The cost is considerably higher than that of ordinary plywood. Facings of metal can also be obtained.

FLEXWOOD and other thin veneers can be used to surface almost any material. Finished like any other wood, with varnish, lacquer, or wax.

WALLPAPER has improved notably in both quality and design. The so-called waterproof papers vary considerably in their water-resistant qualities.

WALL CANVAS: To make walls moistureproof, and to prevent hairline plaster cracks the walls can be covered with canvas which is hung like wallpaper, surface-treated with oils and pigments. Washable.

LINOLEUM: applied to smooth plaster or wallboards. A warm and pleasant surface. Much care is necessary in the application, particularly in bathrooms where dampness tends to loosen the bond.

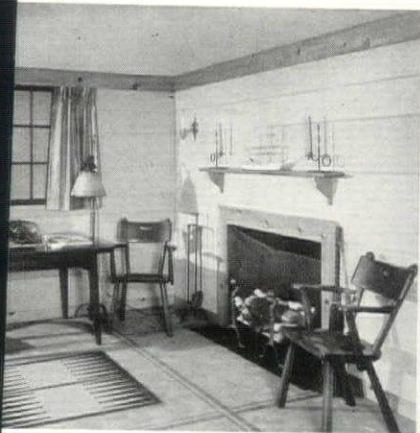
LAMINATED PLASTICS are still too expensive for general use. Excellent for bath or kitchen, they have an impervious surface and are available in many colors and can be produced in any pattern.

WALLBOARD: many can be used as the finish material. Joint treatments vary, with battens of wood or metal the commonest method of covering them. With beveled or rounded edges, the joints can be left exposed. It is also possible to fill the joints, covering the entire surface with paint. Cement asbestos boards are available in many finishes, wood, tile, etc. With a hard smooth surface finish, asbestos boards are suitable for bathrooms and kitchens.

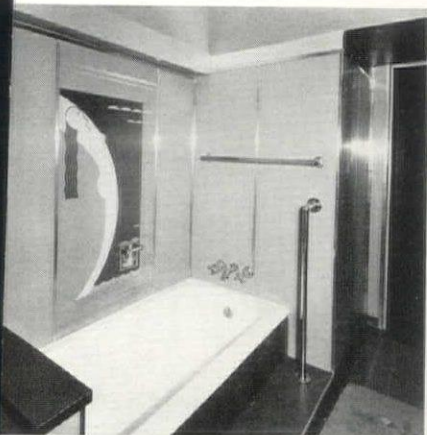
STRUCTURAL GLASS is suitable for baths and kitchens, but is expensive. Installed over any hard wall surface.

TILES, vitreous and semi-vitreous, used for any wall or floor finish. Available in an infinity of colors and textures.

FIBER TILE, made of wood fiber mixed with magnesite binder and color pigments, can be worked like wood, is fire- and water resistant, resilient, and has insulating qualities. Can be used for walls as well as floors.



Plank, an insulating board, $\frac{1}{2}$ " thick, in widths of 6", 8", 10", and 12". One of a number of decorative forms of insulating board, this type is designed to imitate the effect of random width paneling. Johns-Manville Corporation, New York City.



Formica is one of a number of laminated plastics made of paper or fabric and phenolic resin pressed under heat and pressure. Available in many colors with plywood or asbestos cores. Wide variety of colors. Formica Insulation Co., Cincinnati, Ohio.



Glazed panels of lightweight waterproof synthetic material with a glazed finish in a variety of colors and patterns. Walls finished in this material have high luster, may be washed easily. Wash Wall Tile Co., Dover, Ohio.

PLUMBING

PLUMBING practice has changed remarkably little in its fundamentals since present-day methods came into use a quarter of a century ago. There have been changes in materials, as in the increasing use of copper, and installation has been made easier by the use of new type fittings and other improvements. Where the radical changes have occurred, however, is in kitchen and bathroom fixture installation. The introduction of built-in tubs has made the free-standing tub practically extinct, even in the cheapest houses; further developments have been largely in styling, although at the present time there is a trend towards prefabricated units.

WATER SUPPLY

For the city or suburban house this presents no problem. The isolated dwelling, however, must depend upon some independent source of water supply, such as springs or wells. These sources can be easily contaminated, and often contain undesirable minerals and organic matter and must be treated at intervals. For water storage within the house gravity pressure tanks may be used, with the latter more generally favored on account of their convenience and greater ease of installation. Pumps range from the simple hand pump to those which come in a unit with pressure tanks, and the various types of reciprocating and centrifugal pumps. The triplex pump, a device with three cylinders so arranged that a practically continuous flow of water may be maintained, is suitable for larger residences, while the single- or double-acting simplex pump is more commonly specified for the average house. Hydraulic rams are not commonly used for private water supply. They have, however, certain outstanding advantages for isolated homes such as no cost for power and very low maintenance expenses, and might well be considered when conditions permit their use. In figuring tank sizes 15 gallons per person per day is a safe estimate. For sprinkling and similar uses of water provision must be made.

PIPES

WROUGHT IRON: should be puddled iron, known as "fine wrought iron." Galvanized iron is considered more resistant to corrosion than black pipe.

STEEL: made of mild ductile steel. Usually butt-welded to 3", lap-welded in larger sizes. Manufactured black, galvanized, and with alloys of copper and molybdenum for greater resistance to corrosion.

BRASS: made in several mixtures. Yellow brass contains 68 per cent copper and 32 per cent zinc; red brass consists of 85 per cent copper and 15 per cent zinc. The former is customary in ordinary installations. It is rustproof. The size of pipe to be specified depends upon the quality of the water; in certain sections the water requires a higher copper content in the brass to resist corrosive action.

COPPER: made in hard and soft forms. Over 99 per cent copper content. It does not corrode and is easy to fit.

soft copper pipe (copper tubing) can be bent by hand, and is well suited for replacement work on account of its ease of handling and light weight. Care must be taken in installation as it can readily be damaged or punctured. Copper tubing is supplied in coiled lengths of 45 and 60 feet. Hard copper pipe is being widely used on account of its permanence and other qualities, but requires fittings at all turns.

BASIS OF SELECTION

Two factors determine the choice of pipe: type of the water in a given locality, and the amount of money that can be spent. Soft water attacks iron and galvanized iron very readily, and requires the use of red brass or copper. Hard water leaves a coating of lime and gypsum on the interior walls of the pipe. To correct this condition, as well as to eliminate the unpleasantness of this kind of water, one of the standard water softeners should be installed.

Considerations of economy mean nothing if length of service is not considered. The total variation in cost between good and poor materials will not amount to more than 10 per cent on the average job.

PIPE SIZES

1 $\frac{1}{4}$ " to W.C. (flush valve), $\frac{1}{2}$ " to W.C. tank, $\frac{1}{2}$ " to sinks, bathtubs, and showers, $\frac{1}{2}$ " to lavatories and laundry tubs. Hot water requires the same sizes. To supply a bath room with W.C., bathtub, shower, and lavatory, 1 $\frac{1}{4}$ " cold and $\frac{3}{4}$ " supplies are required; if a flush tank W.C. is used, $\frac{3}{4}$ " cold is sufficient. To supply a kitchen sink and laundry tub, $\frac{3}{4}$ " cold and $\frac{3}{4}$ " hot are adequate. Where pipes mentioned are $\frac{3}{4}$ " or larger, they may be reduced one pipe size if of brass or copper.

FITTINGS

Screw and flange types are standard with iron, steel, and brass. Compression and soldered types can be used with copper tubing. These latter are among the most interesting developments of recent years. One compression type for copper tubing uses a flanging tool and sleeve-nuts, and is a convenient and rapid method of joining the tubes. The soldered types rely on capillary action for the spreading of the solder; it is applied either to a hold in the fitting or at the edge.

VALVES

A main control valve should be located on the water main inside the cellar wall and beside a drip valve through which the entire piping system can be drained. Each riser should have its own shut-off valve so repairs can be made without interrupting the supply of the rest of the house. A control valve on each fixture is customary. Cheap valves should be avoided.

INSULATION

To prevent cold water pipes from sweating they should be covered with wool felt, hair felt, or asbestos. Fittings can be covered with a plastic asbestos cement which is efficient, and cheaper than molded coverings.

HOT WATER SUPPLY

WATER CONSUMPTION: Estimates vary considerably. A practical figure which applies in most cases is obtained by allowing 7 $\frac{1}{2}$ gallons per person per hour of use.

HOT WATER STORAGE TANKS: Steel, copper, copper-lined steel, and Monel metal. Insulation: plastic asbestos, hair felt jackets, or with magnesia.

SAFETY DEVICES: Excessive pressures due to overheating can be overcome with a thermostatic control and by the installation of a pressure relief valve set at 25 pounds above the normal water pressure. All of these devices should be regularly inspected.

WATER HEATERS

COAL: There are two types. One uses a waterback in the kitchen range or furnace; the other uses a separate heated stove with a waterback or heating coil.

GAS: The instantaneous type heater has a thermostatic control which regulates the gas flames according to the amount of water to be heated. It comes in sizes which serve from one bathroom to four bathrooms, a kitchen, and a laundry. A storage gas heater consists of a heater and a separate storage tank. It has thermostatic control, and uses a tank with the desired capacity. Gas heaters require a flue connection.

ELECTRIC: Where current rates are low enough, this is excellent. Thermostatic control.

INDIRECT: Indirect water heaters utilize the heat from a hot water or steam boiler of the heating system. The water supply passes through copper coils located in an indirect cylindrical casing which is connected with the boiler. These heaters can be run during the summer months by separate heaters.

SOIL AND WASTE

HOUSE SEWER: Glazed vitrified clay or cast iron. The pipe should not be used where trees are adjacent. Cast iron pipes are better because their joints can be made perfectly tight with oakum and lead.

HOUSE DRAIN: The pipe is usually of cast iron. Clean-outs are installed on the foot of each stack and on the end of the house drain.

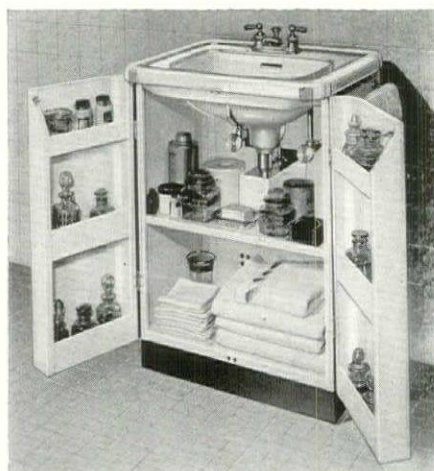
HOUSE TRAP: Prevents sewer gases from going into the piping system of the house, but it interferes with the flow of the sewage, and is considered unnecessary by some Building Codes. If trap is installed a fresh air inlet should be provided.

STACKS: The waste from every fixture can be discharged into the stack when the location allows it. The material may be cast iron, galvanized iron, or steel.

MINIMUM SIZES: for individual fixture wastes are 3" for W.C., 1½" for bathtubs and lavatories, 2" for sinks and showers. If W.C., bathtub, lavatory, and kitchen sink are grouped together, a 3" pipe is sufficient.

TRAPS: The waste pipe of each fixture should be equipped with a trap, tray and a sink, three laundry trays or three lavatories can be equipped with one trap if they are close together.

VENT PIPES: Maintain an equilibrium in the air pressure within the system and provide air circulation. The even air pressure prevents the water seal in traps from being siphoned out. Traps have been designed, which, without the venting system, would prevent trap siphonage, but they are not self-cleaning, and are not allowed by many sanitary codes.



"Coronada Lavinet," a porcelain enameled cast iron lavatory combined with a much roomier cabinet than the usual wall type which it is designed to replace. By Crane Co., Chicago, Ill.



Four-angle tub measures 48x49½ in. The alcove space is as long as the usual 5½-ft. Corner and recessed models available. Crane Sanitary Mfg. Co., Pittsburgh, Pa.

BATHROOM FIXTURES

BATHTUB

Good practice demands that the tub rim be supported on the studs as well as the floor. Brackets for this purpose are available.

Types: Corner, recess, pier, square.

Material: Enameled cast iron, enameled pressed steel and porcelain.

Sizes: 30" and 36" wide, from 4' 6" to 6' 5" and 5' 6" most common. Bottom should be flat as possible to prevent slipping.

SHOWER

Types:

1. Over tub.
2. Prefabricated units, sheet steel walls, glass doors or curtains.
3. Built-in, tiled or waterproof panels, precast stone pan or tile on lead pan.

Head: Standard pierced head. Self-cleaning head.

Valve: Hot and cold separate. Cheapest type.

Mixing: three types

1. Hand operated, does not maintain constant temperature.
2. Pressure-regulating. About 30 per cent more expensive than (1), does not compensate for any change of temperature in hot or cold water.
3. Thermostatic. Responds to changes in both temperature and pressure. Desirable, but expensive.

Material: Chrome or nickel plated brass.

WATER CLOSETS

These fixtures should be set on a very substantial base and securely fastened down. Failure to do this is a common cause of annoyance in small homes. Types are as follows. Flush tank—Capacity 3½ to 8 gallons. Gravity action.

Available in one-piece fixtures.

Flush valve—Requires high water pressure and a 1¼" supply pipe, while ½" is enough for a tank. Fairly noisy in operation.

Siphon-jet bowl—One or two jets cause siphon action. Water supplied through rim washes the bowl. Large water area, minimum fouling surface. Quiet in operation. This is a most desirable type of fixture.

Wash-down bowl: All the water comes from the rim only. Acts after water accumulates in bowl, developing sufficient head to force contents into waste line. Noisy in operation.

Material: Vitrified china preferable to enameled cast iron, for reasons of sanitation.

LAVATORY

Types:

1. Wall-hung, resting on wall brackets.
2. Pedestal.
3. Leg, braced to wall on brackets.

Shapes: rectangular, half round, oval, and corner type.

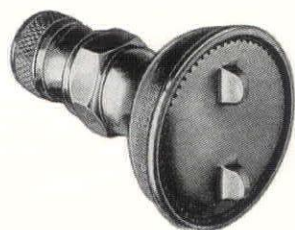
Material: Enameled iron. Cheap, good enough for ordinary usage.

Vitreous china.

Pressed steel, enameled.



Usual round spray is replaced by an adjustable nozzle mounted on a ball joint. Nozzles are large enough to prevent clogging. Water is aerated in passing through nozzle. Crane Co., Chicago, Ill.



Medium priced, small size shower head with the adjustable feature usually found in those of higher price. Permits fine or coarse spray and complete flushing. Integral ball joint. Speakman Co., Wilmington, Del.



One-piece water closet made of twice fired vitreous china in white and in a wide variety of colors, is powerful and quiet in action. Protected against overflow. By W. A. Case Son Mfg. Co., Buffalo, N. Y.



A steel enclosure to go above the bathtub concealing plumbing pipes and forming a water-tight wall on the enclosed sides of the tub. The steel walled cabinet includes a medicine cabinet, space for a lighting unit, space and support for a lavatory, a glass utility shelf over the lavatory and a removable towel hamper. This cabinet built into the wall eliminates the need for separate openings or holes for the fixtures or accessories and the finishing around them. By The Accessories Co., Inc., Division of American Radiator Co., New York, N. Y.

FITTINGS

BATHTUB

Nozzle:

1. The over-rim nozzle is best practice. Located in waste cannot enter supply pipe.
2. Bell supply attached to inside of tub. If submerged permit waste to flow into supply line. Not recommended.
3. Same objection to a lesser degree holds for top nozzle located in side of tub.

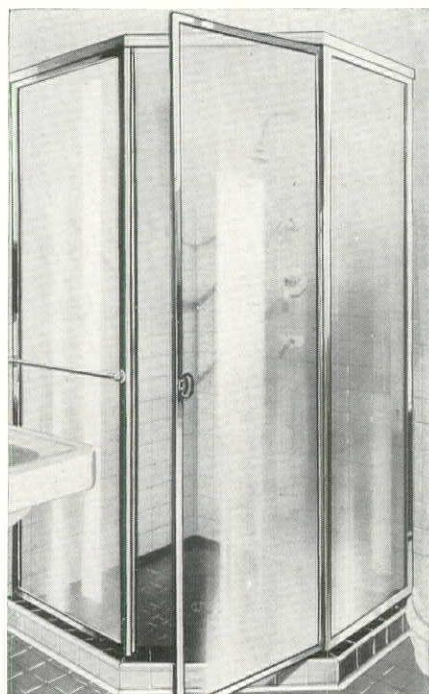
Valves: Combination supply units for hot and cold, controlled.

Waste:

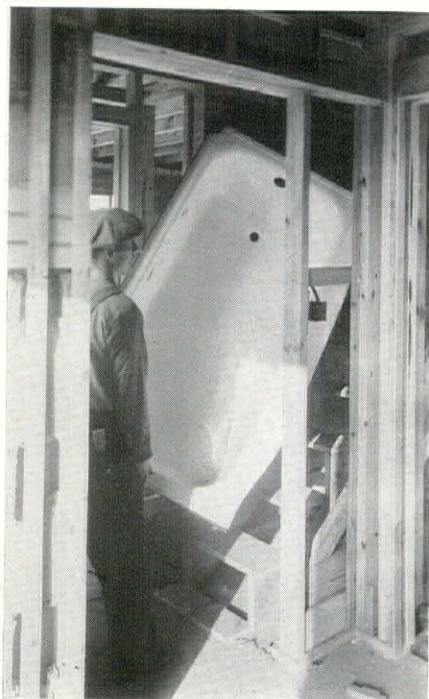
1. The oldest and most reliable type is the chain and
2. Pop-up waste, operated by a lever above the water
- Leakage is too rapid for bathtub use.
3. Standing waste and overflow; tight but unsanitary

LAVATORY: Same in general as for bathtubs, except faucets and nozzles are always attached to the basin. As the bathtub the nozzle should never be located so that it be submerged.

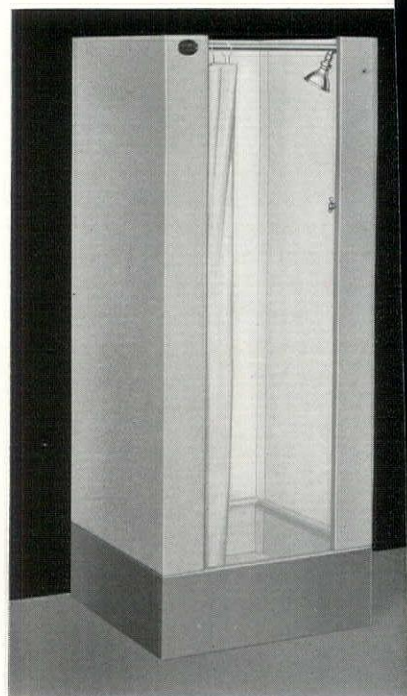
MATERIAL OF FITTINGS: Chromium plated brass is preferable to nickel plating; it is harder and does not tarnish. White metal, such as Benedict Metal, excellent.



A line of glass shower doors and enclosures available in many models; also a chromium framed glass shield to fit a built-in bath tub which is equipped with a shower. By Lehman Sprayshield Co., Philadelphia, Pa.



The formed metal tub is one-third as heavy as an ordinary cast iron tub, requiring no floor supports or reinforcement. The tub is available in a great range of colors. By Briggs Mfg. Co., Detroit, Mich.



A low-cost shower stall shipped in four sections of galvanized steel to be assembled and painted on the job, easily put up by one man with a screwdriver. By Elkay Mfg. Co., Chicago, Ill.

KITCHEN FIXTURES

SINK

Types:

1. Roll rim, used only on the cheapest installations.
2. Flat rim, used commonly when sink is built in cabinet.
3. Apron type, apron completely hiding the walls of the basin. Splashboards usually included in one piece with sink.
4. Numerous combinations with dishwashers and cabinets are available.

Material:

Enameled iron, cheap and durable. Subject to discoloration from acids.

Acid-resisting enameled iron will not discolor, but somewhat higher in price.

Porcelain develops small hair cracks, is heavy and higher in price than acid-resisting enamel.

Vitreous china seldom used.

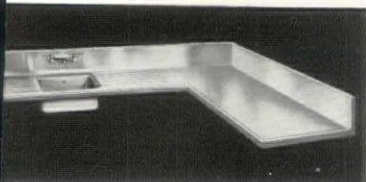
Enameled pressed steel comes in acid-resisting enamel.

Monel metal and stainless steel ideally suited for requirements, but still comparatively high in price.

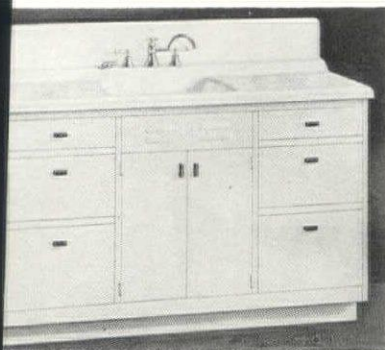
Height of sinks $36\frac{1}{2}$ " to $37\frac{1}{2}$ " from floor; sizes from 16" square to 22" wide by 79" long.



drain boards, sink tops and work
s of Monel Metal. A special sound
ing insulation is installed under the
By The International Nickel Co.,
New York, N. Y.



and cabinet tops made of "Enduro"
ss steel. Tops and splashers are one
the corners are welded. A sound-
er minimizes metallic sound. They are
to fit any requirement. By Tracy Mfg.
Pittsburgh, Pa.



f a great number of kitchen sinks with
boards on both sides and a spacious
et below. A spray hose, disappearing
not in use, is located in the 3-in. ledge
ng across the back. By Kohler of
er, Wis.



The garbage disposal unit is located beneath the sink and is connected to the sink drain. Kitchen refuse (except large bones, metal and glass) is thrown into the drain, ground into fine pulp by means of an electrically driven cutter. Water from the faucet washes the waste out into the sewer. By General Electric Co., Nela Park, Cleveland, Ohio.



Laundry tubs are mounted on individual bases and can be used singly, in pairs or series. The legs are adjustable to varying heights. The tub is made of pressed light weight steel and is finished in stainless porcelain enamel. By Briggs Manufacturing Co., Detroit, Mich.

HEATING

PHYSIOLOGICAL BASIS OF HEATING

In any discussion of heating, however brief, the fact must not be overlooked that the human body, and not the dry-bulb thermometer reading, is the basic factor to be considered. The body is a generator of heat, losing it by convection, evaporation, and radiation. When the loss by any or all of these three ways is properly balanced by the heat received, the result is called comfort.

An air temperature of 70° or 72° is commonly considered comfortable. That this is not the whole story is well illustrated by some striking experiments carried out by a group of engineers who constructed two chambers into which people were admitted. In the first all agreed that they felt cold, although the thermometers showed an air temperature of over 100° F. The adjacent chamber, whose air temperature was only 50° was unanimously judged to be warmer. The explanation of this apparent reversal of normal reactions lay in the fact that in the first chamber the wall temperature was below freezing, while in the second it was almost 90°. The effect of radiation, in these two cases, more than balanced that of convection. A practical application is seen in the use of insulation and double glazing to reduce the chilling effect of cold walls. Similarly, humidification represents an attempt to balance body heat losses by evaporation. Since the universal method of heating, with the single exception of panel heating, consists of the use of warm air, whether from a central source or from room radiators, it has been realized more and more during the past number of years that insulation and humidification are necessary adjuncts to the heating of air if comfort without overheating is to be attained.

COMPARATIVE INSTALLATION AND OPERATING COSTS

Omitting from consideration individual heating units, the pipeless furnace is the cheapest system that can be installed. Changing from a pipeless to a warm air system with ducts raises the cost about 100 per cent. Of the piped systems, one-pipe steam costs least, but approximately 50 per cent more than warm air. Two-pipe vapor or hot water involves an extra expenditure of about 25 per cent. Obviously these price comparisons are necessarily approximate.

Operating costs, according to a report of the President's Conference on Home Building and Home Ownership* vary about 25 per cent between systems, with pipeless as the cheapest and one-pipe steam as the most expensive. The committee points out, however, that the factors of installation, maintenance, operation, etc., may completely change, or even reverse this order of costs. A one-pipe steam system, for example, will closely approach the economy of a two-pipe vapor system if vacuum air valves are incorporated in it. In the average house installation it is preferable to select the system on the basis of type of performance desired concentrating on efficient design, and the difference in operating cost will not, as a rule, be large enough to have an appreciable effect on the heating budget.

*House Design, Construction and Equipment, pub. Washington, D. C., 1932, by the Conference.

NG SYSTEMS

broad trends are noticeable in heating. There is increasing insistence on automatic heating; the invention of oil and gas made possible the development of plants which require little attention beyond occasional inspection. The coal industry has kept in the competition by the use of automatic stoker which feed the fire at a predetermined rate, and take care of ash disposal as well. The use of safety devices has eliminated virtually all dangers attending the use of any type of plant. One-pipe hot water systems, unduly expensive in terms of performance, have become practically extinct, although there is a possibility of new developments which bring them back into use. Two-pipe steam has given way to vapor and fractional distribution types. Flexibility, uniformity of heating effect, and automatic control are the requirements without which no system is able to compete except on a purely price basis.

PIPELESS FURNACE

As noted above, this type has the advantage of low cost. It is suitable only for small houses so planned that the air from the central register will pass with reasonable ease throughout the house.

PIPE AIR—GRAVITY CIRCULATION

Gravity circulation than pipeless. Its low cost is due to absence of expensive valves and controls, and therefore it is less likely to go wrong, no pipes to freeze, etc. Flexible, quick response to temperature changes. Much of what is called air conditioning is no more than a warm air system with a blower and humidifier attached.

ONE-PIPE STEAM

Best of piped systems. This can be a satisfactory system of installation, but it must be correctly designed and well installed. Since the steam entering the radiator and the condensate leaving must use the same pipe, the connection must always be wide open. The only control, therefore, is by the valves which govern the flow of air elimination. Uneven heating, one of the chief disadvantages of the system, is to some extent eliminated by the use of vacuum type valves. These valves, when set on a tight job, reduce the pressure throughout the entire system, creating what is in effect a vapor blanket, maintaining a more even distribution of vapor throughout all the radiators. Unless these valves are used, there will be a tendency for the most distant radiators to heat last and cool off first. A one-pipe system should not be specified unless the architect can be certain that the

design and installation will be carried out by competent engineers and contractors.

TWO-PIPE VAPOR

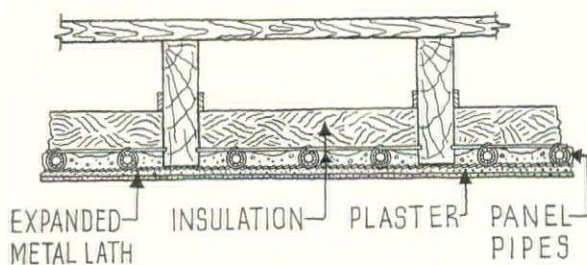
Costs more, since there is twice as much piping and correspondingly more labor. The system is designed to reduce steam pressure in mild weather, and consequently to eliminate the overheating that takes place in a less flexible steam system. It is more quiet in operation than one-pipe steam, and somewhat more economical, and since the discharge of air can take place in the basement, there is no possibility of disagreeable odors in the rooms. The flexibility and uniformity of heating provided by the system depend on the tightness with which it is constructed and upon the controls. Two-pipe vapor can run below atmospheric pressure as long as air does not leak in, after which steam pressure is required to expel the air through the return main and air vent. While most vapor systems are similar in design, there is considerable variation in the various valves and controls put out by different manufacturers.

TWO-PIPE FRACTIONAL DISTRIBUTION STEAM

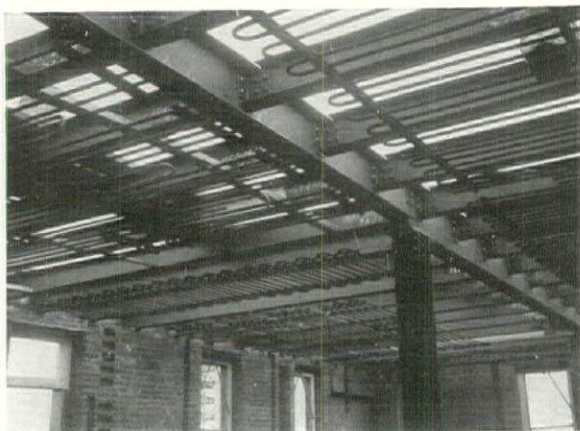
A modification which has excellent possibilities for flexibility, control, and economy of operation. Steam is distributed to the radiators which are partially filled with air at atmospheric pressure or at boiler pressure. The latter type has an air vent in the basement, operating in a manner similar to vapor systems, with the pressure above or below atmospheric pressure as required.

TWO-PIPE HOT WATER

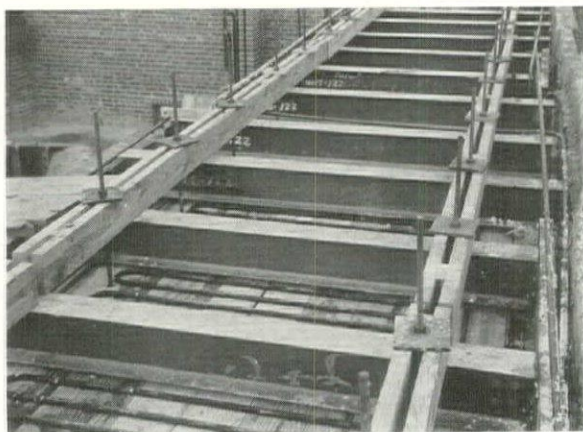
Customarily designed to operate at temperatures around 170°, the system requires larger radiators than corresponding steam installations. The low temperature hot water system with open tank, however, is giving way to closed tank systems which require less care and permit the temperature to be increased to 215°, allowing the installation of smaller radiators. The closed tank system also permits positive circulation with smaller pipe sizes than the open tank type. The use of a circulation pump on the return main will provide even better circulation, making possible further reductions of pipe and radiator sizes. The pump may be installed to provide the entire motive head, or may be thermostatically controlled for operation only during the heating-up period. With these improvements the main criticism against hot-water heating, that of sluggishness, is removed.



Section showing installation of heating pipes. Insulation of cork blocks is used above, lath is attached below, and plastering done directly on the lath. To strengthen the plaster a layer of burlap is incorporated in the plaster. Note that when installation is complete all piping is entirely concealed.



Panel heating installation in the British Embassy, Washington. Pipes were clipped to the bottom of the steel members. Note the large area covered by the pipe coils. While this produces a very even warming effect, it materially increases the cost of the system.



Top view of same pipe coils after forms were put in place. The combination of steel framing members and concrete is by no means common practice. The illustration shows, however, how panel heating coils may be laid directly on forms when concrete floor construction is to be used.

PANEL HEATING

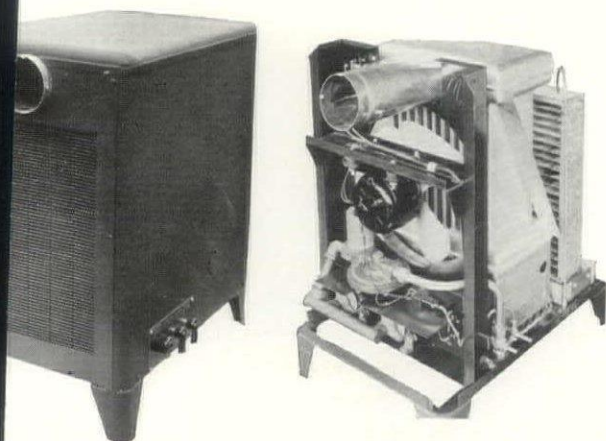
The most radical departure in heating methods since the central heating plant first came into general use is the system developed a number of years ago in England, and one of the accepted methods there, known as "panel heating." Its use in the U. S. is limited to about six installations at the present time.

Basically panel heating differs from all others in that it depends upon radiation for its functioning, whereas ordinary methods all heat the air, whether at a central plant or in separate rooms, and use these warmed air particles to transmit the heat to the occupants and to the exposed surfaces in the room. Radiant heat is independent of the air as a transmitting medium, the rays traveling in straight lines until they strike some object which partially absorbs and partially reflects them. To anyone familiar with the pleasant warmth of the sun on a winter day it will be clear that the sensation of comfort might be produced in a room whose temperature was comparatively low. Such is the case. With the average comfortable room temperature with a conventional heating system is around 72°, an equal degree of comfort will be attained in a panel-heated room with an air temperature of 65°/or lower*. It is apparent that if a comfortable air temperature is 65° and lower, there will be no discomfort and dryness than with air heated to 70° or over. Windows can be opened with more freedom, since the warming action of the invisible heat rays picked up by the skin and clothes is still effective.

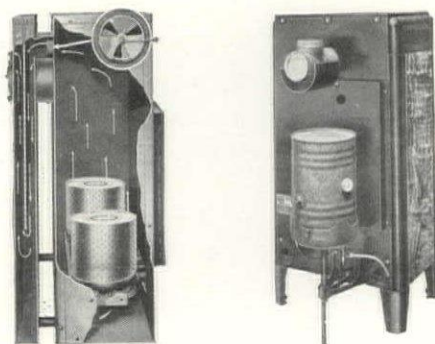
The system functions like a hot water system; it differs from radiators in that the radiators are coils of steel pipe, usually concealed in the ceiling, covered by a layer of lath and plaster. Water at temperatures of 90° to 130° is circulated through these pipes, which, warm the plaster surface, the latter, in turn, radiating the heat downward. (Heat traveling downward seems strange until one remembers that with the usual system it is not the heat that rises, but warmed air.) Since the plaster is not perfectly flat, and heat rays go in a direction perpendicular to the radiating surface, they are sprayed, to speak, over the entire room. As the surfaces upon which they impinge are warmed, these warm the air, but never to the degree that takes place with a warm-air system.

Apparently the chief reason panel heating has been so rarely used in the U. S. is its cost. It is about 50 per cent more expensive than a good vapor job; it has to be designed by a competent engineer, and it must be of the finest quality of material and workmanship, since a breakdown means ripping out entire ceilings. It can, however, show savings as high as 25 per cent, due to economy of operation, and to reduced heat losses. Some heating engineers believe that the warming action of the panel will cause the formation of a layer of warm air, which in low-ceilinged rooms will cause discomfort. There has been insufficient experience in this country to pass judgment on the system; abroad, particularly in England, its undoubted advantages of complete concealment, low air temperatures, and pleasant warming effect have led to its wide use.

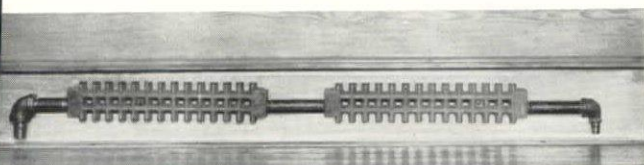
*See "Panel Heating in the British Embassy" by Alfred L. Jaros, and Richard A. Wolff, *Heating and Ventilating*, June 1930.



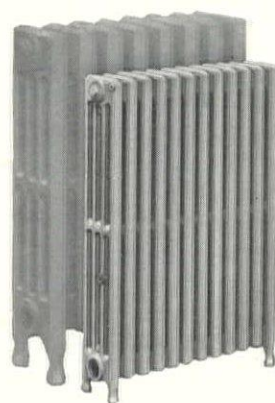
ROOM HEATER. A room heater, gas fired, with circulation fan and louvers to direct warm air towards the room. Operates on electric switch and pilot light, with gas control. Stack connection required. Trane Co., Milwaukee, Wisconsin.



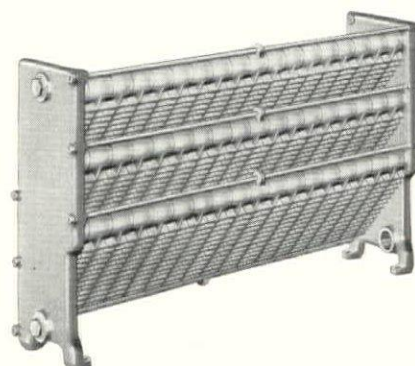
ROOM HEATER. An oil burning heat circulator equipped with ring-type burners. Combustion chamber separated from air chamber so that heated air has no contact with fuel. Norge Division Borg-Warner Corp., Detroit, Michigan.



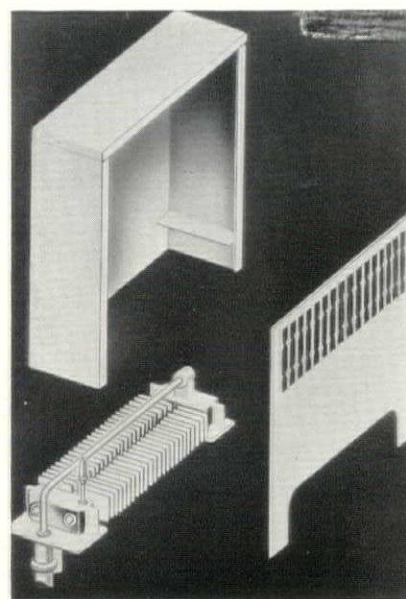
RADIATOR. A variation of usual radiation methods consisting of very low hung radiator units recessed in the wall. There is no flue chamber as in convector units, a reflecting shield being used instead. Slater Manufacturing and Engineering Co., Boston, Mass.



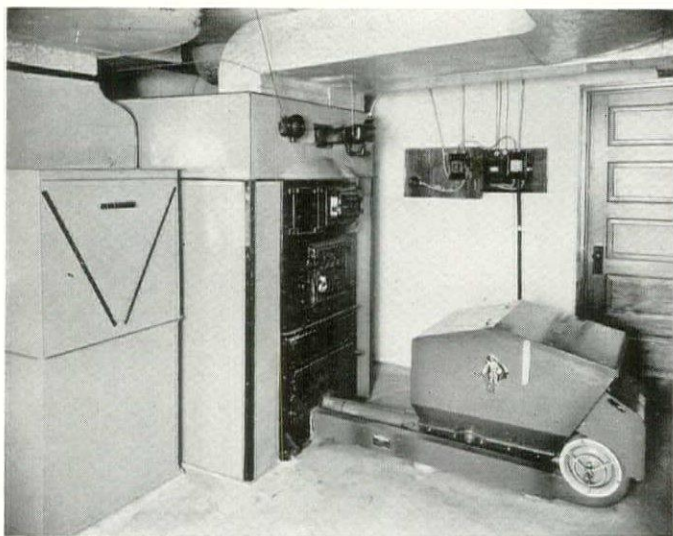
CAST IRON RADIATOR. New radiator, shown with standard model of a few years ago, illustrating tendency towards more compact units. Depth $3\frac{1}{4}$ " for 3 tubes, $4\frac{7}{16}$ " for 4 tubes. Burnham Boiler Corporation, Irvington, N. Y.



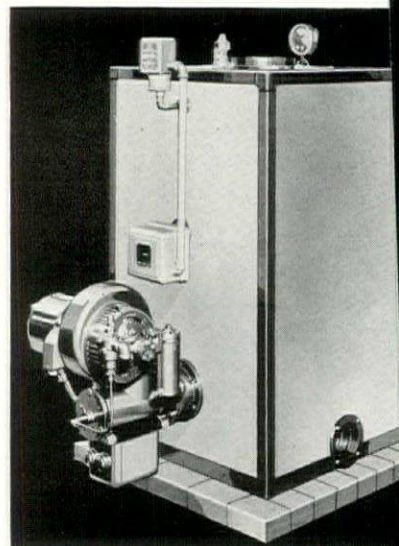
CONVECTOR TYPE RADIATOR designed for semi-indirect use with steam or water. Integral fins are arranged at an angle to facilitate convection of steam, water, and air. National Radiator Co., Johnstown, Pa.



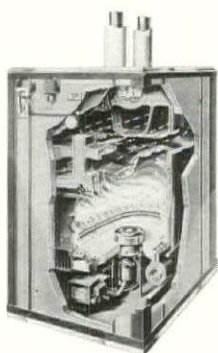
CONVECTOR designed specially for one-pipe steam systems. Detail of connection header provides for bypass separating supply and return thus giving one-way flow advantage of two pipe system. Damper for control of air circulation is available. Commodore Heaters Corp., New York City.



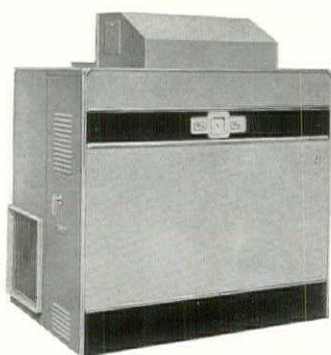
AUTOMATIC STOKER. Designed for use with hot water, steam, vapor, or warm air heating systems, this stoker shows the tendency in basement equipment design to enclose machinery in simple metal casings wherever possible. Combustioneer, Inc., Springfield, Ohio.



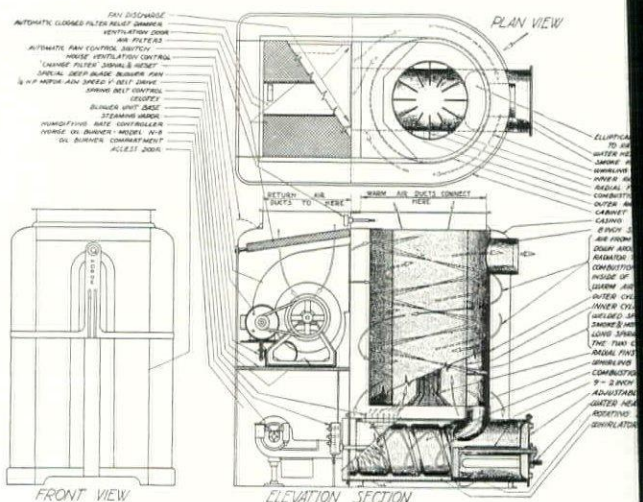
ARCO PETRO JUNIOR BOILER. A small boiler for heating and domestic hot water for small houses features an unusually low water line which avoids condensations in basement radiation and necessity of pit or condensate pump. Petroleum Heat and Light Co., Stamford, Conn.



BOILER-BURNER. A combination unit including both burner and boiler. The burner has a simplified system of operation claimed to increase quietness and efficiency. The Timken Silent Automatic Company, 100-400 Clark Ave., Detroit, Michigan.



OIL BURNING FURNACE. A combination providing tankless domestic hot water heater, boiler for heating system; also equipment for filtering air, humidity control, and air circulation. May Oil Burner Corporation, Baltimore, Maryland.



OIL BURNING FURNACE. A new warm air furnace with burner, blower, air filter, and humidifier. Like similar units on the market, it has provisions for cooling if desired. An adjustable hot water heater is part of the equipment. Norge Division Borg-Warner Corp., Detroit, Michigan.

IRING

SERVICE CONDUIT

Carries the current from the source (either private or public) into the house. The size of this conduit is generally figured per square foot of room area. Special allowance has to be made for installations of electric air conditioning equipment, electric water heaters, ranges, radios, etc. Four watts per square foot is considered a minimum. Twenty watts per square foot is not too high if planning for a complete future electrification of the house.

METER BOARD

Is located near the point where the service conduit enters the house. A main service switch is usually installed on the board to allow a complete cut-off of the current. An individual power meter is installed where a special power rate is established.

PANEL BOARD

On the panel board are located the main service fuse and the fuses for the individual branch circuits. Circuit breakers are rapidly superseding fuses. They eliminate the necessity of exchanging fuses and, since they work only for the originally designed load, "overloading" is avoided.

BRANCH CIRCUITS

Carry current to the individual parts of the house. Lighting, large appliances and power have to be kept separate. Each room should have two independent circuits.

ORDINARY appliance branch circuits take care of appliances rated at not over 12 amperes, like irons, toasters, etc.

MEDIUM duty appliance branch circuits takes care of appliances rated at 15 amperes (kitchen, bathroom, laundry).

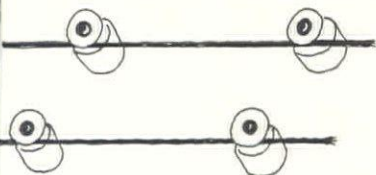
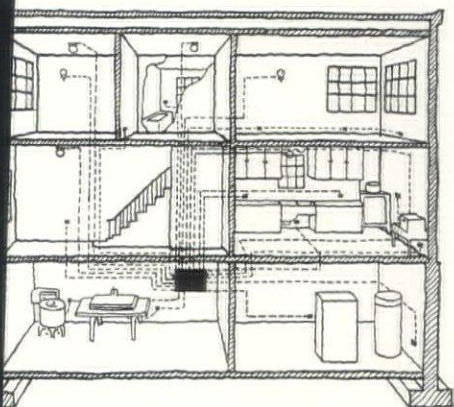
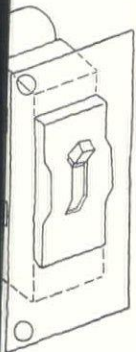
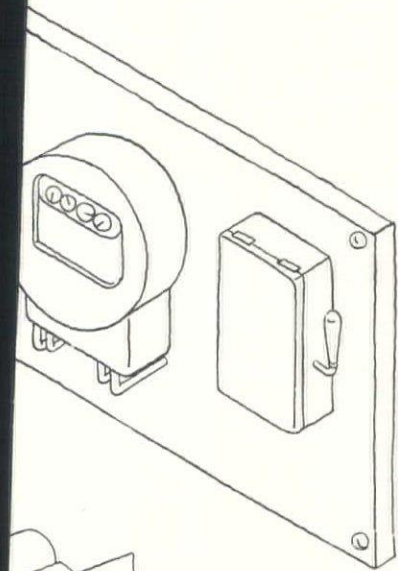
HEAVY duty appliance branch circuits are used for 20 amperes (electric ranges).

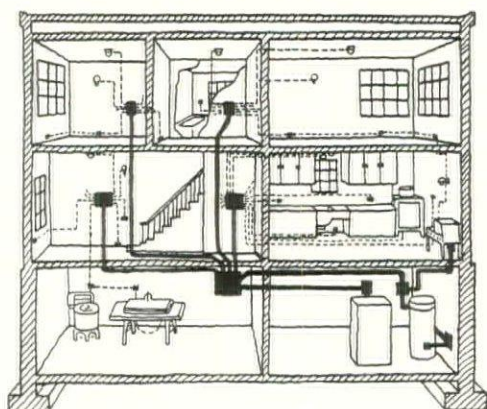
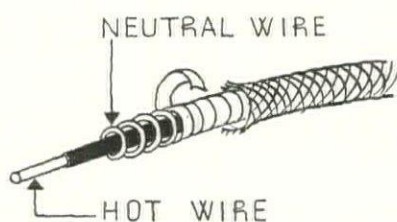
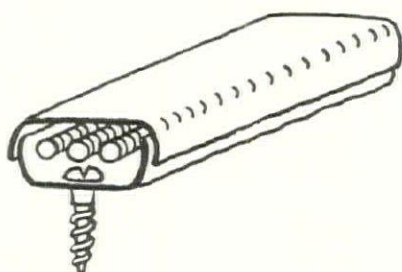
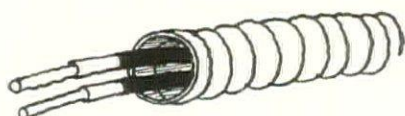
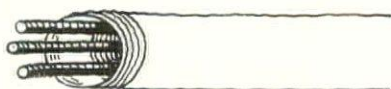
POWER circuits are needed for heating and air conditioning equipment, pumps, etc.

Spare circuits should be provided for additions and alterations.

WIRING SYSTEMS

KNOB AND TUBE. The oldest surviving and simplest wiring system. Rubber insulated, single wire is carried along on porcelain knobs. When the wire has to pass through walls, beams, etc., porcelain tubes are inserted. Wires have to be kept 5" apart and 1" away from the surface on which they are mounted. The system is extensively used in frame construction, is cheap and considered safe by the codes.





RIGID CONDUIT. Enamel paint inside and outside varnized. These are seldom used in small residences. It is installed first and the wire drawn through after. Additional wires are easily inserted. Flexible conduits of one or two metal strips wound so that they interlock form a "goose neck" pipe.

ARMORED CABLE. Called "BX." A flexible metal sheath wound over two rubber insulated wires. It is run from outlet to outlet. The system is the most common in residences. Installation costs are lower than for conduits but alterations are more difficult. An extra heavy type, "BXL," has a lead sheath.

Another flexible cable is the "Braid X" non-metallic sheathed cable, designed on the same principle as "BX" but with a braided fibrous protective surface. This type is also capable with a third wire for grounding. All these flexible cables are run from outlet to outlet without joints or spliced-in connections.

SURFACE WIRING. Surface metal or rubber raceways are installed exposed on wall or ceiling. The most frequently used is a shallow tubing in two pieces, one of them snapping into the other which in turn is fastened to the wall. Newer systems tend to revive this old type of wiring. The conductors are embedded in rubber and outlets are arranged in several fashions (see below). Several types of metal base board are under this classification. They have a removable front cover and have space inside for any required number of wires. They have thus far been used mostly in offices but further developments will probably make them available for homes.

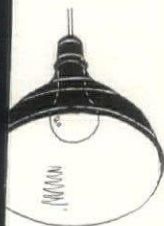
BARE NEUTRAL WIRING. A low cost small diameter concentric cable. The feature embodying an exposed base neutral has not yet been approved by the codes. The system is being tested by the Underwriters' Laboratories. It is believed best for low-cost residences. The concentric cable consists of an insulated hot wire around which is wrapped an insulated stranded neutral, the whole being enclosed in a plastic and braided cover. This cover should eliminate the objections made to exposed base neutrals. New types of boxes, cabinets and clamps are required; switches and convenient outlets are standard. Because of its small size it is as suitable for surface wiring as for concealed. The system would depart from conventional layout in that several fuse cabinets would be placed throughout the house, each being fed from the main panel board. This would provide circuits, none of which would be very long or heavily loaded.

RADIAL WIRING SYSTEM developed by the General Electric Co. This system deviates from the conventional system in that individual risers lead from the distribution center to individual sub-circuit breakers from which branch circuits run out. In a five-room house, four points of sub-control would be installed besides the separate controls for heating and conditioning, warm water heater and range. The advantages are that a future full electrification of the house can easily be installed, that the electricity is efficiently carried to appliances and outlets with a minimum loss of current, and that overloading of a circuit is hardly possible and easily remedied if it does occur.

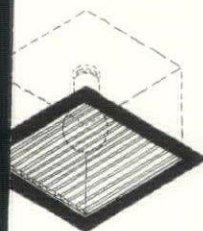
LIGHTING



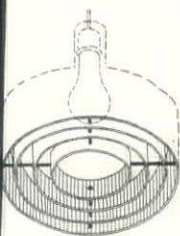
The incandescent lamp is the starting point of today's lighting. All satisfactory methods must include some way of shielding the eye from the intense glare of its filament. This powerful light source cannot be treated as if it were a candle.



Localized direct lighting. The shade must be set low to protect the eyes. The light is ample but tends to cause eyestrain due to glare and excessive contrast. Use of translucent shade reduces contrast, but not the harshness of the light on horizontal surfaces.



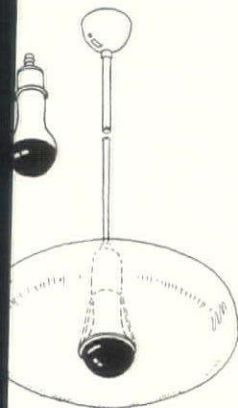
When a diffusing element is introduced, the quality of direct light is greatly improved. Lenses are available to control the spread. This type of lighting, if concealed in ceiling, is effective and unobtrusive.



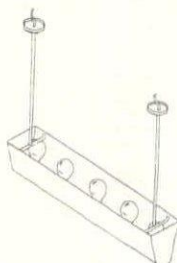
A most satisfactory means of controlling direct light without the use of a diffusing medium. The bands of metal permit the rays to pass directly downward, but conceal the lamp from view. With a silvered bulb this becomes an indirect lighting fixture.



Increasing the amount of luminous surface decreases glare. Thus a frosted lamp is better than a clear one, and a globe continues the diffusing action. This type also has a component of indirect light. There are innumerable varieties on the market.



Indirect light depends upon reflecting surfaces. Troughs, coves, etc., lose efficiency when dust settles in them; the silvered lamp, with a hermetically sealed reflector, eliminates this deficiency. Most satisfactory for general illumination, indirect lighting costs vary widely.



In no field has the house been so neglected as in that of lighting. Proper illumination is as important for physical well-being as proper sanitation or heating, but the lighting of the American home of today is in most cases an offense to the eye and an insult to the intelligence.

Where good lighting has been translatable into terms of money, either as dollars saved or extra profits, there have been notable advances. Factories, stores, and other commercial structures furnish numerous examples. Yet the house, amid these developments, has been ignored with remarkable unanimity by manufacturers and architects alike.

The subject of lighting is enormously involved, as any textbook will reveal, and the mass of data available to the architect is overwhelming. As far as residential lighting is concerned, this material can be boiled down to a few fundamentals. The first and most important is that the human eye, coupled with the nervous system, is the criterion by which lighting must be judged. Research has indicated that ideal illumination is furnished out of doors when the sky is somewhat overcast; this conclusion was reached *because under these conditions the eyes functioned efficiently for the longest period of time.*

The basic problem of lighting by artificial means, therefore, is to provide, as unobtrusively as possible, a certain necessary quantity of even, glareless illumination. Note that this has nothing to do with the ornamental design of fixtures: too much ingenuity has already been squandered on these devices. The manufacturer of plumbing fixtures who displayed highly elaborated lavatories in which the simplest essentials of plumbing had been neglected would be laughed out of business overnight. The analogy has not thus far applied to lighting. Once the basic problem of furnishing correct illumination is solved, however, there is no reason for neglecting the decorative aspects of lighting, but the consideration is secondary. Up to date the order has been reversed.

When the eye is suddenly confronted with a brightly illuminated object, the pupil contracts; when the object is removed, it expands again. In a room where the illumination ranges from very dim to very bright this expansion and contraction goes on continually. The result is fatigue and eyestrain. It does not take pages of graphs and calculations to indicate that the remedy lies in the lessening of contrasts and elimination of glare. The architect can easily, with the aid of common sense and a light meter, give his client a lighting arrangement that is infinitely better than anything found in the average home today. Consultation with a lighting specialist will spare him time and mistakes.

At the present time there are indications that residential lighting is shortly to undergo radical changes for the better. The Better Light-Better Sight campaign now under way centers around an efficient portable lamp which has met with great public approval, and is doing much to create interest in better illumination. The acceptance of the modern house should tend to raise lighting standards, because this type of dwelling imposes no stylistic requirements to interfere with the design of suitable lighting equipment. The increased use of indirect lighting in theaters, restaurants, and similar places will also contribute much to appreciation of proper illumination in the home.

RECOMMENDED LIGHTING INTENSITIES

Adequate illumination does not mean that the entire house must be brightly lighted. General illumination in rooms where no reading, sewing, etc., takes place may be under 5 foot-candles, provided that there are no glaring light sources to cause too great a contrast. There should always be provision, either through fixtures or portables, for pro-

ducing a general level of illumination of about 10 foot-candles. Localized lighting, from 10-100 foot-candles, is always required in addition to general illumination when reading or writing is to be done.

The following table of lighting intensities, recommended by the Illuminating Engineer-

ing Society, is necessarily approximating lamp wattages are also approximating should be taken as general rather than specific recommendations, since the design, and efficiency of fixtures vary greatly. It is assumed that the figures would apply to rooms of average size, light ceilings and light-colored wall-

	foot-candles	
LIVING ROOM, GENERAL ..	3—10	The lower levels are suitable for conversation, etc. Where a ceiling fixture is used at least 200 watts; 400 watts suitable for portable units.
READING AND WRITING,		
ORDINARY	10—20	A portable with a 100-watt lamp and a diffusing glass is sufficient. For higher intensities semi-indirect portables using 400-450 watts are excellent.
PROLONGED, OR FINE		
TYPE	20—50	
DINING ROOM	10—20	If central fixture is used, allow 150-200 watts. Fixture should give direct light on table as well as indirect light. Some measure of indirect light must be provided if candles are used.
BEDROOM, GENERAL	2—5	100-150 watts in central fixture, if any. Provide bed lamps with 60-100-watt lamp.
LOCAL (READING)	10—20	
KITCHEN, GENERAL	5—10	Light-colored walls and ceiling are necessary. A central diffusing globe or indirect fixture with a 150-watt lamp will furnish ample general illumination. Fixtures for sink, stove and refrigerator should have 40 to 60-watt lamps.
WORK CENTERS	10—20	
BATHROOM (SIDE LIGHT ON		
FACE)	10—30	Light at mirror will illuminate the room. Two lamps of 40 or 60 watts. For dressing table two lamps of 40 or 60 watts.
SEWING ROOM, LOCAL ..	20—50	Use a 100-watt lamp with diffusing glass or louvers. For the highest intensities, additional general illumination is necessary. Semi-indirect portables using 400 to 450 watts are satisfactory.
CHILDREN'S ROOM.		
GENERAL	5—10	Lighting in children's rooms should be designed with particular care. A central fixture preferably totally indirect, with 100-200 watts should be provided. A bedside lamp of 40 watts is also desirable. For reading, a portable of the type recommended by the Illuminating Society should be furnished. Prolonged study requires a portable plus bright general illumination from central fixture.
LOCAL	10—20	
STUDY	20—50	
FINE WORK, EMBROIDERY,		
ETC.	50—100	Direct lighting unit, with 100-150-watt lamp and diffusing glass, or other means of screening lamp, plus high level of general illumination.
STAIRS	2—5	Wall or ceiling fixtures, using 40 to 100-watt lamps, are sufficient.
LAUNDRY	10—20	Two fixtures are needed. One should be over tubs, other over ironing board. Diffusing globes, each with 150-watt lamps, are satisfactory.
CLOSETS	5—10	A lamp of sufficient brightness to illuminate the far corners is desirable. 60-watt lamps are adequate in most cases.

GUIDES IN THE DESIGN OF RESIDENTIAL LIGHTING

INTENSITY: See above table.

GLARE: The commonest source of glare is the exposed lamp. No lamp, whether frosted or clear, should ever be unscreened. Diffusing globes, shields of opaque or translucent materials, louvers, and all forms of concealed, built-in lighting are calculated to protect the eye from a direct view of the lamp. Smooth reflecting surfaces are also likely to cause glare unless precautions are taken. Enamels and varnishes should be used with discrimination where walls and ceilings are used to reflect and diffuse light. A matte finish for ceilings is generally preferable where there is a central fixture. Glare from table tops, coated paper, etc., can be avoided by using more indirect light, and also by covering direct light sources with diffusing materials.

QUALITY: Excessive contrast should be

avoided. General illumination should not fall to less than one-tenth the intensity of the most brightly lighted portions of the room. Lighting should be as nearly shadowless as possible. Shadows cast by furniture near lamps will be transparent if fixtures and portables are of the indirect or semi-indirect type. The so-called "daylight lamps" are useful where prolonged reading or other work causing eye fatigue is to be done. They furnish a much more restful light than the usual type of lamp. The natural yellow of most lamps is frequently intensified by the use of warm-colored shades, and the light given off by these fixtures is fatiguing and even harmful if used for long periods. The use of colored lamps in the home is a practice which requires much skill and discrimination, and in most cases might just as well be avoided.

WALL COLORS: Interior finishes must be

considered in the design of lighting. A face painted white will reflect about 90 per cent of the light thrown on it, whereas a dark color will reflect only about 10 per cent. Consequently the color of a room, whether papered or covered with paper, fabric, or wood, is very important. Light colors, such as ivory, light green, pink, and gray, will reflect 50 per cent to 70 per cent of the light. Dark red, blue, and green are unsatisfactory reflectors. Metallic paints have a fairly reflecting value, but do not diffuse the light as evenly as white, and are apt to cause glare. Where dark-colored walls and fixtures predominate it is advisable to use a light-colored ceiling with indirect or semi-indirect fixtures. Wall fixtures, in dark-colored rooms, are useless for lighting purposes. Portables should be well shaded, as they have a tendency to stand out strongly in dark interiors.

BUILDING MONEY

**A monthly section devoted to reporting the news and activities
of building finance, real estate, management and construction**

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JOHN CUSHMAN FISTERE
Editor



V. J. Wonderly

Men of the Month I. FRIEDLANDER (above) and LEGRAND WARREN PELLETT (see page 632)

UNITY OF MORTGAGE LENDERS

is a hope held out at the U. S. Building & Loan League's annual session; Pellett of Newburgh succeeds Friedlander of Houston as the group's new president.

THOUGH they share a common denominator, the four trustee institutions which do the bulk of the nation's mortgage lending have never seen eye to eye. Particularly during the last three years in the framing of mortgage lending policies of the U. S., have they fought each other bitterly. The result has been that all are facing competition from a new source—the U. S. Government.

If there were no other reason to join forces for mutual aid, the threat of direct Government lending would be reason enough for them to drop their suspicions of each other and show a united front against the common foe. There are, however, dozens of other reasons why the mortgage lenders of the U. S. should pool their activities in the permanent reorganization of the mortgage market.

Last month, following an informal invitation to the U. S. Building & Loan League in convention at Cincinnati, it appeared that 1936 might see insurance companies, savings banks, trust companies, and building and loan associations sharing their problems and working out a common solution. The invitation was extended by R. Graeme Smith, aggressive executive of the Connecticut General Life Insurance Company, who suggested that a committee composed of members of all four groups unite in their efforts to stabilize mortgage lending practices in the U. S.

Acknowledging his lack of authority, but obviously representing the sentiment of the major life insurance companies, Smith proposed that the four groups jointly undertake the following:

(a) Research work on city planning, prefabricated houses, the growing pace of the style factor in buildings of all types as it affects the rate of obsolescence on current structures; (b) agreement on minimum standards of construction which will qualify for mortgage credit; (c) a compilation of opinions on the proper spheres wherein Government agencies can and should naturally supplement and complement the private trustee institutions; (d) a joint study of costs of title search, and lost time in real estate transactions.

Further than that, he urged the periodic bringing together of representatives from all trade associations representing trustee institutions, and the encouragement of a "high class trade paper covering all com-

ponent parts of the real estate financing structure."

Convention. No ordinary meeting was the 43rd Annual Convention of the U. S. Building & Loan League. Attended by more men than have met together since 1929, the convention reflected the new spirit of optimism that is pervading all mortgage lending. In his 39th annual report Secretary Herman F. Cellarius reported that on January 1, 1935, there were 10,920 building and loan associations in the U. S., with borrowing and saving members totaling 8,370,146. Volume of new loans made during the year showed an increase over the previous year for the first time since 1929, a total of \$462,000,000 having been disbursed by all associations.

That building and loan associations are more deserving of respect than they were entitled to in the "era of anything goes" was apparent in the increase in surplus and undivided profits to 13.3 per cent, as compared with 7.36 in 1933, and 4.27 in 1932.

President. Moving in its customary manner of electing the first vice president to the office of president, the convention named as its 1936 leader Legrand Warren Pellett, Newburgh, N. Y., building & loaner. Of Revolutionary stock, President-elect Pellett is secretary-treasurer of the aged Building & Loan Association of Newburgh. Active in the business for nearly forty of his fifty-odd years, President Pellett has been a frequently heard voice in shaping the association's attitudes.

Like many another building and loan man, he has other rows to hoe, notably an insurance and real estate business that bulks large among upstate New Yorkers. A one-time president of the Izaak Walton League of New York, he knows every bend and turn of the Catskill creeks. He is equally active in the affairs of his city, having once been president of the City Council and a member of the city's planning commission.

President Pellett takes over the reins of office at a time when the U. S. Building and Loan League is at the peak of its prestige. During the past four years the League has won a series of legislative victories in Washington that can match the lobbying success of any other trade group. No small contributor to the high standing

of the League is the retiring president, Israel Friedlander of Houston's General Savings and Building Association.

If he had not the distinction of being League's president, he would be a standing building and loaner in his right. His association has initiated advances in lending practice, among them the much discussed variable interest rate plan. (ARCH. FORUM, 1935, p. 68.) Chairman of the board of his regional Home Loan Bank, he is one of the leaders in having the Home Loan Banks established and he has much to overcome the reticence of his colleagues in joining the bank system. He is short and heavy-set, and looks not like the astute coordinator of mind and action that he really is. He is one of the few building and loan men with a reputation outside his immediate business.

Like his immediate predecessors of the past few years, Pellett's work will be carried out for him by the able, ambitious Executive Vice President of the League, Mel Bodfish, generally regarded as the most astute Washington lobbyist in all the building field. Convinced that building and loan associations are the premier financing agencies in the U. S., Vice President Bodfish, through his understandable partisanship, has won the cordial dislike of nearly all agencies which represent other mortgage lending building agencies in Washington.

In a speech Vice President Bodfish discussed the possibility that the Home Owners Loan Corporation might become a permanent organization. Pointing to the experience of the Farm Credit Administration, he warned that agencies which are set out to help only the man who cannot help himself usually wind up by usurping the business of normal agencies.

Fahey. Not unlike Daniel, who had good reason to believe the lions would be friendly, Chairman John H. Fahey of the Federal Home Loan Bank System was invited into the Convention to report on the Government's aid in home financing. Under Daniel, Chairman Fahey found the gates as unfriendly when he left as when he arrived. Whether it is true or not, most of the members of the U. S. Building and Loan League are convinced that Mr. Fahey is not on their side. Whatever they disagree about him, they must have admired

in warning them that the thing dreaded, lowered mortgage interest was inevitable. He said in part: "There are who are disturbed over the fact that the Bank System is making loans available to members at 3 per cent. I fear that as a result borrowers will get lower charges on home mortgages. Lower rates on such mortgages are all over here and are being made effective in most sections of the country. Competition for sound mortgages is springing every day. Rates on such mortgages will of course be influenced by local conditions but generally speaking our abundant monetary resources are such that comparatively low rates of return on loans and investments are in prospect for years to come. Where can you turn to find a bond or other security that can be depended upon to yield 5 per cent and which compares in value with the sound home mortgage? I am sure that the rates paid to savers should be so low as to discourage thrift, nevertheless, if the lending institution obtains money as a whole at lower rates it is a part of wisdom to reduce charges to borrowers if it wishes to retain and expand its business. It is the reason for the spread between the average cost of money and the rate at which it is loaned in all countries."

Whatever hopes the b. & l. institutions of the U. S. have for getting on amicably with the Government are largely resting on the shoulders of Al Preston Delano, newly appointed Governor of the Federal Home Loan Bank System. Upped from his position as general manager of the Home Owners Loan Corporation, Mr. Delano's new title was specially created for him. He frequently said that the Federal Home Loan Bank System is to home mortgage what the Federal Reserve System is to commercial lending. Thus Mr. Delano's position is like Governor Eccles of the Federal Reserve Board. The non-existence of a special Governor for the Federal Home Loan Bank System was due to the fact that the Federal Home Loan Bank Board had never gotten around to filling the position; it was too busy with emergency work of the Home Owners Loan Corporation. The appointment coincided nicely with the growing impression that the Federal Home Loan Bank System is on its way to becoming the most important unit in mortgage finance. Already its 3,500 members, with assets of \$50,000,000, have an average borrowing under \$100,000,000.

In his address at the Convention, Governor Delano excited his listeners by pointing out the possibilities of growth which the association had by using the facilities of the System. He outlined for them the various types of plans made, pointing out the low interest

rates permitted enough of a spread to make use of the System's money profitably. And he explained in detail the ten or more different kinds of loans, ranging from short term unsecured notes to the long term amortized type.

Other highlights of the convention were the annual report of retiring President I. Friedlander from Houston, who voiced the sentiments of his constituents in mixing praise with blame for the Administration in Washington.

A curious commentary on the attitude of the delegates was their apparent willingness to accept the Government's aid in one hand and to deal out vicious wallops with the other. Speaker after speaker ranted against the Government in business, and yet none opposed the Federal Home Loan Bank System, nor deplored the fact that the action of the Home Owners Loan Corporation in refinancing their poor mortgages had put many of the listeners on their feet.

A sad note of the convention was the abandonment of the proposed half million dollar advertising campaign contemplated by the League. Apathy of members in contributing their share of the expense led to the probable permanent postponement of the campaign which was designed to sell the building and loan idea to the U. S. through newspaper, magazine and radio advertising.

1935's HOUSES

forecast the trend of residential construction for 1936.

IMPORTANT to the building industry in guessing what kind of houses U. S. home owning aspirants will want next year is knowing what kind of houses home owners built last year. THE ARCHITECTURAL FORUM's October issue, containing 101 houses built under the supervision of architects, provided a good clue. So interesting did Engineer Thomas A. Turner

of South Orange, N. J., find them that he compiled an analysis for different sections of the country.

Surprises were few. Not the least was the discovery that 30 per cent of the houses had air conditioning of a sort. Ten per cent of the houses cost less than \$5,000, 36 per cent from \$5,000 to \$10,000, 26 per cent from \$10,000 to \$15,000, and 17 per cent costing \$15,000 and over.

Eight per cent of the houses were built for less than 25 cents per cubic foot, 17 per cent from 25 to 30 cents, 24 per cent from 30 to 35 cents, 13 per cent from 35 to 40 cents, and only 15 per cent were erected at a cost exceeding 40 cents per cubic foot.

For foundation walls, poured concrete was used in 49 per cent of the houses, reinforced concrete, 6 per cent; various types of cement blocks, 21 per cent; stone, 16 per cent, and brick or hollow tile was used in 7 per cent.

Wood still seems to be the universal choice as a framing material with 74 per cent of the houses thus framed. Twenty-three per cent were built of masonry and 3 per cent were framed with steel.

Exterior finish materials were divided thus: masonry or brick, cement, concrete block or stucco, 44 per cent; wood shingles and clapboard, 35 per cent; combination of wood and masonry, 20 per cent.

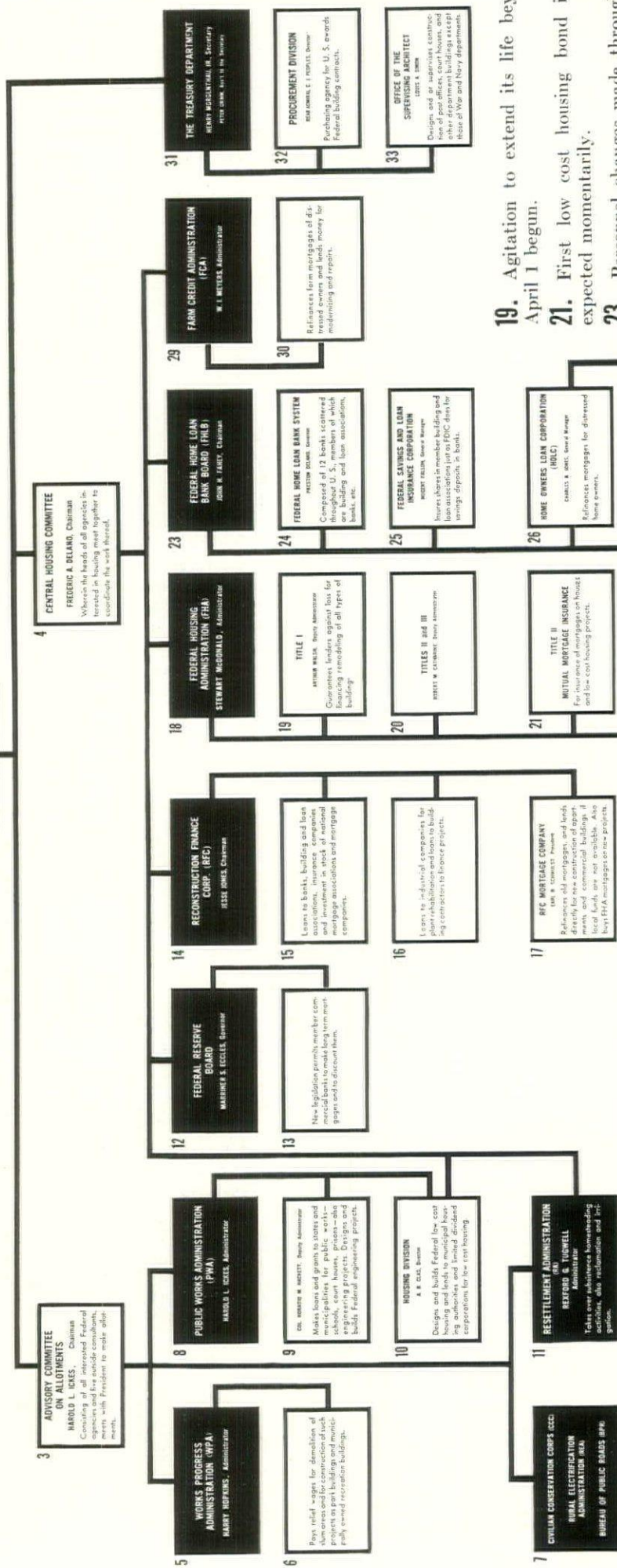
For the roof 54 per cent of the houses used wood shingles, 17 per cent slate, 14 per cent composition or built up roof, 6 per cent tile, 5 per cent asbestos or asphalt and 4 per cent metal.

The following table gives the cost per cubic foot and various structural data for a composite house for the entire country and a composite house for each geographic district. Because the median costs and cubage are figured in accordance with the number of houses for which the information was reported, there is a slight difference between the reported median cost and the cost per cubic foot multiplied by the cubage.

	<i>Composite N. Atlantic</i>		<i>South</i>	<i>Mid-West</i>	<i>South West</i>	<i>West</i>
Median cost	9,671	9,464	8,325	12,499	11,250	8,437
Median cube	29,250	26,500	27,500	35,000	42,500	30,000
Median cost per cu. ft.	32.8c.	33.3c.	27.5c.	35.5c.	32.5c.	29.0c.
Foundations	Concrete	Concrete or brick	Concrete	Concrete	Concrete	Concrete
Structural frame	Wood	Wood	Wood	Wood	Wood	Wood
Exterior finish	Wood	Wood	Brick	Wood	Stucco	Stucco
Roof	Wood shingles	Wood shingles	Tile	Wood shingles	Wood shing. or compo.	Wood shingles
Fuel	Oil	Oil	Coal	Oil	Gas	Gas
Water pipe	Brass	Brass	Copper	Brass or Copper	Steel or gal. iron	Steel
Air conditioning	No	No	No	Yes	No	No
Weatherstrip	Yes	Yes	Yes	Yes	Yes	No
Insulation on walls	None	Loose fill or batt	None	Quilt loose fill	None	None
Insulation on ceiling	Loose fill or batt	Loose fill or batt	Loose fill or batt	Loose fill or batt	None	None
Lath on walls	Board	Metal or board	Wood	Board	Metal	Wood
Lath on ceiling	Board	Metal	Metal	Board	Metal	Wood

A Composite of the 1936 House

WASHINGTON'S BUILDING BATTALION



MOVES OF THE MONTH

2. An assistant directorship of NEC gave Peter Grimm more gold braid and epaulets, which are the liaison officer's requisite.

4. Formed to coordinate U. S. housing activities. A typical November session discussed legal aspects of the Controller General's ruling on management (see 10, below). Committee members mostly sent their lawyers.

10. By November 8 had added five new projects to the 52 which THE ARCHITECTURAL FORUM listed last month. Enid, Okla., Evansville, Ind., Puerto Rico, Schenectady and Toledo were the beneficiaries. To Controller General McCarl's disallowance of its right to retain private housing authorities, on which it has a firm thumb. Less pleased by a stop-order on payment of taxes to cities, Director Clas hesought Atlanta's for...

19. Agitation to extend its life beyond April 1 begun.

21. First low cost housing bond issue expected momentarily.

23. Personnel changes made throughout its entourage. New post of Home Loan Bank System governor created for Preston Delano, former General Manager of HOLC. Nugent Fallon made General Manager of savings and loan insurance. In HOLC, Charles A. Jones replaced Delano as General Manager, and three Deputy General Managers were named: Charles F. Cotter, formerly of Boston, in charge of loan servicing; Col. Harold Lee, formerly of New York, in charge of property management; and Donald H. McNeal, former General Manager of HOLC's Recondition-

AN AIR CONDITIONED \$7,500 HOUSE

to launch a Pittsburgh suburban development;
it completes a banner year.

acre of improved ground and a five-
house with year round air condition-
or \$7,500 is an offering that would find
ers in the majority of U. S. cities.
only it has in the Pittsburgh suburb
Braddock where a wholesale grocer has
successfully turned developer with that as
stock in trade.

because the land was cheap Grocer F.
Bishoff a few years back bought 80
on the William Penn Highway,
ve on one side and 68 on the other.
what he wanted to do with it Mr.
off did not know until this year when
decided to build a house for himself
discovered that he wanted neighbors.
progressive as any large city mer-
t, he has been using mechanical
geration in his store for nearly 25 years.
s proud, too, that he "owned the third
room in the Braddock district and the
th commercial truck that came to
burgh." Last year he installed a unit
er in his office.

when he decided to build a house for
self he was already convinced that air
conditioning would be a part of its mechan-
equipment. His own house completed
cost of \$7,500, Mr. Bishoff started a
nd house which he opened last month.
entering his selling campaign around the
that the house was completely air
ditioned he had sold it before comple-
and also sold the ten other lots on
side of the William Penn Highway. A
ous fact is that none of the other ten
ers has so far chosen to air condition
house.

as a land user, Mr. Bishoff is making

only one contribution to current practice:
he is insisting that no plot be less than one
acre. This in the \$7,500 price class is some-
thing of an innovation.

The two houses are of stone and clap-
board exterior, modified Colonial in de-
sign. Unaccountably, a window has been
placed in the middle of the double chim-
ney. Aside from that, Architect F. B.
Milligan has done a creditable job.

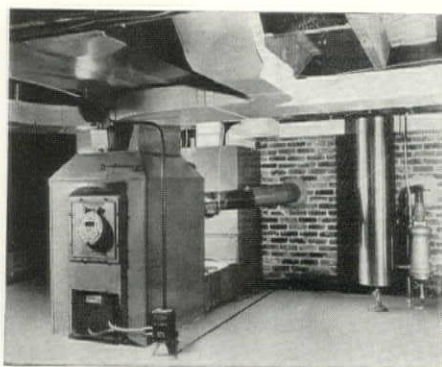
The air conditioning plant in the first
house consists of a 1½-hp. York Freon
water cooled condensing unit, connected
with an air conditioner that is built into
the furnace in the basement. The air is dis-
tributed through ducts with grille outlets
in every room in the house. The cooling
system was installed for approximately
\$745. In the second house, to reduce the
cost, the zone system of air conditioning
was used, making it possible to condition
the air in the living rooms in the day and
the bedrooms at night. By this means the

plant was reduced to 1 hp. capacity. Both
houses are insulated with four inches of
rock wool.

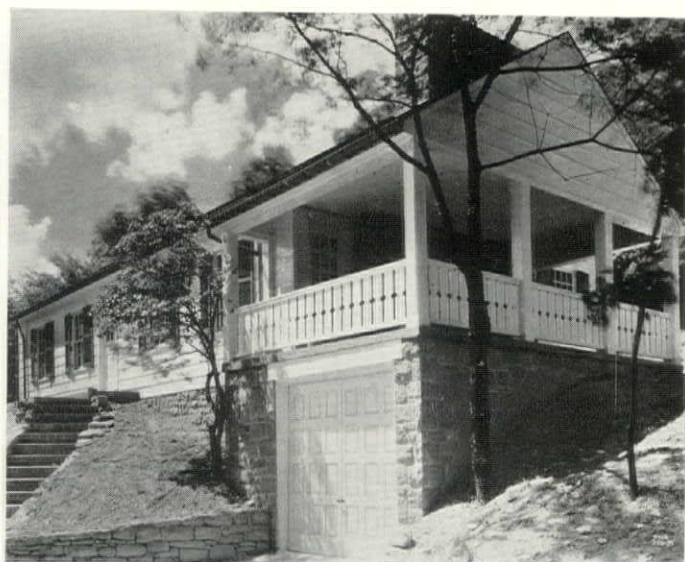
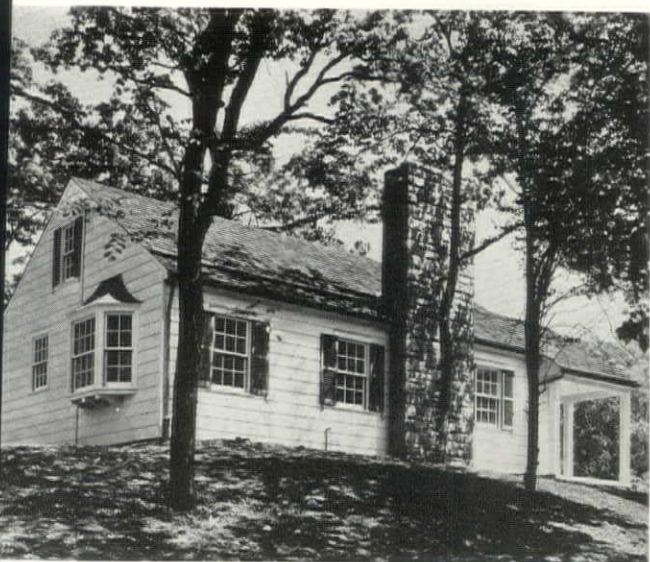
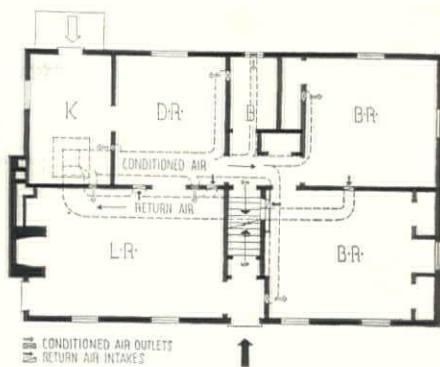
¶ Few disputants would challenge the
claim of the Long Island Levitts, if they
made it, to being the most talked about
developers of the year. Their Strathmore-
at-Manhasset has been as astutely pro-
moted as any subdivision in the U. S., and
has attracted a steady stream of experts to
see the why and wherefore. Though there
were supplementary reasons aplenty, most
of the visitors agreed that top notch adver-
tising plus intelligent use of an enviable site
were the foremost reasons for the success
of Levitt & Sons.

To the "& Sons" goes most of the credit,
for with only proud overseeing plus land-
scaping from Levitt père, young William
and Alfred Levitt, whose combined ages are
just over 50, were responsible for Strath-
more's sales record.

On the 241 plots (60x100) into which
the 50-acre tract is divided, 149 houses
have been built, 142 sold for about \$1,500,-
000. No lot is sold to be built upon by
others. Of the 149 houses, 87 per cent have
been built on order, 13 per cent on specula-
tion, or as President William Levitt prefers
to call them, "as salable merchandise." The
range in price, including plot, has been
from \$8,950 to \$22,000, with \$9,500 the



The Bishoff Cellar and Duct Layout

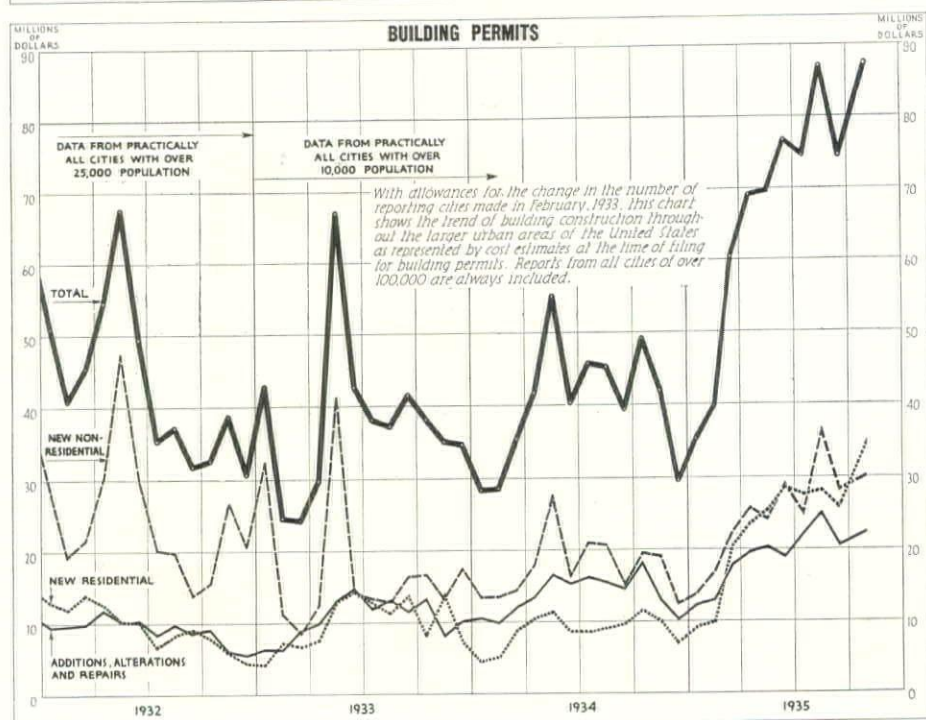
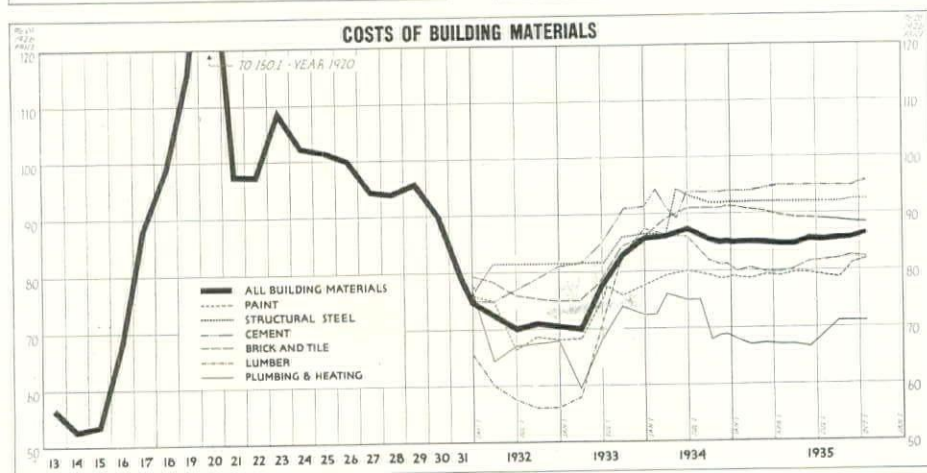
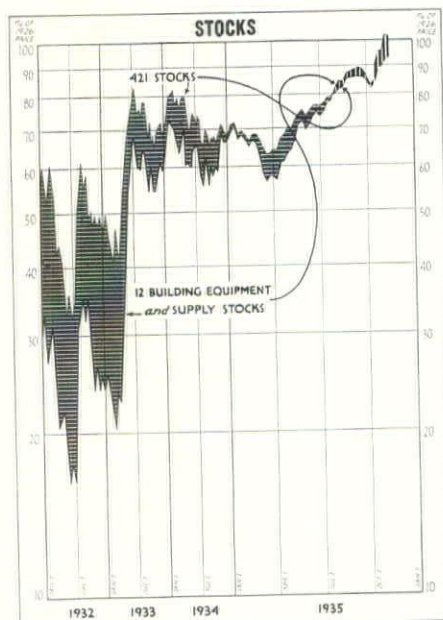
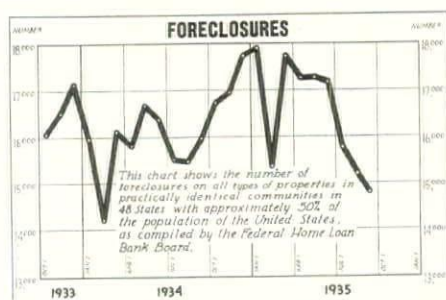
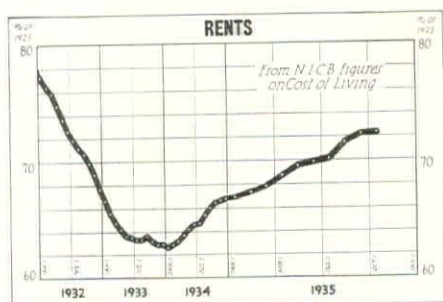


Photos, York Ice Machinery Corp.

Opposite Corners—the Bishoff \$7,500 Offering

A RESURGENCE OF HOME BUILDING

again boosts building to a record high. Foreclosures are low for the third month, rents still on the rise, and costs inert. Stocks top '26.



median price. The average would be what higher, about \$11,000.

From the day the development opened, there have been available from six to twelve houses at all times.

Financing for most houses came from Prudential Insurance Company, the plan being a 20-year mortgage for 66 2/3 per cent of the value, at 6 per cent interest. Despite early enthusiasm for the plan, not a single Levitt house has been sold with FHA financing. The Prudential offers all the benefits, except the \$1,000 down payment, of the FHA type of financing at a considerably less expense.

Levitt offers any one of the different Prudential financing plans, with varying interest rates as follows:

- 75% mortgage 6%
- 65% mortgage 5 1/2%
- 50% mortgage 5%
- 40% mortgage 4 1/2%

With prospects bright for building, the Levitts are selling another 85 houses at Manhasset, sometime before May of next year. Levitts are casting about for new Island sites. One or both of two sites on Long Shore locations seems most probable. The first of 90 acres to accommodate about 180 houses, the second of 35 acres and 100 houses.

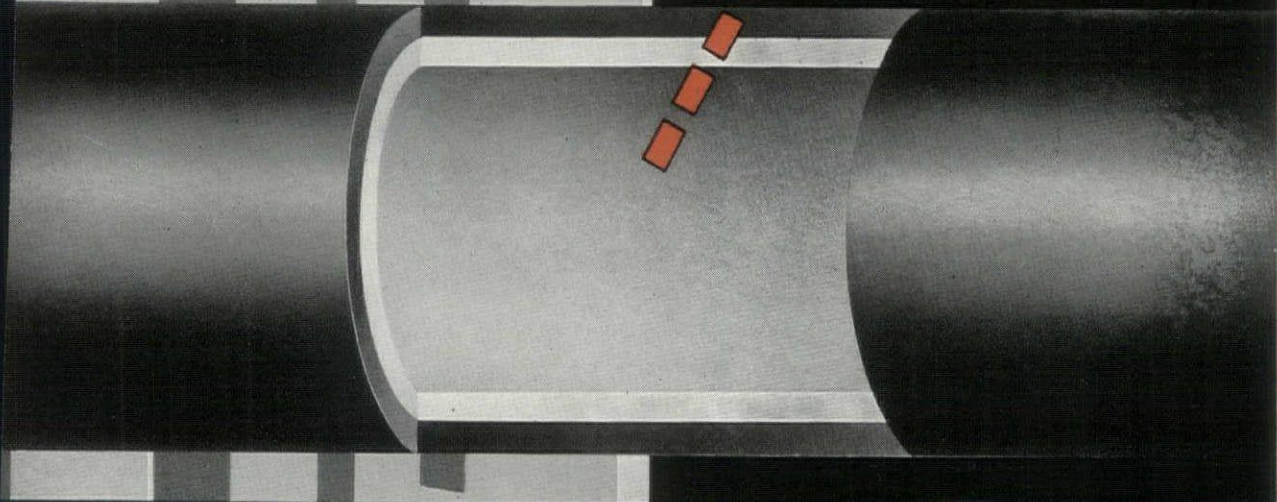
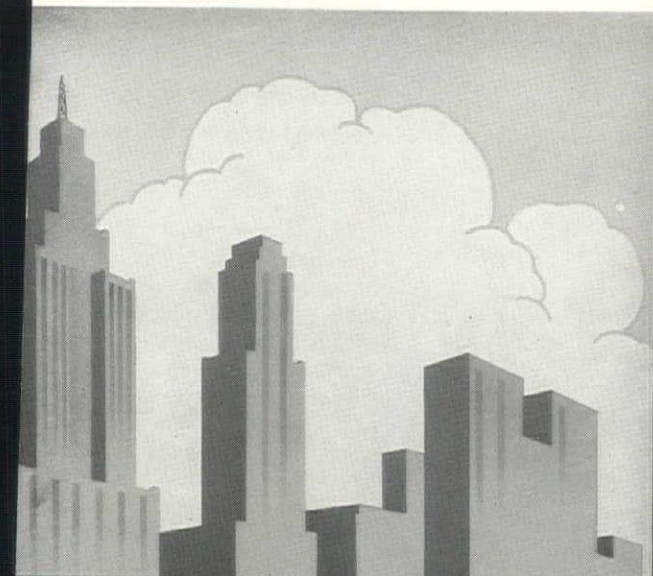
What innovations the Levitts have made in the new tracts it was too early to say. Of one thing they were sure. With a rising real estate market, they would not build many more houses on speculation than they did at Manhasset. And never will they build a house on speculative cost more than \$13,000.

It is certain too that into their new development they will carry along with them the atmosphere of quality which surrounded their activities. No reader of a Levitt advertisement could fail to be impressed by the dignity of the copy. A studied disregard of price considerations has helped to create confidence in their performance. Another small aid in maintaining that confidence has been the judicious use of nationally advertised products. The standard Levitt house includes the following:

Poured concrete foundations, No. 1 white pine framing laid diagonally, random slate roof, copper leaders, gutters and flashing, brass plumbing, J-M rock wool insulation, Monel metal hot water boiler, G-E furnace, Fenestra steel casement windows with Roto-adjustor bronze hardware, Armstrong linoleum, American Raditor radiators, Standard Sanitary plumbing fixtures.

Though Manhasset houses range far and wide in choice of style, no Modern house and no Spanish house was built on the acreage, nor will either of these two styles unless Levitt prejudices alter market conditions be found in the one or two new developments contemplated for next year. The reason: No prejudice against the styles themselves but they do not "harmonize."

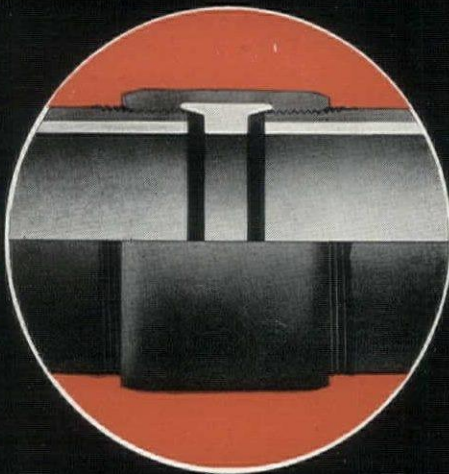
CORROSIVE WATERS *cannot* *touch the* PIPE METAL



When Duroline Pipe is installed in hot- and cold-water supply lines, one thing is certain—even if the water is of a corrosive nature, its destructive influence is of no importance. The special Duroline cement lining does not permit water to touch the pipe metal—no corrosion is possible. Therefore, you can have all the desirable features of steel pipe, such as uniform high strength, ductility, etc., without the danger of corrosion and tuberculation, at a cost only a little higher than that of galvanized pipe.

Architects, engineers and contractors will win appreciation for themselves and make a better investment for the owner by specifying and using this modern pipe in any type of structure—whether it be office or public building, hospital, school or residence. NATIONAL engineers will be glad to give you further information. A bulletin on Duroline will be furnished on request.

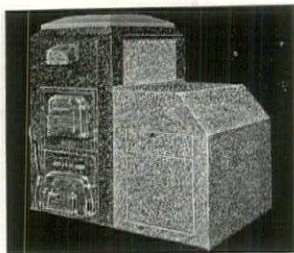
NATIONAL TUBE COMPANY • Pittsburgh, Pa.
Pacific Coast Distributors—COLUMBIA STEEL CO., San Francisco, Calif.
Distributors—UNITED STATES STEEL PRODUCTS CO., New York, N. Y.



Section of National DUROLINE Pipe coupling and joint. (Note special highly corrosion-resistant joint compound on end of pipe and on threads.)

United States Steel  Corporation Subsidiary

NATIONAL DUROLINE PIPE



The Moncrief Aristocrat Air Conditioning Unit

Includes new patented Wind Box, which distributes air from the blower chamber uniformly over surfaces of heating unit—Greatly increases efficiency. An exclusive Moncrief feature.

MONCRIEF AIR CONDITIONING SYSTEMS *Provide the Fullest Measure of Winter Comfort with Economy...*

Moncrief Engineering Service

On any problem involving heating and air conditioning, architects and builders are invited to consult our Engineering Department. It is maintained to cooperate with them in estimating, laying out plans, etc.

● All that has been proved best in winter air conditioning is made available at low cost by Moncrief Air Conditioning Systems. They are adapted for all types of homes, large or small, either for new installations or for replacing antiquated heating systems in older buildings.

From the beginning Moncrief has taken the lead in developing air conditioning for homes; and out of the long experience of Moncrief engineers have been perfected features which express unusual efficiency and reliability:

Large, slow speed blower, quiet and vibrationless, circulates air positively and gently.

Filters of over-size area give extra cleaning efficiency with much reduced resistance to air flow.

Humidifier, fully automatic, is simple and trouble-free in operation, and may be easily adjusted to the requirements of the home.

Automatic controls govern all operations accurately and dependably.

Heating units are specially designed for coal-hand or stoker fired, oil or gas.

Exteriors are modern in design and beautifully finished, a pledge of the excellence of materials and workmanship prevailing all through Moncrief Air Conditioning Systems.

Write for Literature. Let us send you, for your files, folder giving complete information

The Henry Furnace & Foundry Co.
3485 E. 49th St. Cleveland, Ohio

THE WAGNER BILL

would give the U. S. a billion dollars to spend for low rent housing

IF a Senator other than New Robert F. Wagner were its author introduced at the last session of Congress calling for a permanent housing program with a billion dollars to give away for a period of ten years would not be so frightening to private real estate as it obviously is. For Senator Wagner is a way of being successful in backbiting. His name has been attached to social security, labor disputes, and pensions laws, all of which are now books.

Possibly because there was other legislation nearer and dearer to his heart he did not really go to work for his bill last summer. And some experts expressed the opinion that he will not do more than lip service for it at the opening session. Supporting such a view is an apparent agreement among Administration men to stop direct spending, but it is the character of Senator Wagner, although an astute politician, that wastes his time in shadow boxing to the benefit of his constituents.

Pending the opening of Congress, Senator Wagner must be taken at his word, and this case is an echo of the desires of the National Public Housing Conference, a housing agitation agency directed by Mary K. Simkhovitch and Miss Alfred. Like all other groups whose aim is social betterment, they see no place for private enterprise.

The plan calls for the creation of a permanent housing division in the Department of Interior. Presumably it would be a continuation of the present Housing Division with expanded powers to make it effective. An initial appropriation of \$1,000,000,000 would be used for loans—loans for 70 per cent of the cost of labor and materials, and grants for 30 per cent. These would be made to state and municipal housing agencies, and responsible limited dividend groups, as under the present arrangement. A Federal agency would be permitted to do its own building if it is found advisable. In the light of PWA's experience the conclusion is inescapable that the building of the housing would be done by Wagner direct.

Since the bill specifically states the inability of private initiative to provide low rent housing, it would appear that the chance private initiative has of heading off this further competition would be to its ability to perform. As yet, beyond a half dozen jobs initiated under the plan, no new privately financed low rent housing has been produced.



WEBSTER SYSTEM RADIATION

CONCEALED • LIGHTWEIGHT • FOR CONVECTION HEATING

A NEW FEATURE OF

Webster
Systems of
Steam Heating

WARREN WEBSTER & CO.
CAMDEN NEW JERSEY

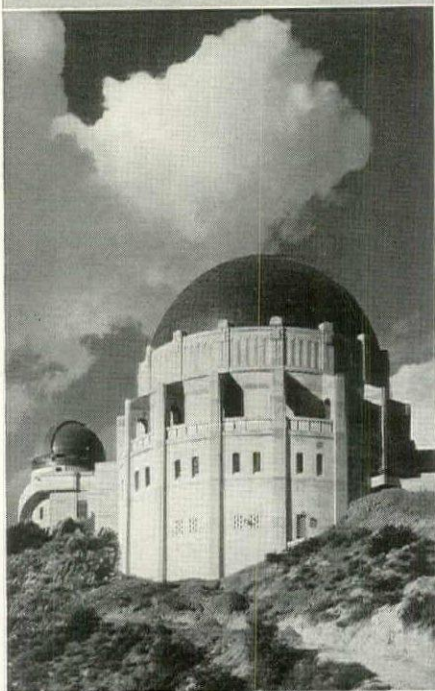
Established 1888 • The Pioneers of the Vacuum System of Steam Heating

GET THIS BOOK: It tells how Webster System Radiation provides balanced heating service . . no cold corner rooms . . See how Webster concealed radiators harmonize with the decorative schemes of living rooms, dining rooms, bed rooms and dens in a group of America's finest homes. Check the performance of these typical installations. Read what home owners say about the economy and comfort of this new feature of Webster Systems of Steam Heating. Fully illustrated . . design and installation data . . architectural specification . . and it's yours for the asking. No obligation, naturally.

WARREN WEBSTER & CO., Camden, New Jersey

See the Warren Webster & Co.
Exhibit at the Heating and Ventilating
Exposition, Chicago, January 27 to 31, 1936

In the Skies . . .



*Temperature
Control by*
BARBER-COLMAN

**The Griffith Observatory,
Griffith Park, Los Angeles
. . . John C. Austin and
Frederic M. Ashley, arch-
itects . . . Uniform room
temperature automatically
maintained by Barber-
Colman Controls on heating
and ventilating system.**

*Barber-Colman
Temperature and
Humidity Controls*

BARBER-COLMAN COMPANY, ROCKFORD, ILL.

STEEL BUILDINGS, INC.

is American Rolling Mills latest
prefabrication offshoot.

AMONG prefabricators none has been longer in the business, none has been more hopeful of factory-made houses than the American Rolling Mill Company. Spearheaded by aggressive Vice President Bennett Chapple, the company's attack has been on several fronts, all leading to the use of sheet steel in residential building.

Last month Mr. Chapple announced the formation of Steel Buildings, Inc., a national distributing agency for Armco's



Theatrical Studio

Steel Building's Betcone

Steelex method of construction. To direct it, David S. Betcone, one-time architectural director and sales supervisor of Sears, Roebuck's housing division, was made president. In addition to the ten years he had spent with Sears, Mr. Betcone has to his credit another decade in the small house business. Associated with him will be Edward B. Sickie, former general manager of the Steelex Company, and B. T. Lourim, designer of Steelex houses.

Steel Buildings, Inc., will sell all materials, excluding masonry, for complete low cost steel houses. Directly they will do no construction but it is anticipated that their dealers will in many cases be local contractors. The houses will be sold from stock plans ranging from \$1,800 to \$4,000.

Basis of the construction system employed by Steelex is the self-framing, interlocking steel unit which forms the exterior and interior wall. Steel Buildings, Inc., has made contracts with other companies for insulation, plumbing fixtures, lighting fixtures and heating. For details of Steelex construction, see the analysis of residential construction in this issue.

FOR BETT FLOOR TO FLO SERVICE

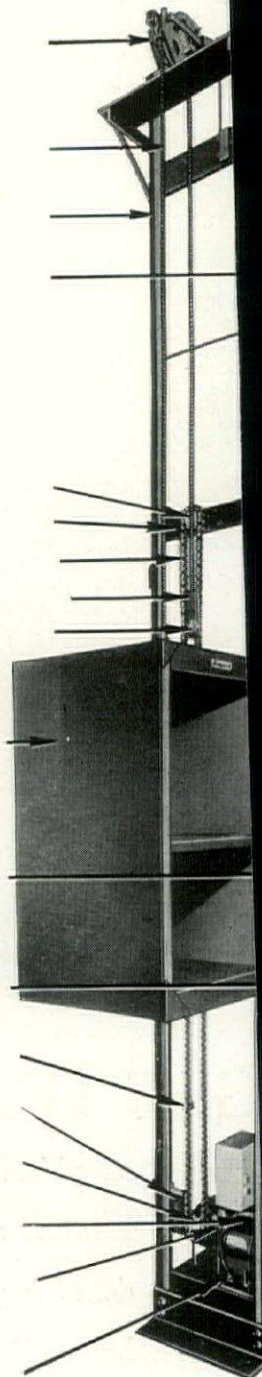
THE NEW SEDGWICK ELE

ROTO-WAIT

Registered Trade Mark
Patented in the United States and C

**FULL AUTOMATIC
DUMB WAITER EQUIP**

In two short years, already widely used in restaurants, hotels, libraries, clubs, hospitals, stores and banks. Low initial cost. Low installation cost. Low operating cost. Investigate!



Every arrow points to an important feature.
**Better Service at Lower Cost
Safe, Compact, and Durable**

Write for Complete Data and New
log of Dumb Waiters and Elevators

SEDGWICK MACHINE WORKS

Established 1893

140 West 15th Street, New York, N.Y.

Y DEALERS ROUT SPARK PLUGS

100-year-old Washington factory building is converted into apartments to meet Capital housing needs.

STING well the pace and pressure of Washington housing boom, the conversion of an old abandoned factory building adjacent Alexandria, Va., into an architecturally distinguished apartment is perhaps the Capital's most important remodeling job. Closest contest for the good results obtained in the remodeling of many of the century-old buildings which Washington's Georgetown boasts.

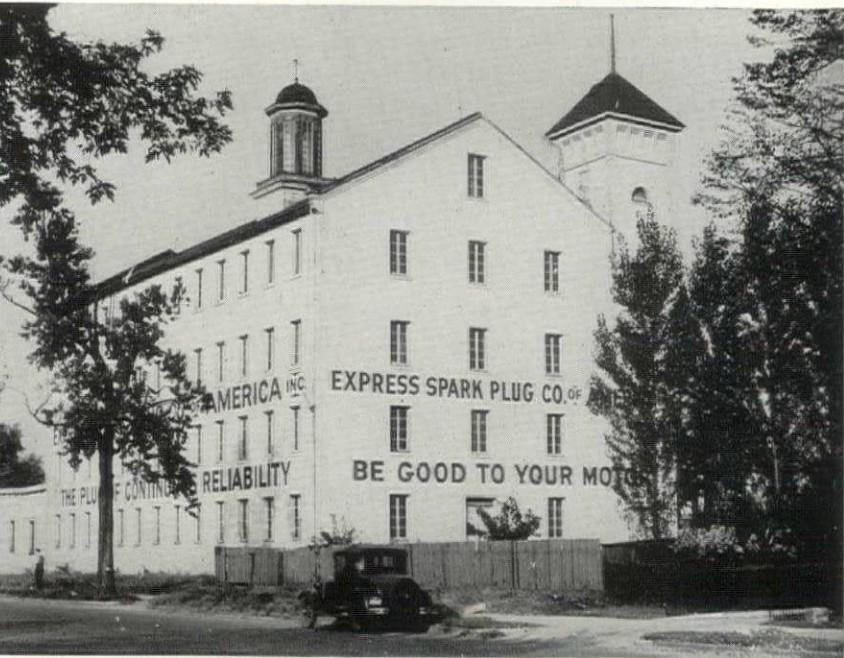
In the Georgetown houses, Architect Lowstuter had good raw material to work with in the 100-year-old factory building on Washington's famed Mount

Vernon Boulevard. First used as a cotton gin, then as a hospital and a prison in the Civil War, the building which he tackled had later become successively a tobacco factory and a spark plug plant (see cut).

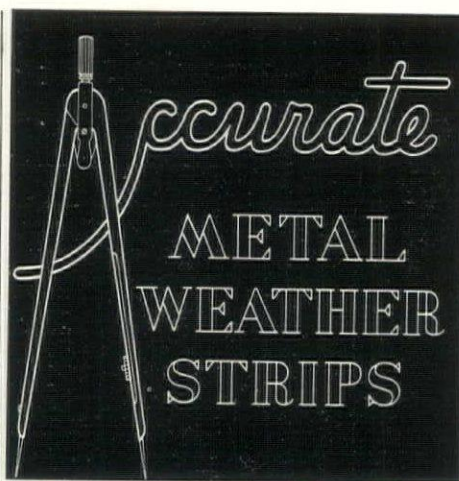
In the old building Architect Lowstuter readily recognized the heritage of good taste and instinctive balance of the Colonial builder, and hastened to show its owner, John Loughran, former operator of the spark plug factory, the way to recoup his manufacturing losses.

Starting with the perfect combination

(Continued on page 40)



From Factory to Dwelling-Place



FOR WINDOWS and DOORS



**All Installations
Guaranteed for
Life of Building**



When an Architect specifies Accurate Metal Weather Strip he does so with full assurance that he is best serving the interests of his client.

No modern residence is too small to escape the need for Accurate Metal Weather Strip.

Metal weather strip as made by Accurate reflects a quality and precision and lasting satisfaction possible only because of constant development of design and practice over a period of 30 years.

Write or phone for list of typical installations and let us help you select the type of strip best suited to your needs.

ACCURATE
Metal Weather Strip Co.

214 East 26th Street, New York

ACCURATE
METAL WEATHER STRIPS



The Sunbeam Oil Burning Air Conditioning Unit

SUNBEAM
AIR CONDITIONING UNIT

Outstandingly Beautiful
—and Efficient

THE FOX FURNACE COMPANY
ELYRIA, OHIO

A Division of

American Radiator & Standard
Sanitary Corporation

One of the newest developments in residential equipment is the modern air conditioning unit—and the most modern of air conditioning units is the Sunbeam.

Developed for the most modern of homes, and the most modern of basements—and for modernizing of existing residences, as well as for expert designers have now matched in artistic, attractive appearance the excellence of construction that has characterized Sunbeam Conditioners since their introduction, 5 years ago.

In the six types of Sunbeam equipment, there is a unit designed for every fuel, oil, gas, or coal. And there is a model and size for every home, from the largest to the smallest.

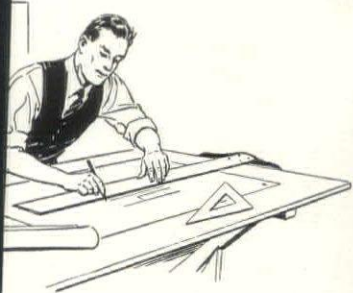
A capable staff of engineers is maintained to prepare air conditioning layouts from building plans. This service entails neither cost nor obligation. Installation specifications and illustrated instructions are provided with all layouts so that each installation shall be made in accordance with Sunbeam standards.

Distributors are located in all the principal cities of the country. There is one, in or near your community, who can provide complete information and cost estimates. Write us for his name.

A Sunbeam System for every type of home • every kind of fuel

MONEL METAL STANDARDIZED SINKS

Exactly Fit your Plans



*re's complete flexibility
their range of sizes . . .
n 48" to 144" by fractions
of an inch*

TAKE your plans to fit your own
ideas—not to fit a cut-and-dried
specification in a catalog!

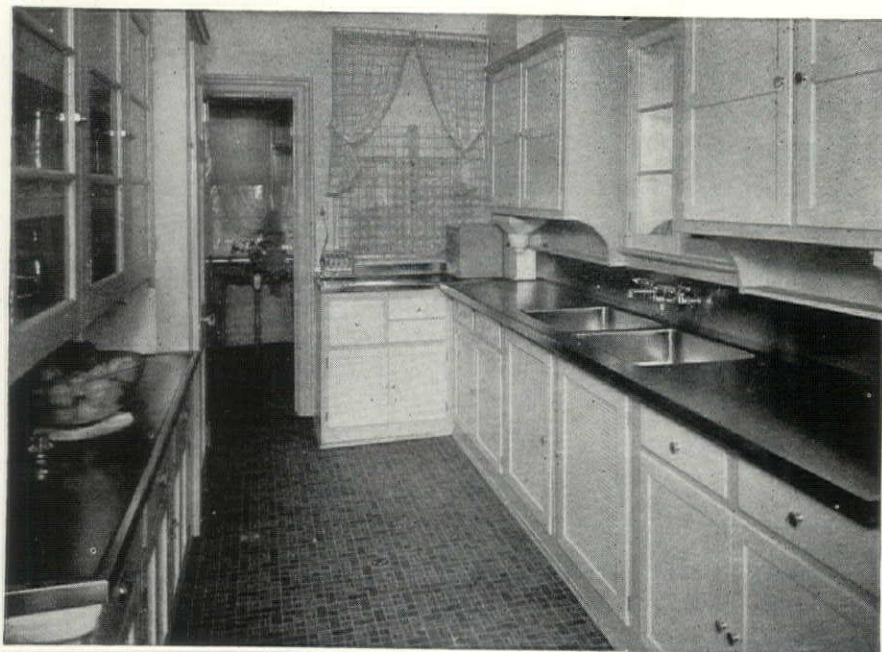
As you can, you know, when you work
your designs with Monel Metal in

For Monel Metal standardized
and work counters (cabinet tops)
from 48" to 144" and you can get
model in one piece and in exact
dimensions down to the fraction of an

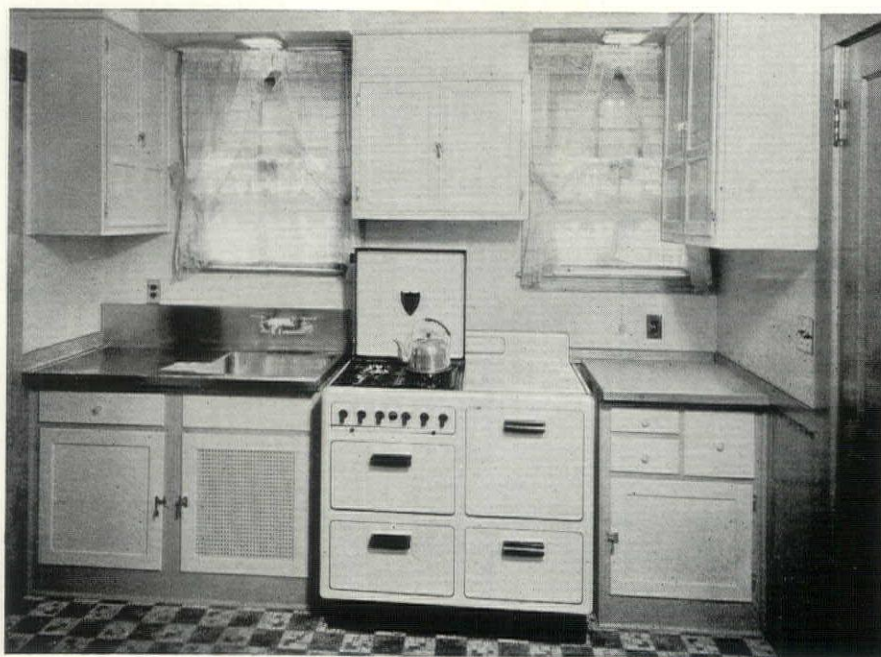
Moreover, you don't need to worry
about the budget. For new prices on
sinks and working surfaces are
reduced—some as much as 35 per cent.
which means that a complete Monel
kitchen will fit into things as
easy as the sink fits into the kitchen.
To make the picture complete, re-
member that you have entire freedom
in details. You can specify any type
you want: apron, low-back, high-back,
one-drainboard or double, single- or
double-bowl, or a sink with drain-
boards that are smooth or grooved, in
lengths as short as 41" . . . 57 models
in all.

For complete details, illustrations
and prices, call in a representative of
the distributors, Whitehead Metal
Products Co. of New York, Inc., 304
Madison Street, New York, N. Y. Or
write direct to them.

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



*Monel Metal Double Bowl Standardized "Straitline" Cabinet Sink and stand-
ardized Monel Metal cabinet top, installed in a Washington D. C. residence.*



Monel Metal Cabinet Sink installed in a West Newton, Mass., residence.

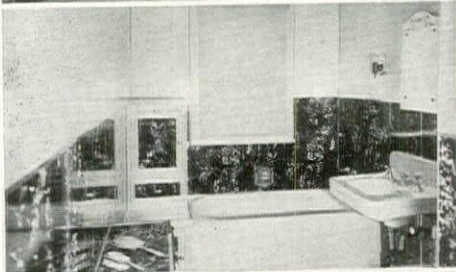
Monel Metal

Monel Metal is a registered trade-mark applied to an alloy containing approximately two-thirds Nickel and one-third copper. Monel Metal is mined, smelted, refined, rolled and marketed solely by International Nickel.



Architects are keeping the MARSHTILE factory galloping to keep pace

The reason is obvious . . . distinguished modern effects in kitchens, bathrooms, and commercial establishments are made possible at costs not possible with other materials.



Send for folder describing Marsh Wonder Walls... of MARSHTILE, tile-marked sheets in a wide range of colors . . . MARLITE, plain surfaced sheets . . . and MARSHMARBLE, accurate reproductions of famous marbles.



See our display in Radio City, Shop No. 15 Concourse, R. C. A. Bldg., New York City

MARSH WALL TILE COMPANY
121 Marsh Place, Dover, O.
Exclusive Manufacturers

MARSHTILE

FACTORY

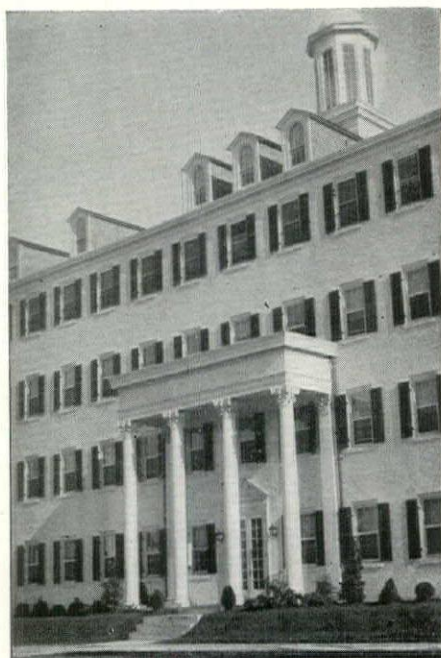
(Continued from page 37)

of thirteen windows across the front and three across the sides, the properly pitched roof and the well-proportioned cupola, Architect Lowstuter met his problems squarely as they arose. One drawback was a first floor level some 21 ft. in height. This was remedied by throwing a concrete floor, supported by precast concrete joists mid-way up in the first story. Suspended ceilings of expanded metal lath were necessary to cut down the unhandy ceiling heights on other floors.

A further major change, which is evidenced by the new exterior, was the addition of dormer windows enabling the use of attic space for apartments. A large imposing Colonial entrance was added, and a coat of white paint, green shutters, and the removal of the tank tower completed the neat conversion.

That Washingtonians were quick to admire the ingenuity employed and the results obtained is evident from the fact that the house is already jam-packed with tenants, paying from \$25 for the one-room attic apartments to \$90 for the largest of the other apartments (living room, bedroom, dinette and kitchen). Light, gas, hot water and automatic elevator service are included at these rents.

Well satisfied is one-time Spark Plug Manufacturer Loughran with a present gross of \$23,000. Cost of the alterations was approximately \$90,000, two-thirds of which was raised by one of the few mortgage bond issues of recent years. Underwritten by the Alexandria investment house of Burke & Herbert, the bonds, yielding 6 per cent, were oversubscribed as soon as issued. The mortgage is being amortized at \$2,000 per year for the first fifteen years, and \$1,800 for the succeeding ten.



Entrance Detail

101 SMALL HOUSE

★ ★ ★

The houses published in October ARCHITECTURAL FORUM were analyzed for Wood Floor Finishes.

..... BY TYPE

STAIN and WAX
SHELLAC-WAX
VARNISHES and other finishes
NOT SPECIFIED

..... BY MATERIAL

Minwax
B Material
C Material
D Material
E Material
F G H I J K L M Material

★ ★ ★

Not only is Minwax Flat Finish modern stain wax finish complete one material but its outstanding qualities are indicated by its popularity the outstanding choice where the architect brand of material was designated.

Circular and color card sent on request

★ ★ ★

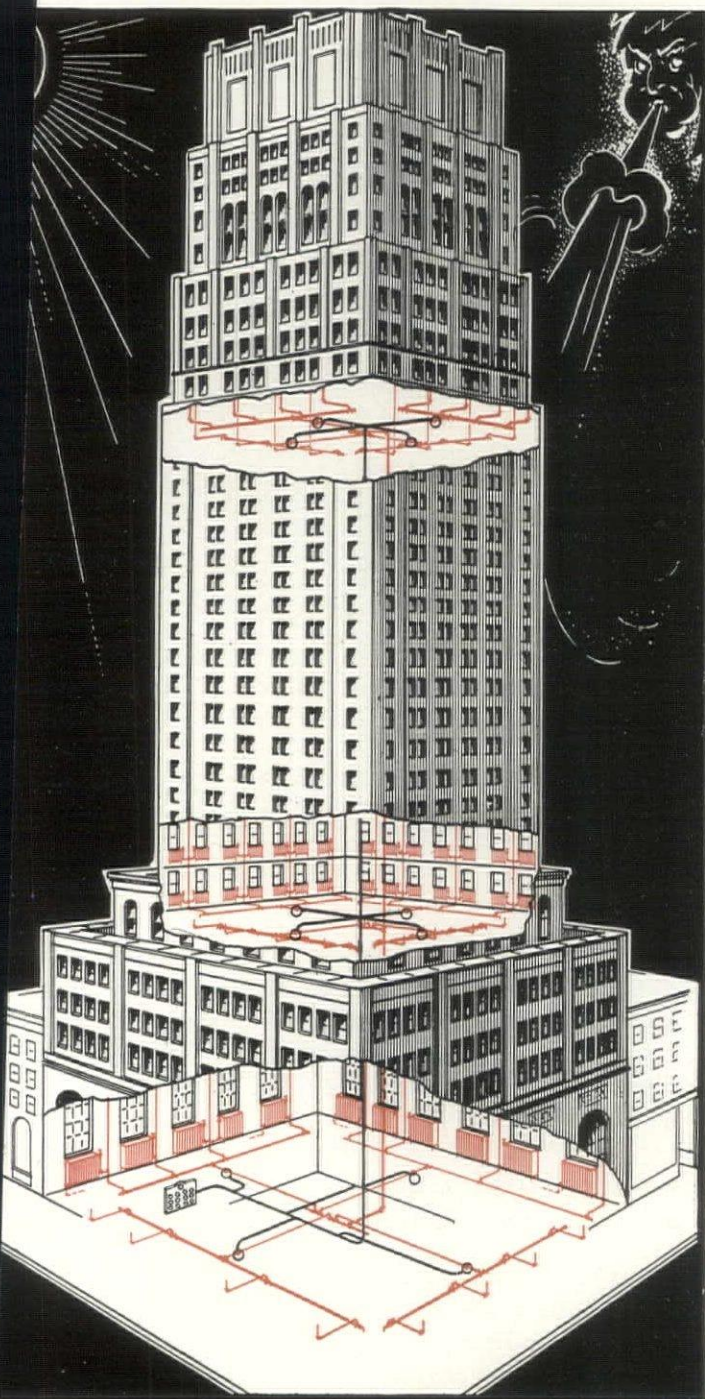
Minwax Company for over thirty years has also been an outstanding manufacturer of Fabric Membrane Waterproofing . . . Asphalt Dampproofing . Caulking . . . Transparent and Color Waterproofing.

MINWAX COMPANY, INC.
11 West 42nd Street • New York



35% SAVED IN FUEL

BY REMODELING A HEATING SYSTEM
TO FULLY COMPENSATE FOR EXPOSURE,
WIND, SUN AND OCCUPANCY FACTORS



Typical Hoffman-Tallmadge installation showing method of zoning, piping and locations of controls.

Bush Terminal, Brooklyn, N. Y., offers a notable example of the economies effected by Hoffman-Tallmadge Zoned Controlled Heat. This tremendous heating installation—623,000 sq. ft. of radiation—reduced fuel cost by 35% in the first year of operation. And this at a remodeling expense comparatively very small!

Hoffman-Tallmadge Zoned Controlled Heat is achieving similar results in many well-known office and industrial buildings. The system provides three correlated controls—division of the building into heating zones determined by type of occupancy, altitude and exposure to wind and sun—accurate control of steam flow into the heating zones—and precise orificing of heating units. Steam consumption is limited—by either centrally located Control Board or Thermostatic Control—to the exact need for heat at any time of day or in any heating zone.

This system is amazingly simple—both in operation and installation. It does not depend upon complex, costly equipment; hence it can be installed at minimum expense in either new buildings or remodeled systems.

For complete information, send the coupon to Hoffman Specialty Co., makers of Venting Valves, Supply Valves, Traps and Hoffman-Economy Pumps—sold everywhere by leading wholesalers of Heating and Plumbing equipment.

HOFFMAN SPECIALTY CO., Inc.
Dept. AF-14, Waterbury, Conn.
I would like further information and engineering
data on Hoffman-Tallmadge Zoned Controlled Heat.

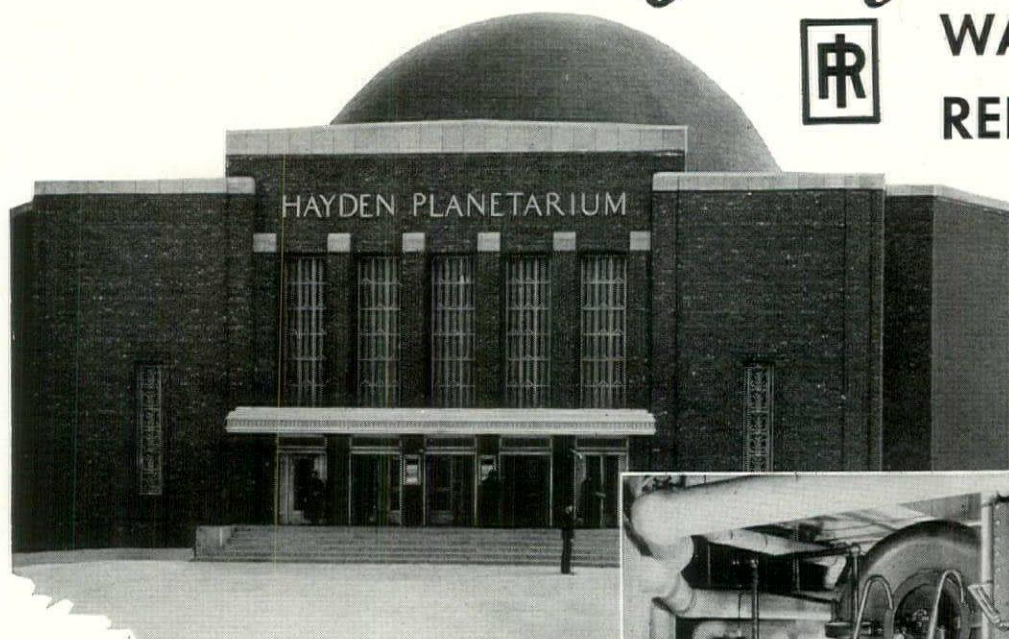
Name
Address
City State
Type Bldg. Approx. Sq. Ft. Rad.

HOFFMAN ★ TALLMADGE

Zoned
CONTROLLED HEAT



The Touch of Refinement



**WATER-VAPOR
REFRIGERATION**

TROWBRIDGE and LIVING
Architects

TENNEY and OHMES, I
Consulting Engineers

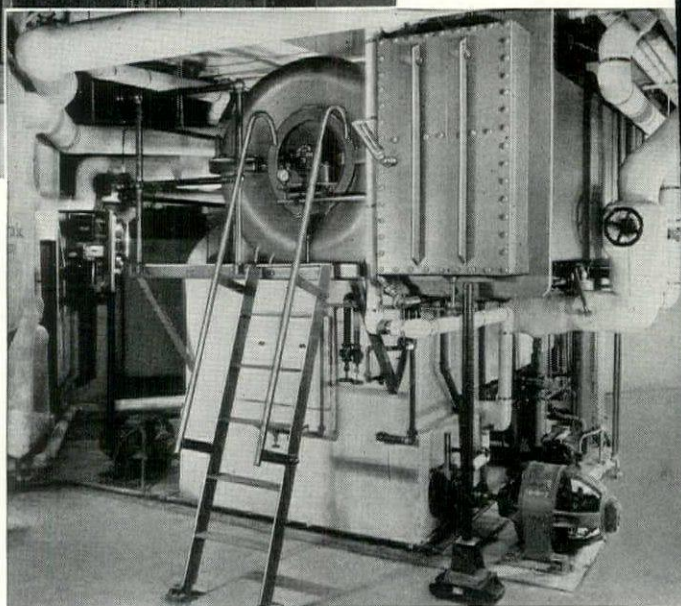
WHITE CONSTRUCTION
Builders

Comfort Cooling For Another Famous Building

IN the basement of the new Hayden Planetarium at the American Museum of Natural History in New York City is installed a simple and compact I-R Water-Vapor Centrifugal Refrigerating Unit which cools water for air conditioning the main auditoriums and halls.

It is driven by a direct-connected condensing turbine operated by exhaust steam from the electric light and power plant of the museum. Since this steam would normally be wasted during the warm weather months, the operating expense is practically nothing.

This is but one of the many successful I-R Water-Vapor Refrigeration installations now serving a wide variety of applications.



Water itself is the refrigerant. Cooling is accomplished by direct evaporation of a small quantity of water under a vacuum, created by a centrifugal compressor. Water chilled by this evaporation is the cooling medium and is circulated directly to the air-cooling coils.

Advantages of I-R Water-Vapor Refrigerating Units

SIMPLICITY • SAFETY • SELF-REGULATION • FREEDOM FROM VIBRATION • SUSTAINED CAPACITY • OVERLOAD CAPACITY • NO REFRIGERANT LEAKAGE

Centrifugal units are available for either motor or turbine drive. Where steam and water costs permit, Steam-Water-Vapor Refrigerating Units as built by Ingersoll-Rand have unique advantages.

Birmingham
Boston
Buffalo
Butte
Chicago
Cleveland
Dallas
Denver
Detroit
Duluth
El Paso
Houston
Knoxville

Ingersoll-Rand

11 BROADWAY, NEW YORK CITY

Los Angeles
Newark
New York
Philadelphia
Picher
Pittsburgh
Salt Lake City
San Francisco
Scranton
Seattle
St. Louis
Tulsa
Washington

For Residential Construction
consider these

8 Anaconda Products



ANACONDA BRASS PIPE



ANACONDA COPPER TUBES
AND FITTINGS



EVERDUR METAL FOR TANKS



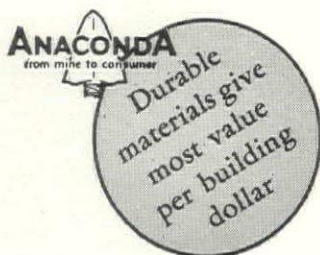
ANACONDA ECONOMY
COTTAGE ROOFING

NOT long ago, rust-proof metals in small house construction were largely confined to water pipe, sheet metal work, hardware and screens. Today these products, on the basis of their proved economy, are being used to a greater extent than ever before.

Further, these products have steadily been supplemented by additional developments which have contributed much to the availability of "quality" construction at a cost within the reach of all, and so low as to effect definite and sizeable savings in the long run.

On this page we illustrate eight Anaconda products ideally suited to residential construction. Each fills a definite need—economically. Complete information on any or all is available on request.

3546



THE AMERICAN BRASS COMPANY

General Offices: Waterbury, Connecticut

Offices and Agencies in Principal Cities

In Canada: Anaconda American Brass Ltd., New Toronto, Ont.



5 ANACONDA SHEET COPPER



6 SCREENS OF ANACONDA
BRONZE



7 "ELECTRO-SHEET" FOR
DAMP-PROOFING



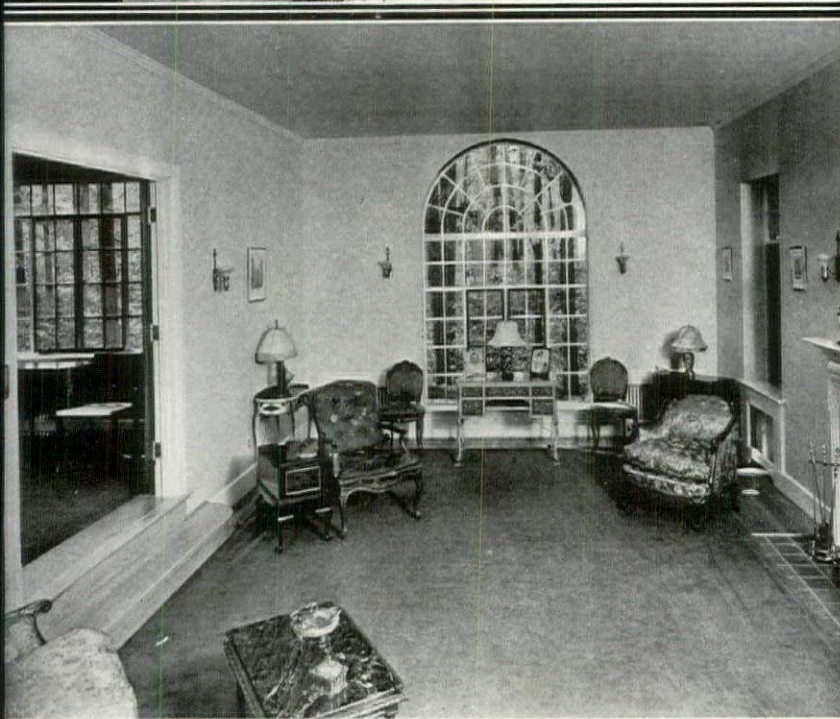
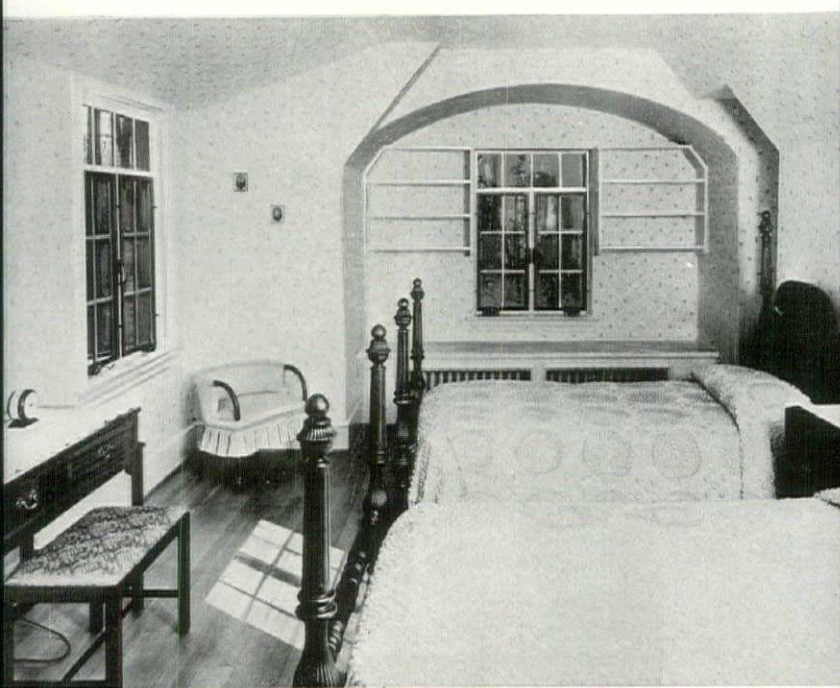
8 "ELECTRO-SHEET" FOR
BUILT-UP ROOFING

ANACONDA COPPER & BRASS

WHERE
STEEL
PROVIDES



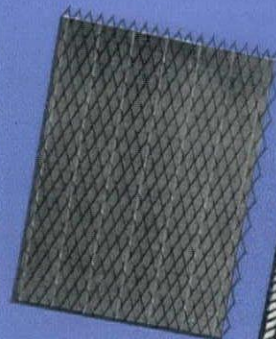
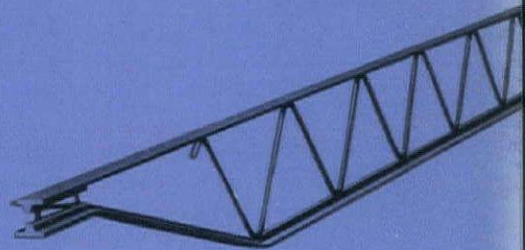
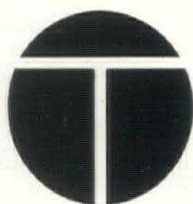
ENDURING BEAUTY



ND CHARM

noteworthy charm which Truscon steel casements bring to any
is all the more appreciated because it is no mere temporary
ute. These beautiful steel casements are immune to fire haz-
—and to the ravages of time and weather. As long as the
e lasts they impart that pleasing atmosphere and distinctive
n which have made these windows so preferred by architects
home owners. Truscon casements are furnished in such nu-
ous types and sizes that architectural harmony can always be
erved by their use. Flawless operation is another feature of
e modern and superior products.

con steel joists and Truscon metal lath are also products of
which no architect or home builder can overlook. The former
vide a fireproof floor construction that costs but little more than
d. The latter assures crack resistance, fire resistance and per-
ent beauty for all varieties of plaster and stucco construction.



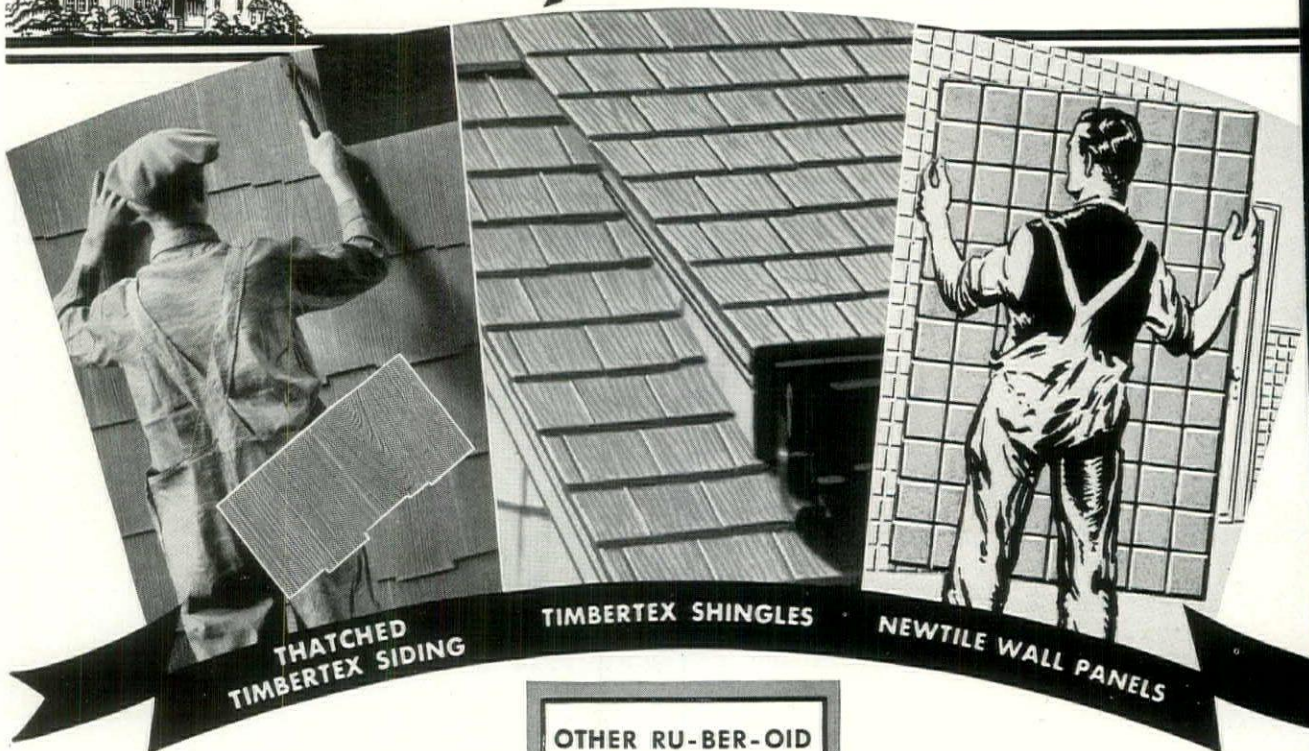
CASEMENTS • STEEL JOISTS • METAL LATH

TRUSCON STEEL COMPANY
YOUNGSTOWN • • • OHIO

3 FIRE-PROOF.. ROT-PROOF

Asbestos-Cement Building Products

All Style Leaders—yet Inexpensive



THATCHED
TIMBERTEX SIDING

TIMBERTEX SHINGLES

NEWTILE WALL PANELS

RUBEROID has created three residential building products from Asbestos-Cement that meet today's revised and exacting standards of greater beauty, safety and economy.

The first picture is Eternit Thatched Timbertex Siding. This siding, with its irregular butts and cypress-like texture, lends distinction and charm as a sidewall material. Each strip is rot-proof, age-enduring, termite-defying, is economical to apply and needs no painting.

The roof of distinguished beauty in the center is laid with Eternit Timbertex Shingles. These shingles have all the charm of weathered cypress, yet they are fire-proof, rot-proof, and time-defying. No

life and economy. Complete specification literature will be forwarded if you mail the coupon.

OTHER RU-BER-OID RESIDENTIAL PRODUCTS

ASPHALT SHINGLES

BUILT-UP ROOFS

MINERAL WOOL INSULATION

ASBESTOS PIPE COVERINGS

NEWMARBLE

WATERPROOF SHEATHINGS

CEMENT WATERPROOFING

periodic staining is required as the coating is an integral part of each shingle.

RU-BER-OID Newtile Wall Panels, another Asbestos-Cement creation, provide lovely colorful walls for bathrooms, kitchens, sun rooms. They have a lustrous finish in popular pastel shades or the conventional colors of white, black or red. These panels have all the beauty of ceramic tile, but are amazingly inexpensive—durable, sanitary and never require painting or decorating.

Investigate all three of these RU-BER-OID Building Products. They offer entirely new measurements of beauty, style, safety, life

The RUBEROID Co.

ROOFING AND BUILDING PRODUCTS

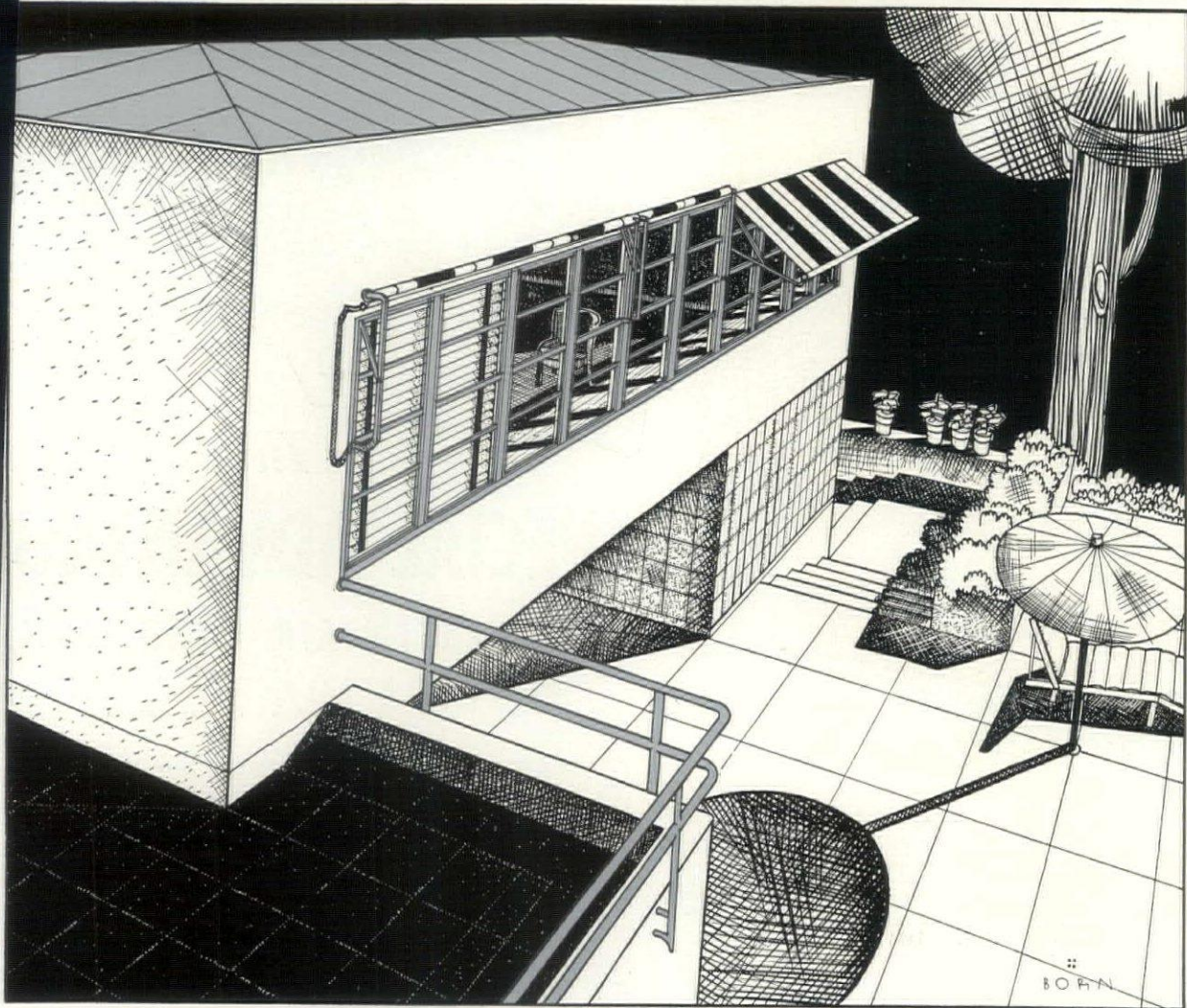
The RUBEROID Co., 500 Fifth Avenue, New York, N.Y.

Please send specification data covering the Ruberoid Products checked.

Timbertex Shingles ☐ Thatched Timbertex Siding ☐
Mineral Wool Insulation ☐ Newtile Wall Panels ☐ Asphalt Shingles ☐ Built-up Roofs ☐ Waterproof Sheathings ☐
Asbestos Pipe Coverings ☐ Newmarble Wall Panels ☐ Cement Waterproofing ☐

Name

Address



LOOK CLOSELY... THEY ARE DOUBLE-HUNG

The small, strong sections and precise profiles of the new Aluminum *light-weight* double-hung window give new scope to fenestration ★ Traditional design limitations are no more ★ To inherent simplicity and efficiency Aluminum adds lightness and ease of operation, plus freedom from maintenance ★ Decidedly, these windows are not expensive ★ Ingenious extruded shapes of Alcoa Aluminum, and advanced fabrication techniques by their manufacturers, make these windows a *must*. We shall be glad to furnish the names of manufacturers, upon request ★ Aluminum Company of America, 1866 Gulf Building, Pittsburgh, Pennsylvania.





SUPERFEX NO.
120-E, one of three sizes.
Heating capacity 85,000 B.T.U.

SPECIAL ADVANTAGES OF SUPERFEX AIR CONDITIONING HEATING PLANTS

TYPE	Automatic Heat	Automatic Air Circulation	Automatic Air Humidification	Automatic Air Filtration	Aided Summer Comfort
SUPERFEX	YES	YES	YES	YES	YES
Hot Water Plant	YES	No	No	No	No
Steam Plant	YES	No	No	No	No
Vapor Plant	YES	No	No	No	No

Read what Superfex owners say:

"Have had this heating plant serving us for three winters. It has worked beautifully all this time."

"Not dependent on electricity in case of severe storm."

"Cheaper than coal. No dust. Even heat at all times. Needs no attention during a busy day."

"It is clean, reliable, efficient, quiet, economical."

"On account this machine relieving me of asthma which I had for 21 years, I operate more than others would find necessary."

"I would buy another Superfex for the reasons they are clean, economical, and labor-free."



ARCHITECTS • BUILDERS • HOME OWNERS ... Send this coupon

PRODUCT OF PERFECTION STOVE COMPANY

SUPERFEX

Complete automatic oil burning heating plant that conditions air

BUYERS ARE LOOKING FOR AIR CONDITIONING EVEN IN THE LOW-PRICED HOME

The fastest selling home is the one that is air conditioned. It

Investigate the
SPECIAL ADVANTAGES
OF SUPERFEX AIR CONDITIONING
FOR LOW PRICED HOMES

SUPERFEX costs no more installed than an automatic water plant. Think what that means in the planning equipping of a low priced home. Air conditioning becomes available in the majority of cases. A major specification the prospective buyer is met.

Summer and Winter Comfort

Superfex is a complete automatic oil burning, heating plant that conditions air winter and summer. One installation assures healthful comfort the year round. In summer circulated, cool pollen-free air; in winter circulated filtered humidified warm air. Superfex heating dependability has been proved by years of satisfactory service including zero weather.

There's nothing complicated about Superfex

The Superfex method of burning oil is simple. It is completely automatic year-round air conditioning in its simplest most economical form. Superfex is made by the Perfect Stove Company, for 45 years the world's leading manufacturer of oil burning equipment.

Everyone interested in new construction should investigate the surprisingly low cost of the Superfex oil burning heating plant that conditions air.

PERFECTION STOVE CO., 7671-A Platt Ave., Cleveland, Ohio

I would like to know more about the modern, clean, economical SUPERFEX automatic oil burning heating plant that conditions air.

Please check: ☐ Architect ☐ Engineer
☐ Builder ☐ Planning new home

Name _____
Street _____
Post Office _____ State _____

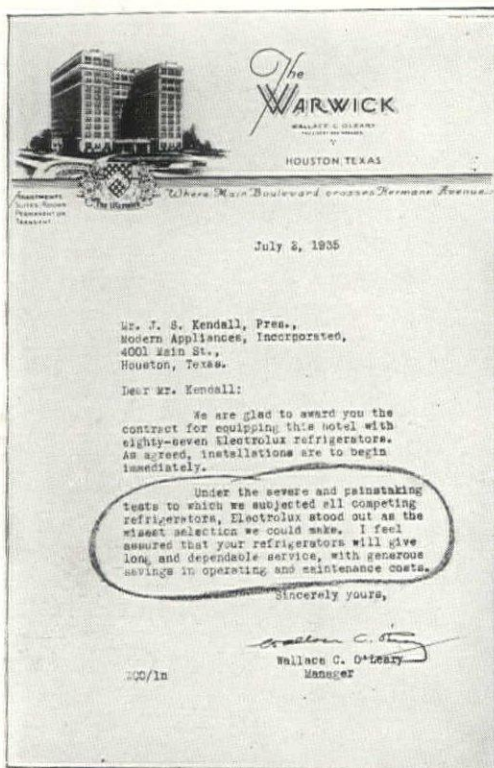
ELECTROLUX CHOSEN

. because it assures "long and dependable service, with generous savings in operating and maintenance cost"

—Writes W. C. O'LEARY, manager of the Warwick, Houston apartment hotel, after 4-month impartial test of all the popular refrigerators.

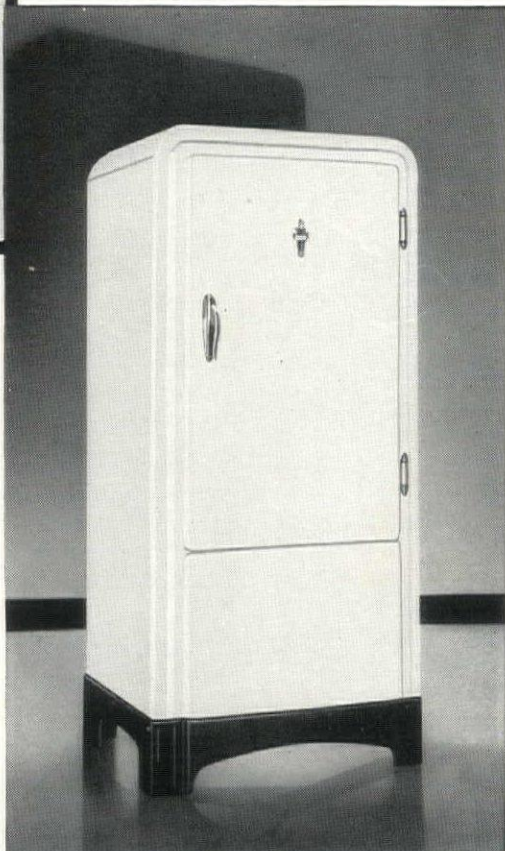


W. C. O'LEARY, manager of the Warwick Apartment Hotel, who chose Electrolux on the basis of tests conducted for him by an impartial refrigeration engineer.



ciation due to moving, wearing parts. Before choosing any refrigerator for properties, see your local gas company about Electrolux. Make your own tests. You'll find—as builders and operators the world over have found—that Electrolux gives you, gives your tenants, more! Servel, Inc., Electrolux Refrigerator Sales Division, Evansville, Indiana.

NEW *Air-Cooled*
ELECTROLUX
THE SERVEL *Gas* REFRIGERATOR



BUYERS of refrigerators who investigate the makes as thoroughly as Mr. O'Leary come to the conclusion: *Electrolux first choice!* In the case of the Warwick, one of the South's leading apartment hotels, a refrigeration engineer was retained to conduct a comparison test of the popular makes. One refrigerator in turn was subjected to exacting and critical tests for temperature maintenance, construction, operating efficiency, convenience features and economy.

This rigorous investigation lasted about 16 weeks. At the end of the time, Mr. O'Leary wrote, "Under the severe and painstaking tests to which we subjected all competing refrigerators, Electrolux stood out as the wisest choice we could make. I feel assured that your refrigerators will give long and dependable service, with generous savings in operating and maintenance costs."

The reason for Electrolux's outstanding performance is its simple, more efficient operation. A gas flame takes the place of moving parts . . . insures continued low running cost, permanent silence, and the elimination of refrigeration trouble and depre-

GLASS

DOMINATES DESIGNS FOR MODERNIZATION

Premiated drawings in Modernize Main Street Competition suggest the effective use of Libbey-Owens-Ford Polished Plate, both plain and colored, Vitrolite, Tuf-Flex and Blue Ridge Figured and Wire Glass.

● The architectural profession generally acclaims the Modernize Main Street Competition recently sponsored by Libbey-Owens-Ford one of the most interesting and helpful efforts of its kind in many years.

To make the results even more far-reaching, the 52 prize-winning designs have been published in book form and are now being distributed to logical prospects for modernizing. This should result in even more business for architects, for, while floor plans, specifications and other pertinent data are included,



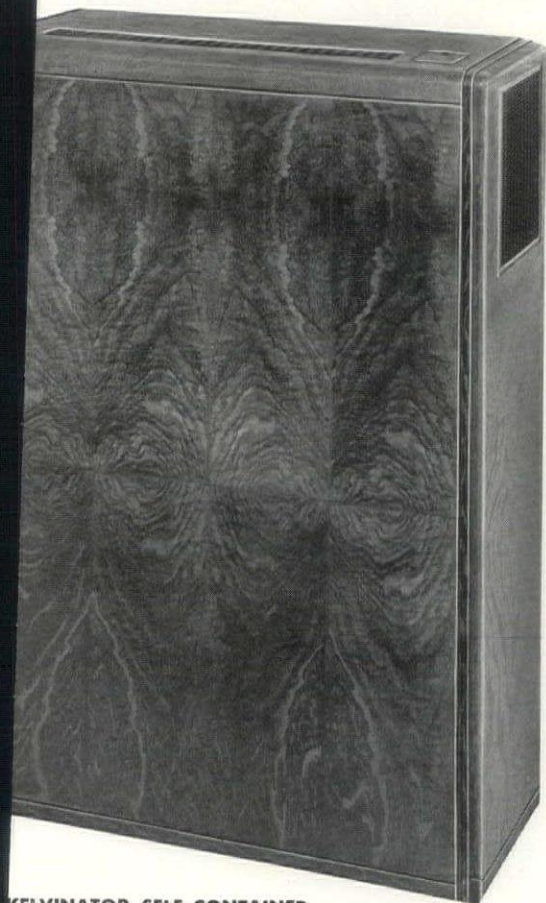
there are no working drawings and each store operator or real estate owner is urged to retain an architect in working out his individual problem.

A generous use of glass dominated practically all designs submitted by the 3,000 and more architects and designers who entered the competition. Since there is a Libbey-Owens-Ford product for almost every purpose where flat glass can be employed, architects specifying it are assured of one undeviating standard of high quality throughout. The L-O-F label on every light guarantees your client's satisfaction, as well as your own. Look for it. It is advisable to instruct contractors and builders to leave the labels on until final inspection has been made.

LIBBEY • OWENS • FORD GLASS COMPANY . . . TOLEDO, OHIO.

LIBBEY • OWENS • FORD
Quality Glass

There's a Kelvinator Model for *every* Air Conditioning NEED!



KELVINATOR SELF-CONTAINED UNITS

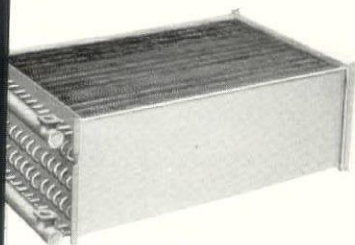
All mechanism and controls in one cabinet. For installation in offices, small retail shops and residence rooms. Seven models, suitable for rooms from 1600 to 4400 cu. ft.

Every air conditioning problem is different—but the complete Kelvinator line provides the correct answer in every case

Kelvinator is in the Air Conditioning business just as it is in the general business of refrigeration—to provide the exact kind and amount of equipment to suit the requirements of every job.

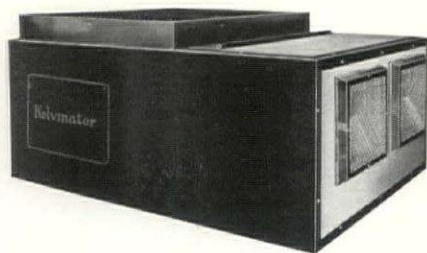
Kelvinator's exclusive plan of EXACT SELECTION applies to its air conditioning equipment just as it applies to its refrigeration units.

On this page are shown only four of the sixty-three Kelvinator Air Conditioning units. Complete information—or dependable surveys on particular jobs—may be secured without cost through your nearest Kelvinator dealer or by writing direct to Kelvinator Corporation, 14250 Plymouth Road, Detroit, Michigan. Factories also in London, Ontario and London, England.



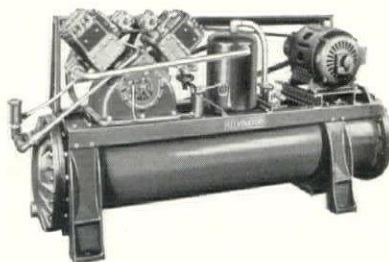
KELVINATOR COILS FOR DUCT INSTALLATIONS

There are fifteen evaporators, in capacities ranging from 1 to 10 tons, in the Kelvinator line. As in all Kelvinator Air Conditioning equipment, down-draft air flow is an important feature of these coils.



KELVINATOR SUSPENDED UNITS

There are 12 models in the Kelvinator line of suspended units for use where floor space is at a premium. Under average conditions their capacities range from 1700 to 18000 cubic feet of room space.



KELVINATOR AIR AND WATER COOLED CONDENSING UNITS

In the Kelvinator line there are 9 air-cooled and 13 water-cooled condensing units with capacities ranging from one-third to twenty H. P. This wide range of units makes possible the specification of *Exact* Equipment for every installation.

KELVINATOR

AIR CONDITIONING

"UNIPAK" WOOD CASEMENTS

ROTPOOFED • WEATHERSTRIPPED • DOUBLE GLAZED



Combining
NEW

- EFFICIENCY
- DURABILITY
- INSTALLATION
- BEAUTY
- ECONOMY
- CONVENIENCE

IN KEEPING WITH THE
NEW ERA OF SMART,
MODERN HOMES.

THE NEW "UNIPAK" outswinging Casement offers you a distinctly new and different window of modern, harmonious design. It provides efficiency and convenience never before thought possible in any window. Strongly and compactly built of decay and termite proofed wood. Equipped with all aluminum screen. Sash operates and locks without screen interference. The double glazing meets all air conditioning requirements. Effectively keeps out wind, weather and dust. Glass easily washed on both sides from inside of building. Installed cost compares favorably with ordinary windows.

"Unipak" comes complete with all hardware and accessories supplied. Sash are factory fitted, weatherstripped, and hinges applied. All installation uncertainties are eliminated.

Complete details and measurements shown in Sweet's Architectural Catalog for 1936.

FARLEY & LOETSCHER MFG. CO.
DUBUQUE IOWA U.S.A.
Qualitybilt
WOODWORK
REGISTERED

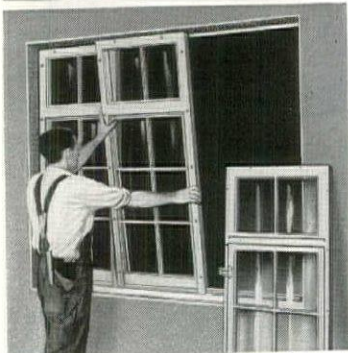
Write us for further information. Check square and sign name and address in margin below.

☐ Architect

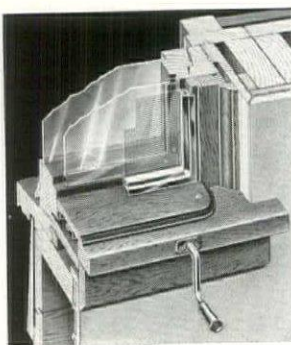
☐ Builder

☐ Dealer

☐ Owner



Installed from inside of building. Each unit complete with hardware.

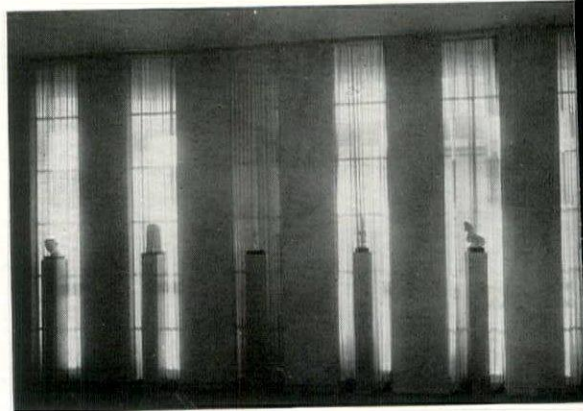


Section showing narrow line beauty and compactness of units. Permits generous plaster returns. Wood trim can also be used.

FORUM OF EVENTS

(Continued from page 14)

his Detroit school he decorated the First Swedish Church in Manhattan (ARCH. FORUM, Apr. 1931, p. 48) the First Swedish Evangelical Church in Arlington, N. J. was an assistant to Carl Milles, helped him work on the Orpheum fountain for Ivar Tengbom's Concert Hall in Stockholm (ARCH. FORUM, Nov., 1934, p. 307), show of his influence. At the Artisan Guild study some 70 students mostly from Wayne University. Under Jacobsson and



DETROIT'S ARTISAN GUILD EXHIBITION HALL

teachers they learn sculpture, fresco painting, bookbinding, etching, photography, puppetry and stage craft, interior decoration, cabinet work, ceramics. Last month, the group earning praise from Detroit art critics with an exhibit sculpture shown in a new hall designed by Sten Jacobsson and unusual in its method of lighting the works (see ARCH. FORUM, Nov., 1934, p. 307). The hall, once the Ford Administration building, is now from Son Edsel to the Guild.

PERSONALS

RALPH BRYAN, Dallas architect, has been appointed technical director of a competition for a model concrete building to be exhibited at the Texas Centennial Exposition in July. Prizes total \$2,500. Details from Portland Cement Association, 1301 Norwood Building, Austin, Tex.

Clifford H. James, architect, formerly of James & James (dissolved 1932), has moved his office from 2422 W. 1st St., Lubbock, Texas, to 1710 Guadalupe St., Austin, Texas.

The Institute of Foreign Travel, 80 Broad Street, New York City, announces a poster contest designed to stimulate European travel in 1936. First prize: \$500 cash and a round-trip passage to Europe on any one of twenty lines. Second prize: \$200; third, \$100.

The Housing Study Guild, New York City, has lent its library to the Resettlement Administration, Washington, D. C., for six months.

The Department of Agriculture, Agricultural and Mechanical College of Texas, announces the appointment of Major J. Sullivan, A.I.A., one-time president of the South Texas Chapter, as critic in design. Samuel B. Zisman, one-time instructor in architecture at M.I.T., has taken over the duties of the elementary work in design.

House Beautiful's eighth annual small house competition awards: for a house of eight rooms or less, first prize (\$500) to H. Roy Kelley, Los Angeles. Second prize (\$300) to Marion Gill, New York City. For a house of nine to twelve rooms, first prize (\$500) to H. Roy Kelley, Los Angeles.

(Continued on page 54)

Friends Everywhere!

Common Brick earns a coveted architectural distinction in the specifications of the 101 homes in the Forum's October issue: "Masonry Construction COMMON BRICK WALLS"

NOTHING is more natural than common brick, nor more naturally and widely available. By the same token it is the most natural thing in the world that common brick should make friends among the leading architects, builders and buyers in every community—that it should be honored *at home*, as perhaps has no other building material.

And that is exactly what we found when we studied and tabulated the construction characteristics of the 101 Homes of 1935 and the Future so beautifully presented in the great inspirational October number of the Architectural Forum.

This most extraordinary presentation of small homes was notable, not only for the fine critical selection which was exercised by the editors in appraising the beauty, design and construction of the homes considered in their nation-wide investigation, but also (if you will forgive us), most importantly, for the fact that the enduring natural beauty and structural soundness of the walls of 29 out of the 38 masonry homes presented was guaranteed by the well-merited specification and use of COMMON BRICK.

Like praise from Sir Hubert, this is a tribute indeed to the advantages which architects and builders have long recognized in this most fire-resistive, basic building material. But we're not going to get "high hat" about it.

The features which have won this flattering national acceptance for common brick may, and do, deserve the notice of kings, but they cannot obscure the common touch which gives to common brick its unique claim to architectural preference:

The infinite variety of natural tones and textures which identify its manufacture and availability in every community—The economies which result from the fact that when you buy common brick your building dollars are invested in actual material, not expensive transportation—The structural superiority demonstrated through the vicissitudes of a thousand years—Its adaptability in natural color, or whitened, and tinted, to the most exacting requirements of *all types* of architecture.

It is enough, that in offering these exclusive advantages, at prices consistent with its low-cost, local-made manufacture, common brick today finds an unprecedented opportunity to make a large and enduring contribution to the beauty, comfort, and genuine economy of the modern homes of America.

THE BRICK MANUFACTURERS ASSOCIATION OF AMERICA

2121 GUARANTEE TITLE BLDG., CLEVELAND, OHIO

A Packet of Educational Literature

● Containing three interesting plan books illustrating over 100 houses; a deluxe booklet of practical Fire Place designs; a complete Builders Manual for brick construction and other useful literature, will be mailed to you postpaid for 50 cents. Simply send this convenient clipping to our National Headquarters with your remittance.

Name _____

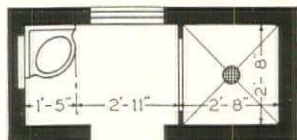
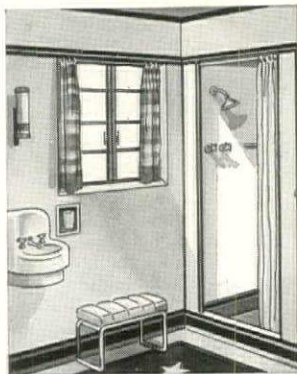
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AN EXTRA BATH 3 FEET SQUARE



WEISWAY Cabinet Showers now make possible the luxury of an added bath—of gleaming vitreous porcelain enamel—in space no larger than an ordinary closet! There are models suited to the requirements of the finest home—and to easily fit the budget for the simplest cottage.

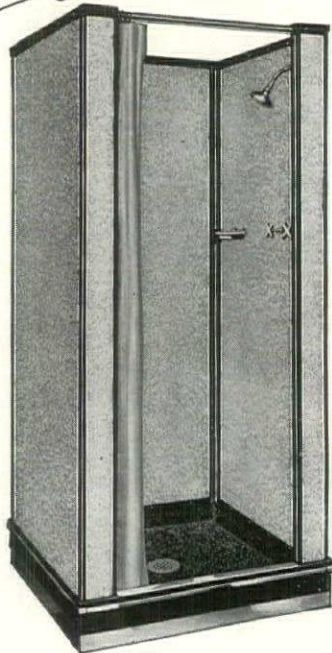
Here is the answer to the insistent demand of every modern family for extra bathing facilities. Space-saving, durable, beautiful, Weis Cabinet Showers are practical for new homes of every size, as well as in modernizing.



Write now for detailed specifications and prices. Complete Weisway line includes models for homes of every size as well as for hotels, schools and institutions of every type.

HENRY WEIS MANUFACTURING CO.
ESTABLISHED 1876
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Safe

FOOT-GRIP, NO-SLIP FLOOR

One-piece vitreous porcelain enameled receptor has floor with new exclusive finish which positively prevents slipping. (Patents pending). Equally effective wet or dry!

Newest Weisway showers have walls of vitreous porcelain enamel. Other models in synthetic enamel. Built as complete units in themselves, Weisway Cabinet Showers are not affected by any settling of the building. Construction is guaranteed leakproof. They add far more in sales value to the property than their small cost, besides providing an immeasurable extra comfort and convenience in use!

FORUM OF EVENTS

(Continued from page 52)

rooms, first prize to Richard Frederick King, Los Angeles; second to Robert Charles Dean, Newton, Mass. A prize for the best remodeled house went to Evans, New Woodbridge, New York City.

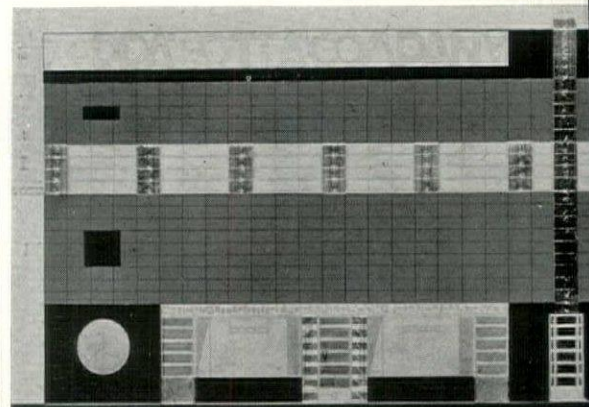
H. M. Shackelford, advertising manager of John Deere Co., heads an executive committee which will sponsor housing expositions and motor caravans throughout the country. Sponsors: Manufacturers' Housing Display in association with the Treasury Department and F.

First prize (\$300) went to Sidney Bagshaw, New York City, for the best general type face design in a competition sponsored by the Advertising Typographers of America exhibited at The Architectural League, New York City.

The American Academy in Rome is announcing its competition for fellowships in architecture, landscape architecture, painting, sculpture, music. Entrants, who must be 30 or less and unmarried male citizens, may apply to the Executive Secretary, 101 Park Ave., New York City, until Feb. 1, 1936.

The Medary Scholarship, A.I.A. was awarded to N. Lykos of Wilmington, graduate of M.I.T.

The Chicago Architectural Club winners in its Terra Wall Block Competition: for a one-story shop building. Evald Young, George Recher, Roy Anderson, first, second and third respectively.



ZAKHAROFF'S TERRA COTTA WINNER

and third respectively. A. A. Zakharoff won first prize for a two-story shop and office building. Second and third prizes went to Herbert Rodde and Charles Koncovic. The project required the use of machine made terra cotta blocks in color with an allowance of 20 per cent terra cotta architectural ornament. The jury of awards consisted of Alfred S. Andrew Rebori, Hugh Garden, Oscar Gross, F. O. Tufts and White.

Joseph D. Murphy of Kansas City, Mo., has been appointed Acting Associate Professor of Design in the School of Architecture, Washington University, St. Louis. Murphy studied at M.I.T. from 1927 to 1929. During his first year there he won the Fontainebleau Scholarship. Three years later the M.I.T. Fellowship for European travel. The latter he had to relinquish when he also won the Pulitzer Prize.

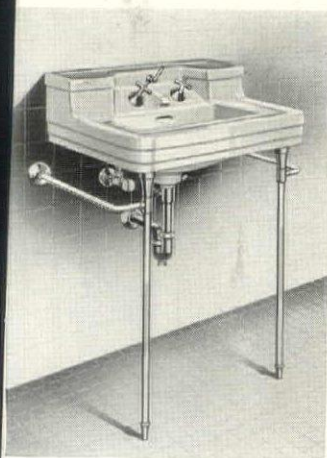
Manufacturers' Catalogues are requested by Lindholm Boozer, Jr., Box 644, Rock Hill, S. C.; the Engineer-Architect, Hydroelectroproject, F. Engelsa No. 102, Rostov-on-Don, U. S. S. R.; Staab & Richardson, 600 Bloomfield Avenue, Bloomfield, N. J.

OUR CLIENTS PAY ONLY FOR CRANE QUALITY

. . . THE BEAUTY IS *Plus*



Crane CORWITH lavatory C-138 distinguished piece with smartly finished chromium legs and towel bar. The new lever-action, quick-drain-SECURO waste, and metal spout. The bowl is of china, rectangular in shape and with a splash lip.



Crane CORWITH COMPEER lavatory C-133 and its novel panel for supply lines, its shelf ends, and its china internal spout. Rectangular basin with splash lip. Chromium towel bars and legs.

The design and beauty that lie in Crane fixtures are distinctions that the homeowner appreciates and desires. This is a plus value. It has no price. It is the reflection of the quality which permeates every Crane product. When you specify Crane fixtures, you are specifying scientific mechanical design, precision manufacture, superior materials. You are also specifying something more — a priceless beauty that gives pleasure and satisfaction.



The Crane SIWELCLO C-10384 closet is a handsome, quiet-acting siphon jet fixture with silent flush and float valves. Elongated rim opening, body-conforming seat. Shelf cover.

CRANE

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The trend is to "all-electric" buildings . . . homes, factories, offices. And these buildings are entirely dependent upon their wiring systems for the efficient operation of electrical appliances and apparatus.

Your plans will follow the "all-electric" trend if you incorporate maximum electrical efficiency and convenience into your plans . . . build in adequate wiring systems to meet present and future needs. Specify the materials for wiring systems carefully.

General Electric Wiring Materials make modern, adequate wiring systems possible. Specify G-E "Safecote" Building Wire; Rigid Conduit, BX Armored Cable, Boxes and Fittings; Switches, Convenience Outlets and Textolite Plates. They guarantee the dependable and economical operation of your "all-electric" buildings permanently. Send today for full information and for special bulletin describing in detail the new General Electric Radial Wiring System. Write Section CDW-2212, Merchandise Department, General Electric Company, Bridgeport, Conn.



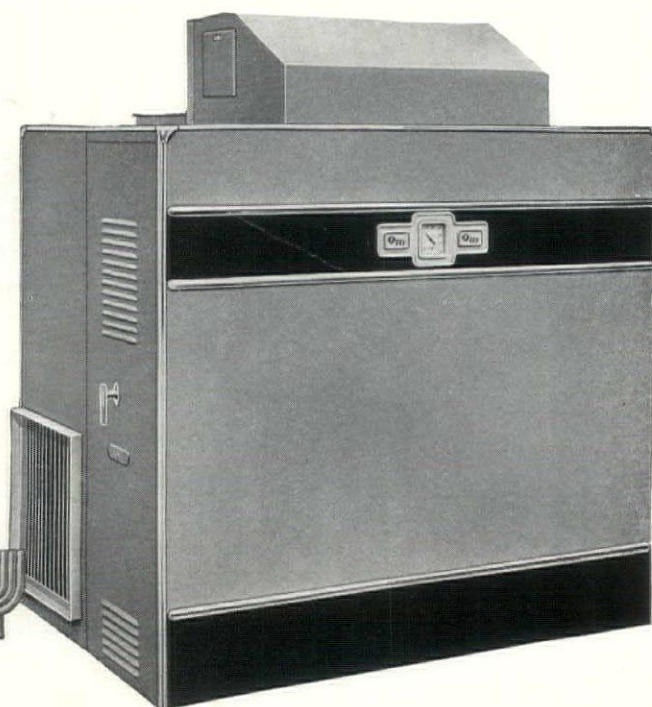
GENERAL ELECTRIC WIRING MATERIAL

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Presenting the new

QUIET MAY

steam-air-conditioner"



combining conditioned warm air heating

. . . . steam radiation heating

. . . . all-year tankless domestic hot water

. . . . controlled summer air circulation

EXPERTS in heating and air conditioning have long agreed that in residential work both radiation heating and conditioned warm air heating should be combined for ideal results. They also seek automatic all-year domestic hot water and some simple method of securing summer comfort.

. . . because warm air heating of living rooms and bedrooms permits effective air conditioning at minimum cost.

. . . because radiation heating in kitchens, bathrooms, garage and sometimes servants' quarters prevents the recirculation of odors or noxious fumes through the air conditioning system, or saves long extensions of duct work.

. . . because domestic hot water is needed at all times and can be cheaply provided by coils submerged in a steam boiler.

. . . because the same blower and filters needed for winter conditioning can maintain cleaned air circulation all year, to the great improvement of summer comfort.

FOR the first time these ideals are met in a single unit—the Quiet MAY "steam-air-conditioner." It heats by both steam radiation and conditioned warm air, it automatically provides domestic hot water all year around by a tankless heater of unique type; it cleans and circulates the air in winter as part of its air conditioning function and in summer to produce the cooling effect of a gentle breeze. Mechanical cooling and dehumidifying equipment may be added at any time by making simple provisions in the duct work.

All equipment is contained within a compact cabinet of furniture steel beautifully finished in grey and black with chromium trim.

The foundation of this new Quiet MAY "steam-air-conditioner" is the successful Quiet MAY Oil Furnace featuring the sapphire atomizer and Gerotor pump, the patented Ther-MAY-lator, combustion chamber, and the year 'round tankless domestic hot water heater submerged in the boiler water.

Incorporated in the engineering design are—a large capacity slow-speed centrifugal blower; oversize Air-mat replaceable filters for air cleaning; a fully automatic evaporating type humidifier of adjustable capacity and a simple "dry-back" heat economizer which forces the flue gases to part with all waste heat before entering the stack.

Carefully balanced and integrated through newly devised controls, this scientifically designed "steam-air-conditioner" is easily installed in old houses utilizing the existing warm air duct distribution system; or in any house, new or old, in which both ducts and radiators can be introduced for ideal results.

Also ask for complete information about Record Performing Quiet MAY Oil Furnace for installation in Steam and Hot Water Radiation Systems. No outside water storage tanks or motorized valves.

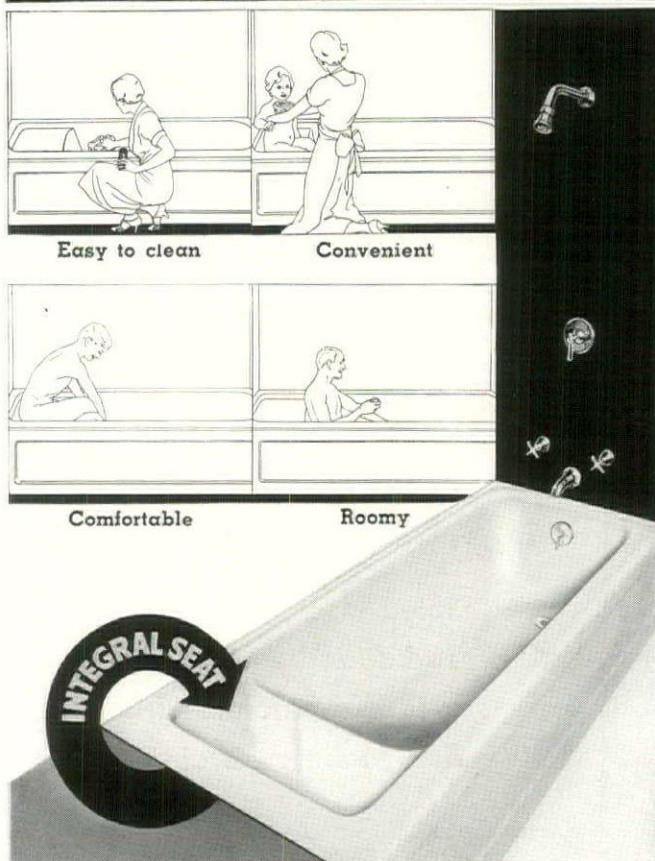
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Consult Telephone Directory for Nearest Quiet MAY
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KOHLER METRIC

A new kind of bath
with *Integral Seat*
for all kinds of bathrooms



NEW, but not a novelty. It's modern, yet there's nothing "ultra" about it.

This compact bath is at home in spacious bathrooms, but doesn't crowd fixtures in the smallest. For remodeling it can be installed quickly without tearing out walls. Every bathroom has room for the Metric.

The Integral Seat is Kohler's contribution to bathing comfort and convenience. It makes bathing safer for children and elderly people, is especially handy for foot-bathing, is a "natural" for the shower bather, yet is roomy for the tub bather.

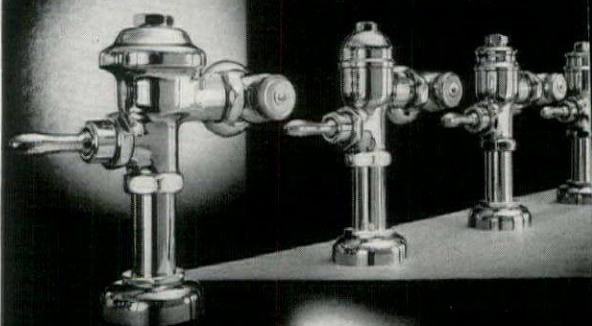
This new bath is remarkably easy to clean. A person of average size can reach the entire bath from one position, without tiresome straining and stretching.

Designed for utility and beauty—straight lines, clean, flat surfaces, recessed panels—the Metric harmonizes with other Kohler fixtures. It appeals to architects and clients on a *common-sense* basis.

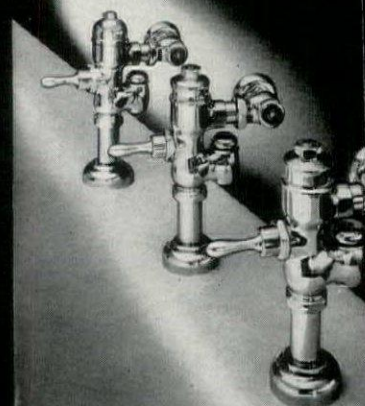
Your clients know Kohler's 62-year reputation for dependability and quality. The Metric keeps up the good work. See this pace-setter at the nearest Kohler branch and at wholesalers. Write for information to the Kohler Co. Founded 1873. Kohler, Wisconsin.

KOHLER OF KOHLER

Spotlight



In the spotlight for thirty years and still the standard by which all others are judged



SLOAN FLUSH VALVES

EDWARDS METAL SPANISH TILE



Satisfy Architect, Contractor and Owner



These tile create the effect of great mass and weight. They lend tone, charm and dignity to any building. They not only protect from rain, snow and wind but also from lightning and from the hazards of roof fires.

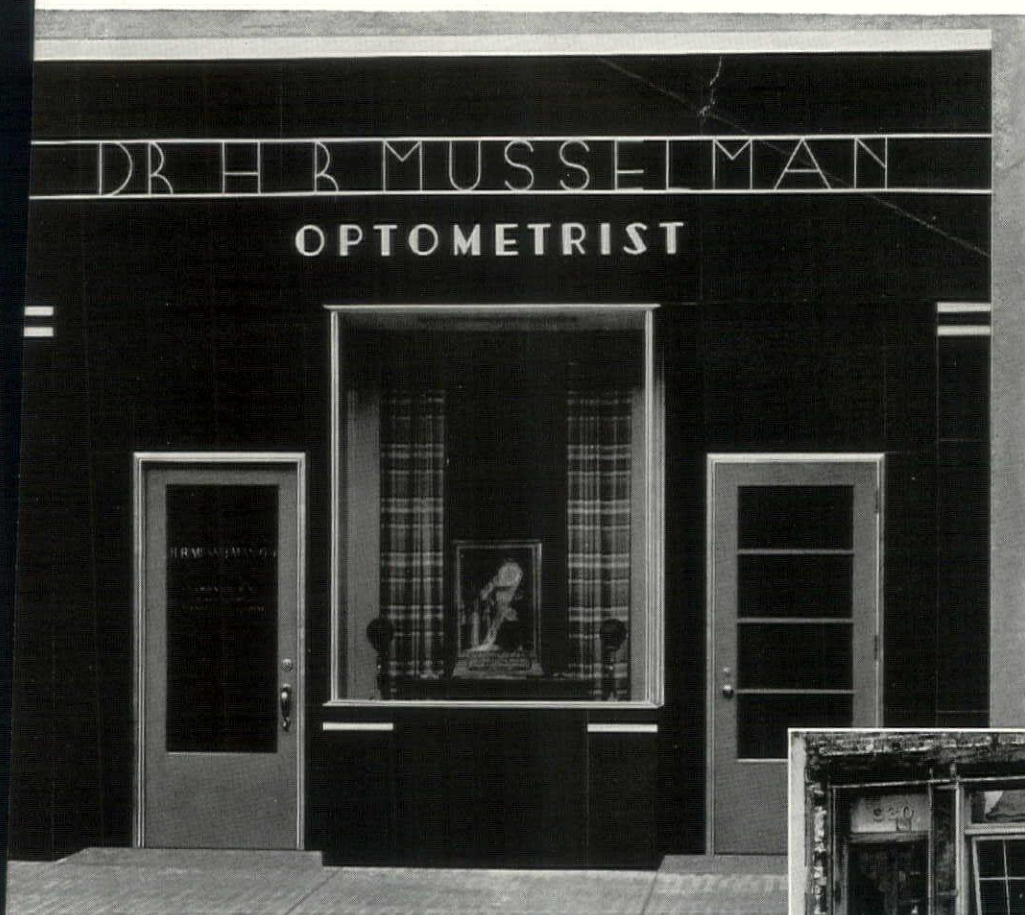
Light in weight and easy to install they require no special reinforcement of roof framing but they do add strength and rigidity to every square foot of roof surface. Low in cost and good for the life of the building.

Write for Tile and Shingle Catalog No. 72.

Send blue prints of your next roof for estimate.

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328 Eggleston Ave. Cincinnati, O.

*Metal Roofing, Siding and Ceilings
Air Conditioning for the Home*



AFTER:

Here is how Architect Karl H. Snyder and Contractor E.S. Yeager utilized Pittco Store Front Products to carry out a modern store front idea in Bethlehem, Pa.



BEFORE:

And this is the way the store property looked before it was transformed with a new Pittco Store Front.



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*offer new possibilities
in store front design*

THIS complete line of store front products... glass, paint and metal... is especially designed to help you carry out, exactly, your ideas for distinctive, original store fronts. Pittco Products are all of high quality, all extremely versatile, giving you a new freedom in design.

Also, in furthering the "Modernize Main Street" movement, we are helping you to get

store remodeling jobs in your community. In our extensive advertising to your prospective clients, we recommend that they retain a local architect to design their store fronts for them. When these prospects call you in, show them how Pittco Store Fronts can improve their business, increase revenue for property-owners, add to property value. And then, to assure them a satisfactory, quality installation, specify Pittco Store Front Products.

We invite you to send the coupon below for our interesting booklet on Pittco Store Fronts. It contains complete information, price data, and many pictures of Pittco installations.

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glass...metal...paint

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PLATE GLASS COMPANY

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Pittco Store Front
Metal
Pittsburgh Mirrors

Pittsburgh Paint
Products
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Tapestry Glass

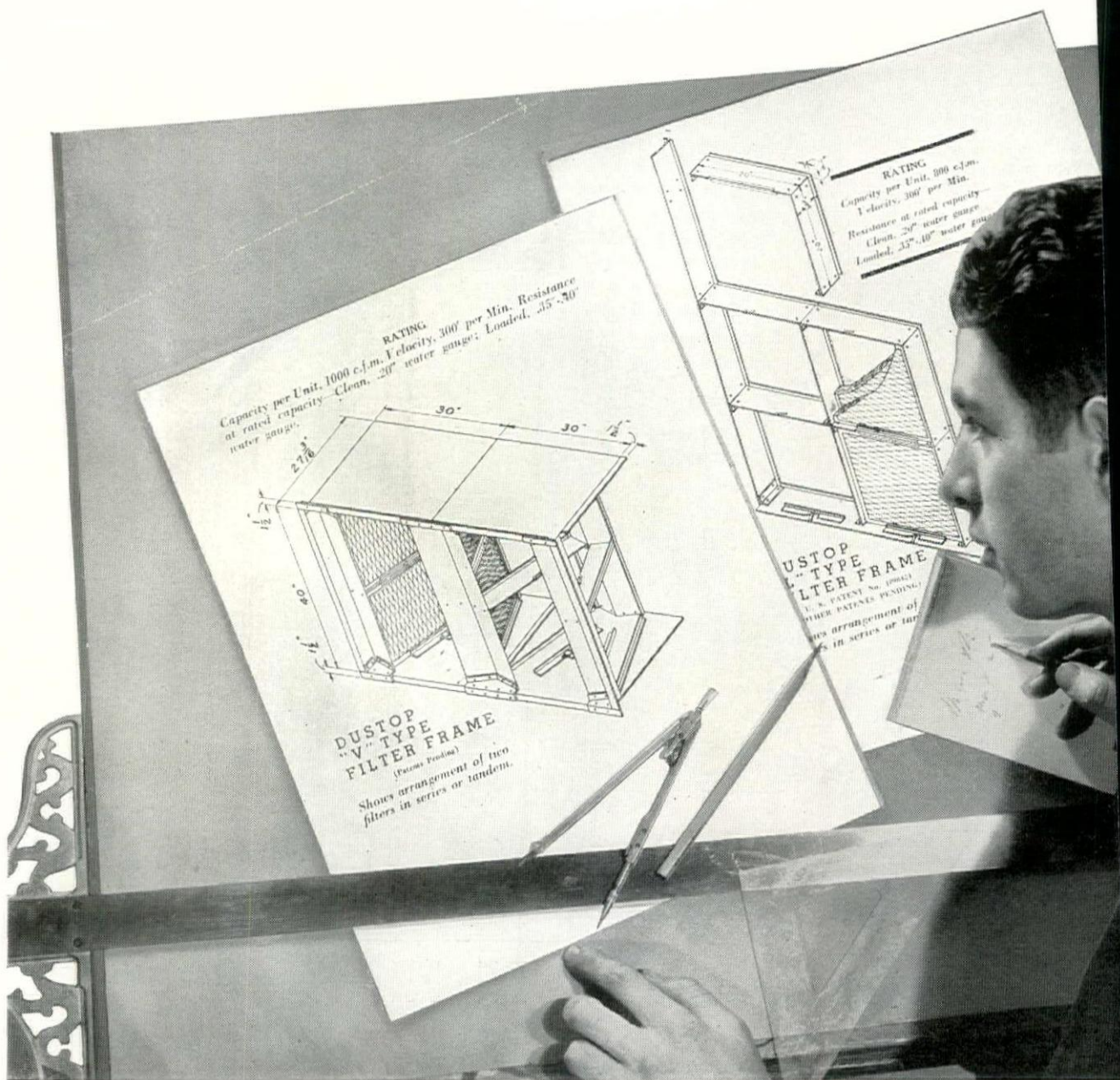
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2298A Grant Building,
Pittsburgh, Pa.

Please send me, without obligation, your new book entitled "How Modern Store Fronts Work Profit Magic."

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Street.....

City..... State.....



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● The Dustop frame is a companion to the Dustop Replacement type filter which does its best job when used in combination with the L and V type frames which have been specially designed to hold them. "Home-made" and "Botch Job" frames mean uncertain results. Assure client satisfaction, highest efficiency and easiest replacements by specifying Dustop frames and filters on all air filter installations. Distributors carrying complete stocks of Dustop filters are located in all principal cities. (Dustop is assembled and installed in Canada by General Steel Wares, Ltd., Toronto.) . . . Owens-Illinois Glass Company, Industrial Materials Division, Newark, Ohio.

OWENS-ILLINOIS DUSTOP AIR FILTERS



It is not a matter to be
taken lightly, the confining of children in
artificial surroundings during the most
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★ *A Better Window* for the better homes of 1936!

There's important news in this new solid ALUMINUM or BRONZE window for every architect, builder, banker or owner interested in better housing. Designed for striking beauty, easy action, lasting service and economy, it meets today's demand for modern products in homes costing from \$7,000 up. A unique development based on many years experience in fabricating rustless metal windows.

COMPLETE UNIT. Sash come glazed and installed in frame—ready for one-man installation in an hour.

SIMPLE. Light Sealair is a weight-hung window—simply, compactly, and sturdily built. No springs. Nothing complicated.

EASY ACTION—ALWAYS. Opens and closes with finger-tip pressure.

UPKEEP SAVINGS. No painting, no re-fitting. Will not swell, shrink, rust, rattle, or rot out. Integral weatherstrip guides and interlocking members are highly effective against wind and weather—save fuel.

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STANDARD SIZES. Available in even glass sizes from 18" x 16" to 30" x 30".

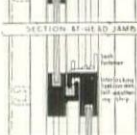
Sold through building material dealers—moderately priced. Light Sealair will revolutionize your idea of what a window should be.



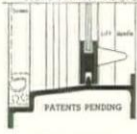
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LIGHT SEALAIR WINDOW

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SERIES "RP" RIVETED HIGH PRESSURE
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Portable return tubular fire box
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CONDUIT SYSTEMS FOR
UNDERGROUND STEAM PIPES

NO MORE TRIPS
TO THE GARBAGE CAN—
IN NEW AMERICAN HOMES



THE NEW KITCHEN WASTE UNIT

disposes of 98% of kitchen refuse
right at the sink!!

GENERAL ELECTRIC offers another great contribution to modern living—the new G-E Kitchen Waste Unit. This remarkable device, attached beneath any sink, reduces kitchen refuse to a thin pulp and flushes it out the drain like dishwater.

No More Wrapping and Carrying Out of Garbage!

The new G-E Kitchen Waste Unit eliminates the householder's daily, distasteful task of accumulating and disposing of kitchen garbage. Instead food scraps, fruit and vegetable waste and peelings, bones and other kitchen refuse (except metal or glass objects) are deposited in a special receptacle attached to the sink—a simple

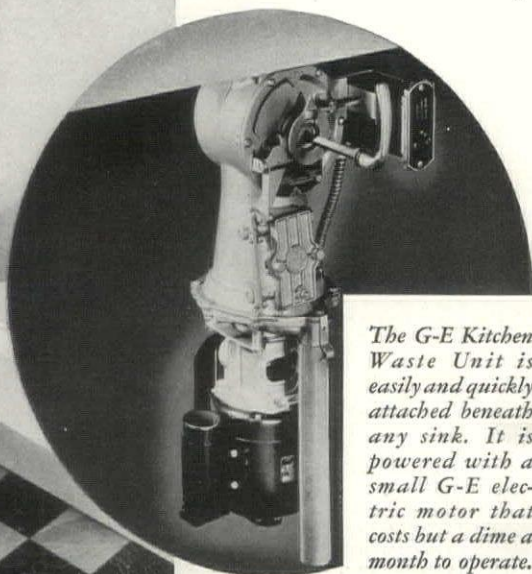
control is turned—and the garbage is gone and forgotten!

Sanitary—No Odor— Cleans Itself

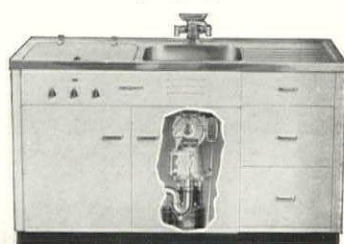
The G-E Kitchen Waste Unit automatically cleans itself and is thoroughly sanitary. The kitchen is entirely free from any odor.

See it Demonstrated

G-E Kitchen Waste Units are installed in many of the kitchens of New American homes. If there are none convenient to you, you can see a demonstration at the G-E Appliance distributor's display room or write direct for complete information and specifications. General Electric Co., Specialty Appliance Dept., Section CG12, Nela Park, Cleveland, Ohio.

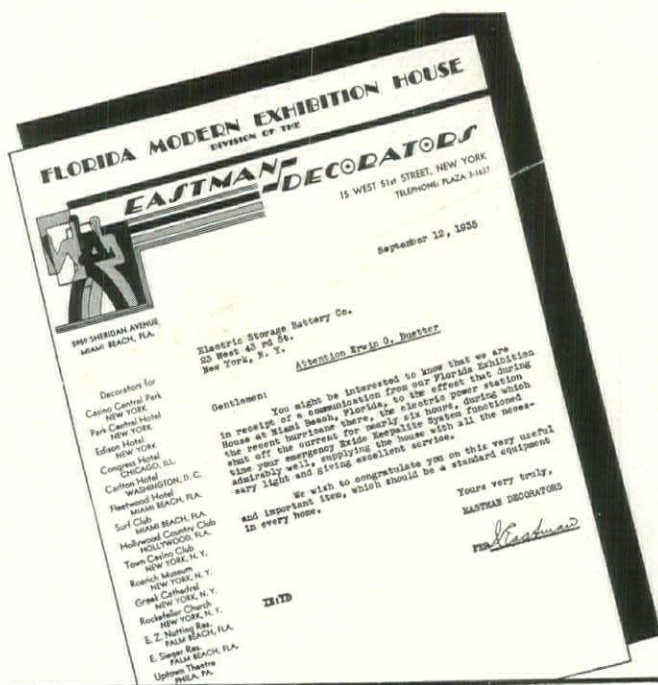


The G-E Kitchen Waste Unit is easily and quickly attached beneath any sink. It is powered with a small G-E electric motor that costs but a dime a month to operate.



General Electric Dishwasher and Kitchen Waste Unit in Combination

Here, for the first time, is a completely electrified sink where food refuse is disposed of and dishes are hygienically cleaned—automatically. Fully guaranteed by General Electric. Ask for details and specifications.



"EXIDE EMERGENCY LIGHTING functioned admirably during the hurricane" say Eastman Decorators

Due to the foresight of the well-known Eastman Decorators of New York, and Robert Law Weed, Architect, the Florida Exhibition House at Miami Beach is equipped with an Exide Keepalite Emergency Lighting Battery System. During the recent hurricane, the normal current supply was interrupted for six hours, during which time the Exide System supplied the house with all necessary light.

Say Eastman Decorators, "We wish to congratulate you on this very useful and important item, which should be standard equipment in every home."

Exide Systems are proving their value in public buildings of all kinds, in schools, hospitals, stores and theatres—wherever crowds gather.

It is well to remember that it doesn't take a hurricane to cause current interruptions. For lighting interruptions do occur in all parts of the country. The utility companies take every possible precaution to prevent them, but cannot always control the effects of accidents, fires and storms.

An Exide System operates instantaneously and automatically upon any interruption in the normal current supply, providing abundant light. It is invaluable protection for public buildings. There is an Exide Keepalite System for as little as \$150. Write for free booklet on Exide Emergency Lighting.

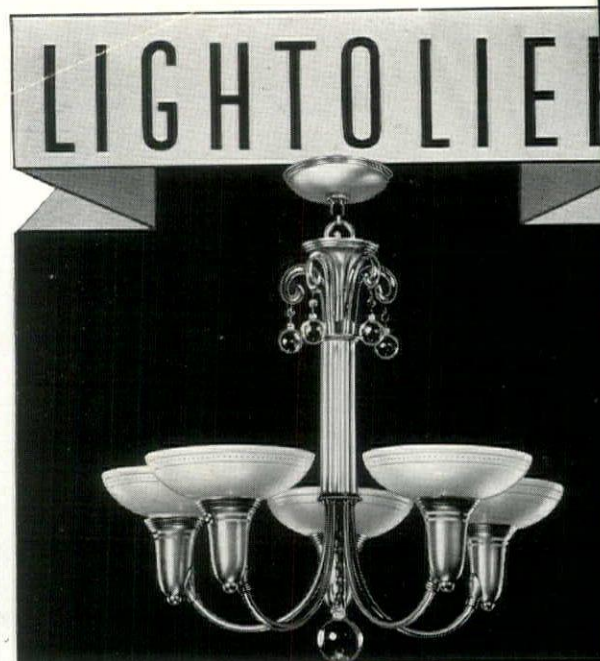
THE ELECTRIC STORAGE BATTERY CO., Philadelphia
The World's Largest Manufacturers of Storage Batteries for Every Purpose
Exide Batteries of Canada, Limited, Toronto

Refer to Sweet's Catalogue, Section 27—Page 1

Exide Keepalite

EMERGENCY LIGHTING SYSTEMS

\$150 AND
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Beautiful Lighting

Lightolier equipment is outstanding because it combines tasteful design with the highest degree of lighting efficiency. Write for informative booklet "Correct Lighting for American Homes"

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Architects, the country over, are specifying the Gar Wood Tempered Aire Automatic Oil Heating and Air Conditioning System . . . because it is the accepted system with proved merit for economy and dependability. Sales of Gar Wood units are far ahead of 1934.

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Look for Gar Wood Systems in
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BRIGSTEEL
Beautyware

PLUMBING FIXTURES FOR BETTER HOMES



Colorful, modern, beautiful bathrooms are no longer confined to the large, expensive homes. The illustration above shows a Beautyware Bathroom that was designed especially for modest homes—

convincing proof of the opportunity afforded by Beautyware to achieve outstanding designs at low cost. Illustrated above are Model numbers: Bathtub 770 A-C; Lavatory 713 A-C; Toilet 800 A-C.

A new idea for modest homes

Brigsteel Beautyware introduces a new and higher standard in plumbing fixtures—a standard that combines new quality, beauty, economy and utility.

Beautyware also introduces a new freedom in color selection—a freedom which permits the creation of new, fresh bathroom and kitchen designs for either the small home or the mansion.

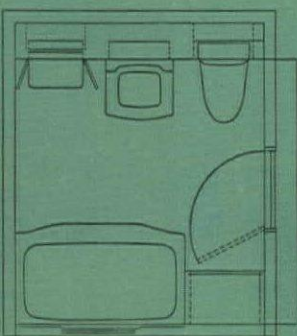
Now, it is possible for you to give your clients the beauty of color, the charm of modern design, and the utmost quality—all at modest cost.

PLUMBING WARE DIVISION
DETROIT

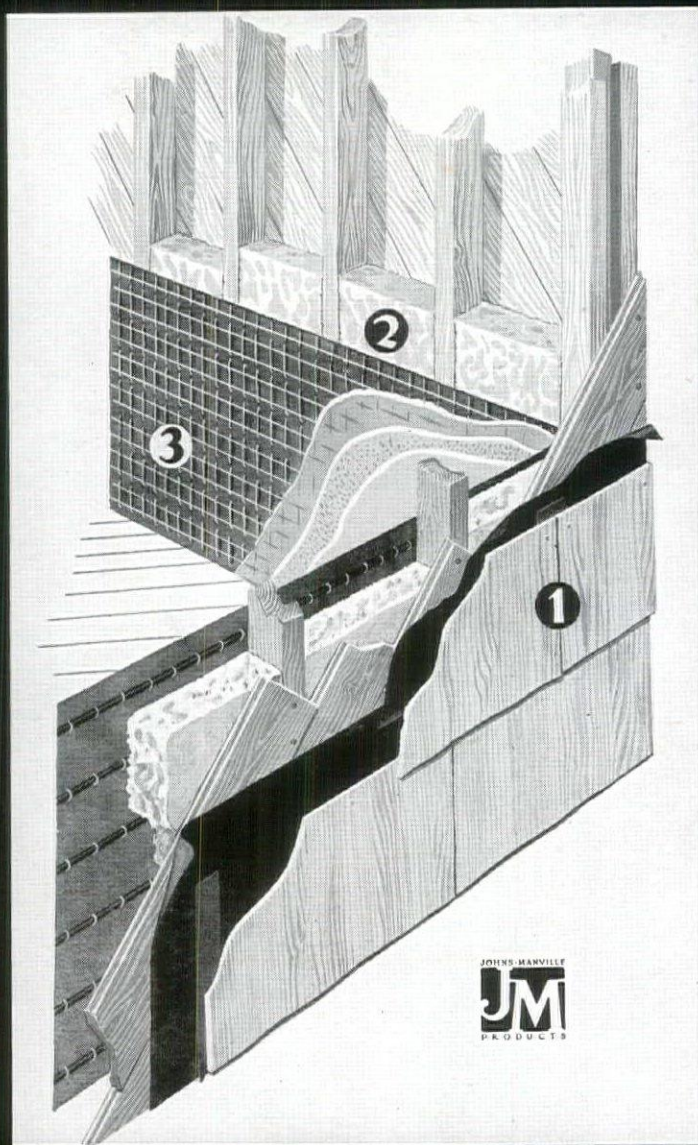
The Brigsteel Beautyware Line includes ensembles and individual fixtures for bathrooms, kitchens and laundries; kitchen sinks and cabinet sinks; service sinks; bathtubs; lavatories; boudoir lavatories; toilets; combination sink and tray and utility porcelain tubs.

Call your Master Plumbing Contractor or write Brigsteel, Detroit, for information, specifications, and roughing-in dimensions. Send for the new Brigsteel Beautyware Brochure "*Personal Luxury in the Bathroom and Kitchen.*"

BRIGGS MANUFACTURING CO.
MICHIGAN

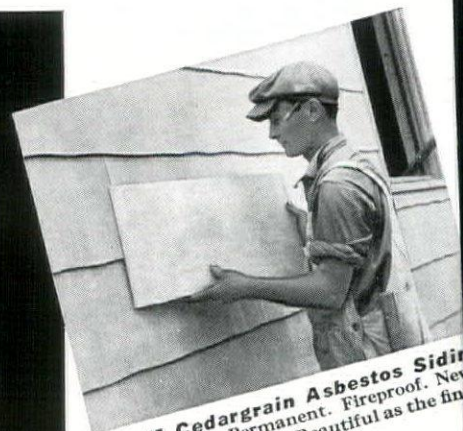


Why not give your client a Triple-Insulated Wall Construction?

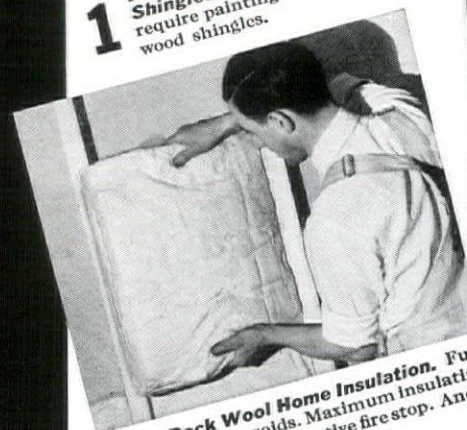


The New Johns-Manville TRIPLE-INSULATED WALL

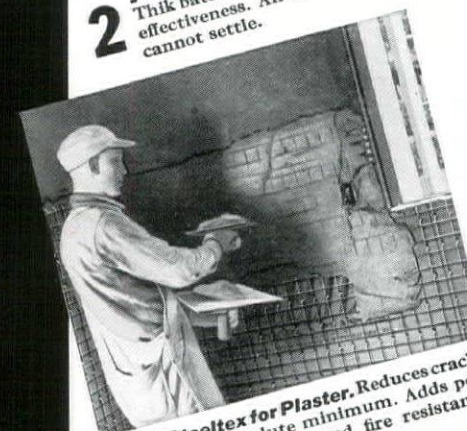
- Insulated against hot and cold weather
- Protected against fire
- Fortified against time and deterioration



1 J-M Cedargrain Asbestos Siding Shingles. Permanent. Fireproof. Never require painting. Beautiful as the finest wood shingles.



2 J-M Rock Wool Home Insulation. Full thick bats. No voids. Maximum insulating effectiveness. An effective fire stop. And cannot settle.



3 J-M Steeltex for Plaster. Reduces cracking to an absolute minimum. Adds permanence, strength and fire resistance.

And what do we mean by a "triple-insulated" wall?

First, an outer wall with all the beauty of wood shingles but which cannot burn or rot and never requires painting (permanent, fireproof J-M Cedargrain Asbestos Siding Shingles).

Second, an inner-wall construction that stops fire spread, keeps the house comfortably cool in summer and saves up to 30% in fuel bills in winter (hollow wall spaces are filled with J-M Rock Wool Home Insulation).

Third, an interior plastered wall with maximum resistance to cracking (J-M Steeltex for reinforcement).

In short, J-M's new Triple-Insulated Wall insulates against hot and cold weather; protects against fire; fortifies against time and deterioration. For further data write Johns-Manville, 22 E. 40th St., New York.

*Build
to endure with*
WOLMANIZED LUMBER
REG. TRADE MARK



**WOLMANIZED LUMBER GIVES YOU CERTIFIED
PROTECTION . . . AGAINST DECAY AND TERMITES . . .**

It can be painted, varnished, stained and used like any other wood.

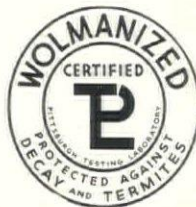
WOLMANIZED LUMBER looks, feels and
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any kind of lumber can be treated with this
odorless preservative to change it to a *perma-*
building material that has all the working and
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The Wolmanizing System of preserving lumber re-
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basements, floor joists, studding, sub-flooring, etc. All mill
products may be made from this treated wood.

The service record of Wolmanized Lumber has been
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NEW YORK, NEW YORK
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Arcade Building

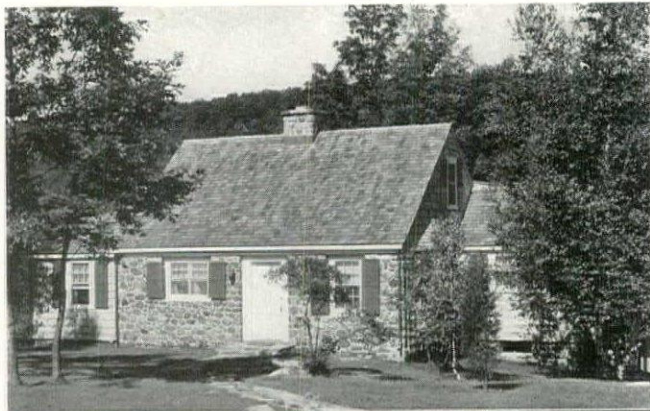
SAN FRANCISCO, CALIFORNIA
116 New Montgomery Street

BOSTON, MASSACHUSETTS
10 High Street

SHREVEPORT, LOUISIANA
509 Market Street

LOS ANGELES, CALIFORNIA
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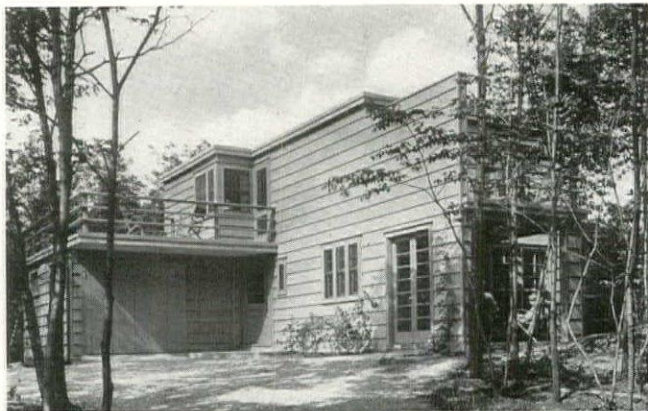
**AMERICAN LUMBER
& TREATING CO.**



House at Lake Mohawk, New Jersey. Edwin R. Closs, Architect. Roof, Cabot's Creosote Stains; trim, Cabot's Collopakes.

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"... in both design and plan ... a spirit of sturdy Dutch common sense," says the *Architectural Forum*. This same spirit doubtless influenced the choice of the exterior finish—Cabot's Creosote Shingle Stains, Gloss Collopakes and DOUBLE-WHITE.



House at Wilton, Connecticut. Evans, Moore & Woodbridge, Architects, New York City. Walls, Cabot's Creosote Stains.

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"... an efficient machine ... wholly acceptable to the present day realist ...," says the *Forum*. The finish is of Cabot's Stains, which for their beauty, their economy, their wood preserving qualities—have been more than acceptable to realists for half a century.

EXTERIOR FINISHES are important to the architect, since their failure can be so damaging to the appearance of his finished work. That is why so many leading architects specify Cabot's Shingle Stains and Cabot's Collopakes—finishes of brilliant, lasting beauty and known quality.

Cabot's Shingle Stains and Cabot's Collopakes

Samuel Cabot
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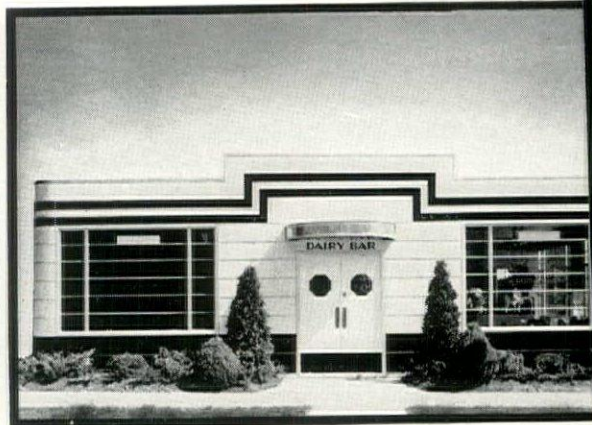
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Gentlemen: Please send me color cards and full information about

☐ Cabot's Collopakes. ☐ Cabot's Shingle Stains.

Name

Address AF-12-35



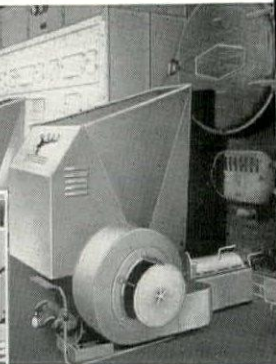
Another CLIP-STRIP installation—
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Now you can write "Automatic Heating" into your specifications as an economy instead of an extra expense item.

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The Automatic Butler is a coal stoker highly and flexibly engineered to burn a wider range of coals under more varying conditions. The facilities of a \$50,000 working laboratory enable Butler engineers to definitely adapt it to the coals available in any region.

Complete working details will be supplied by the Butler engineering staff, field men and authorized dealers on sizes for homes, apartments, hotels, hospitals, schools, churches, office, factory and service plant buildings. We invite full inquiry.

CUTS
HEATING
COSTS
15% TO
50%

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For Homes Where Standard Roof Insulation Is Not Provided

The asphalt shingle modernized . . . given added value . . . INSULATION . . . at no material increase in cost! This is the practical fact back of the sweeping popularity of Carey Cork-Insulated Shingles. Fabricated with weather surface of slate; cork surface underneath. When laid on roof, three thicknesses of insulating cork act as a barrier to cold and heat; insure warmer homes in winter, cooler in summer.

Ten years of service . . . in all climates . . . on thousands of homes . . . have demonstrated the insulating value of this shingle; justify its use wherever standard roof insulation is not specified. Extra thick, it enhances roof beauty. Modern, non-fading colors meet every decorative demand. Approved by Underwriters Laboratories. Write today for samples and full details.

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CORK INSULATED SHINGLES

Include
Quietness
 in your specifications

Acousti-Celotex
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 for Acoustical Correction
 and Sound Absorption

It is a significant fact that the country's architects are of one opinion when the problem calls for acoustical correction and sound absorption.

Acousti-Celotex, for more than twelve years, has been given an ever increasing preference until now it is generally considered the standard material in its field.

These distinctive advantages are responsible for the leading position Acousti-Celotex occupies:

1. *Sound absorption.* The four types of Acousti-Celotex offer a choice of absorption efficiencies to meet the particular requirements of every job.
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5. *Permanent.* Acousti-Celotex is a strong, rigid tile that lasts indefinitely.

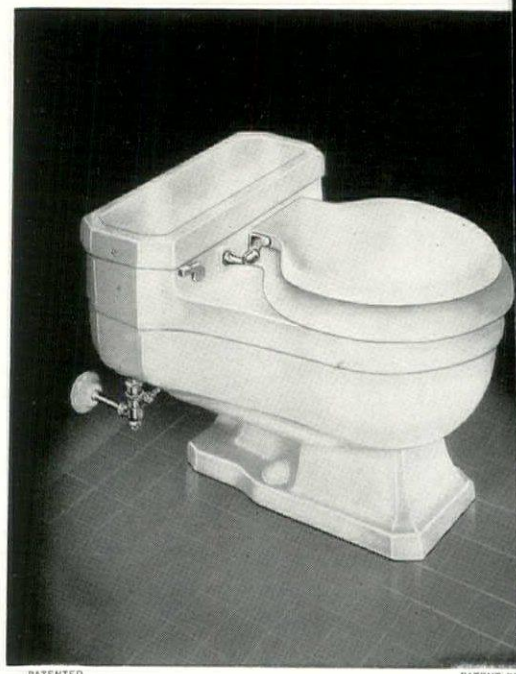
Consult with your local Acousti-Celotex contracting engineer. He will gladly cooperate in making analyses, recommendations and estimates. Or write direct.

NOTE: Acousti-Celotex can now be furnished with a pre-painted hard finished surface especially adaptable to various installation requirements.

THE CELOTEX CORPORATION, 919 No. Michigan Ave., Chicago

PAINTABLE PERMANENT
ACOUSTI-CELOTEX
TRADE MARK REGISTERED U. S. PATENT OFFICE

WHEN YOU ARE
PLANNING A Bathroom



Take advantage of
T/N's FEATURES ★ ★



Architects find that T/N's design permits a wide variety of bathroom layouts. The design does not have to be attached to the wall and installations are possible in corners, under windows and even under stairways. When quietness is a factor, T/N is the satisfactory answer. Other features include

non-overflow control, powerful cleansing flush, volume regulation under any water pressure, and safeguards against water supply contamination. Available in a wide variety of colors. Finest twice fired vitreous china which means complete acid resistance, of course. Easily cleaned and highly sanitary. Priced to fit the most modest home budget.

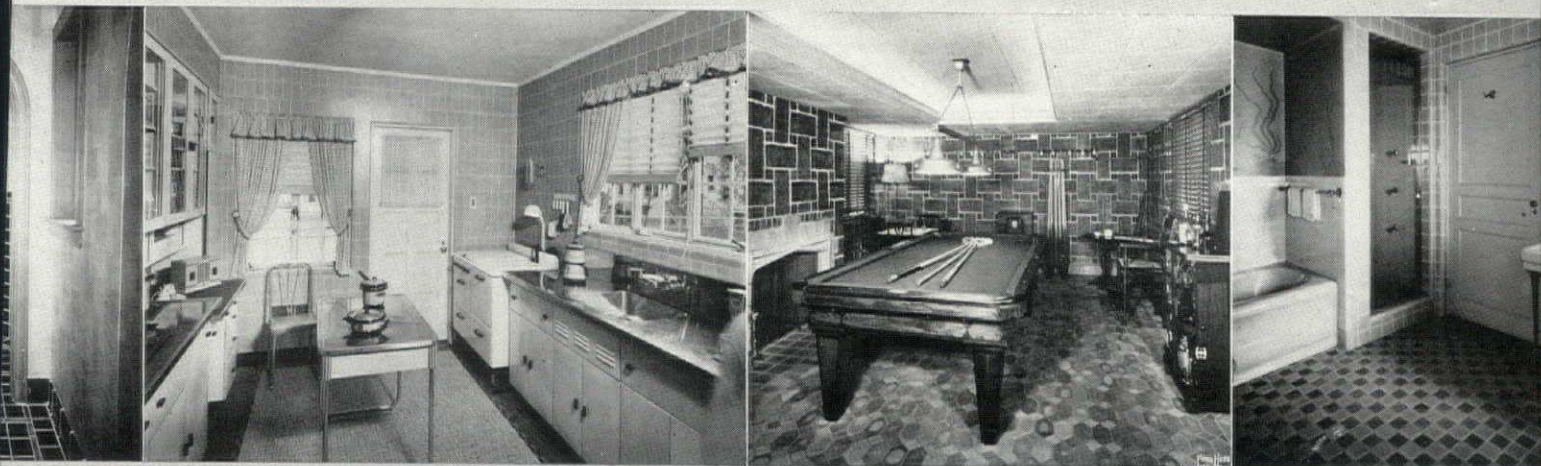
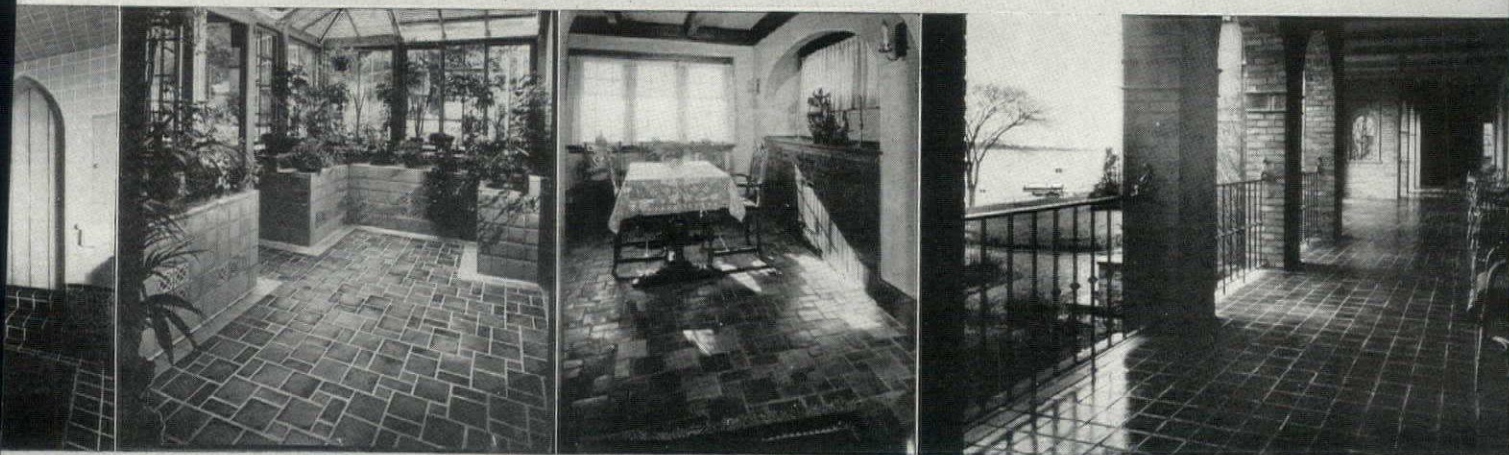


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Please send me complete descriptive literature and helpful data on the T/N One-Piece Water Closet, both for REMODELING and NEW HOMES.

There is nothing "just as good" as **REAL TILE**



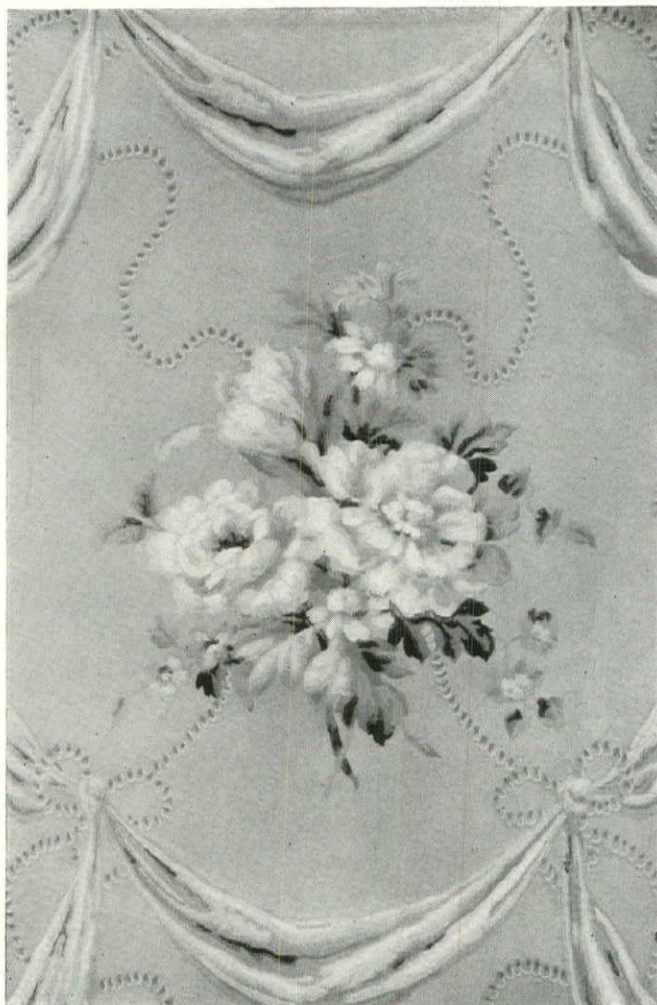
This book contains suggestions for use and shows interesting installations of Tile. • Architects wishing copies are invited to write for whatever quantity they require. • Home owners or prospective builders may obtain copies from their local tile contractors.

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STRAHAN WALLPAPER



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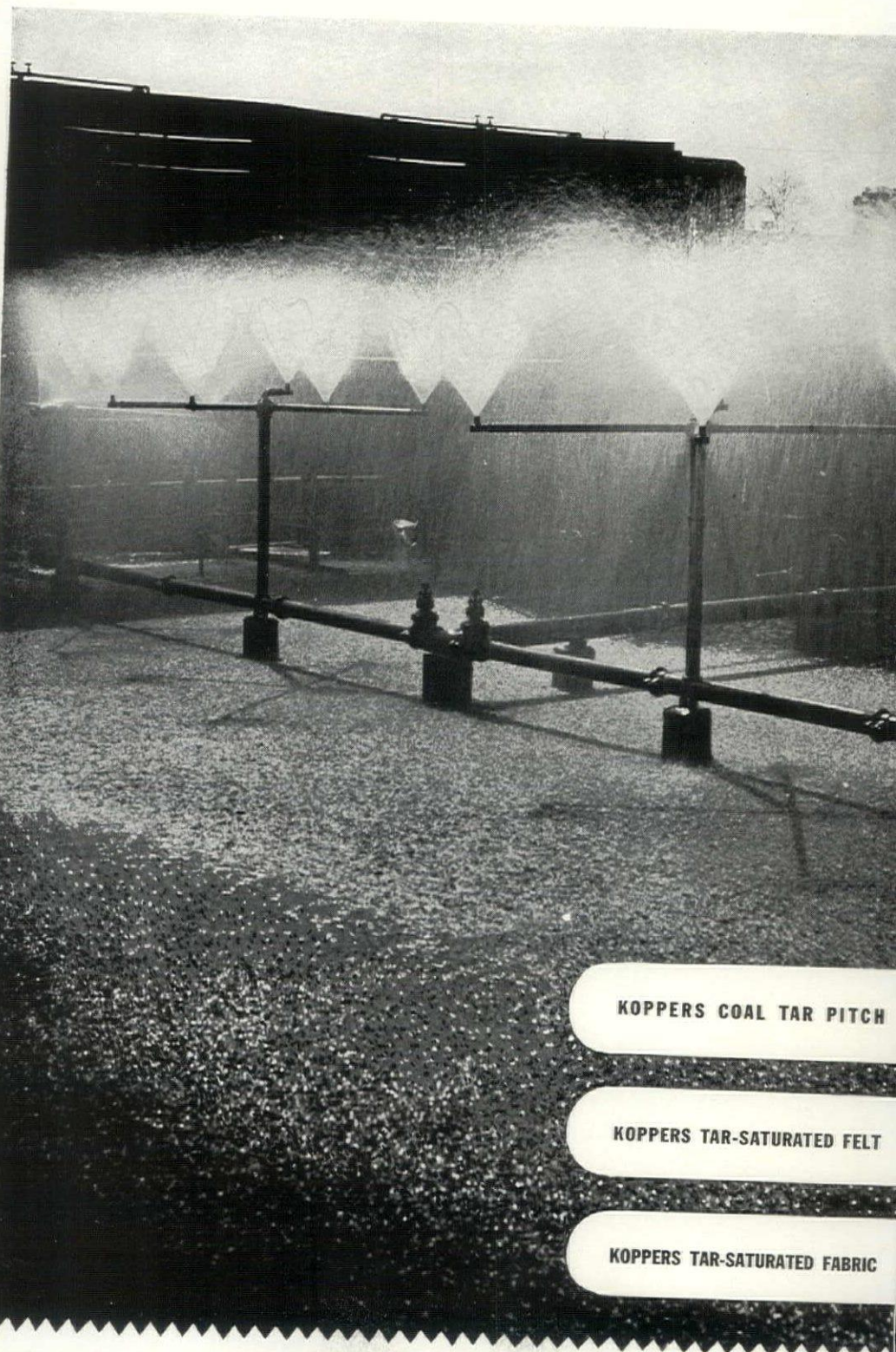
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roof for long life . . . for freedom
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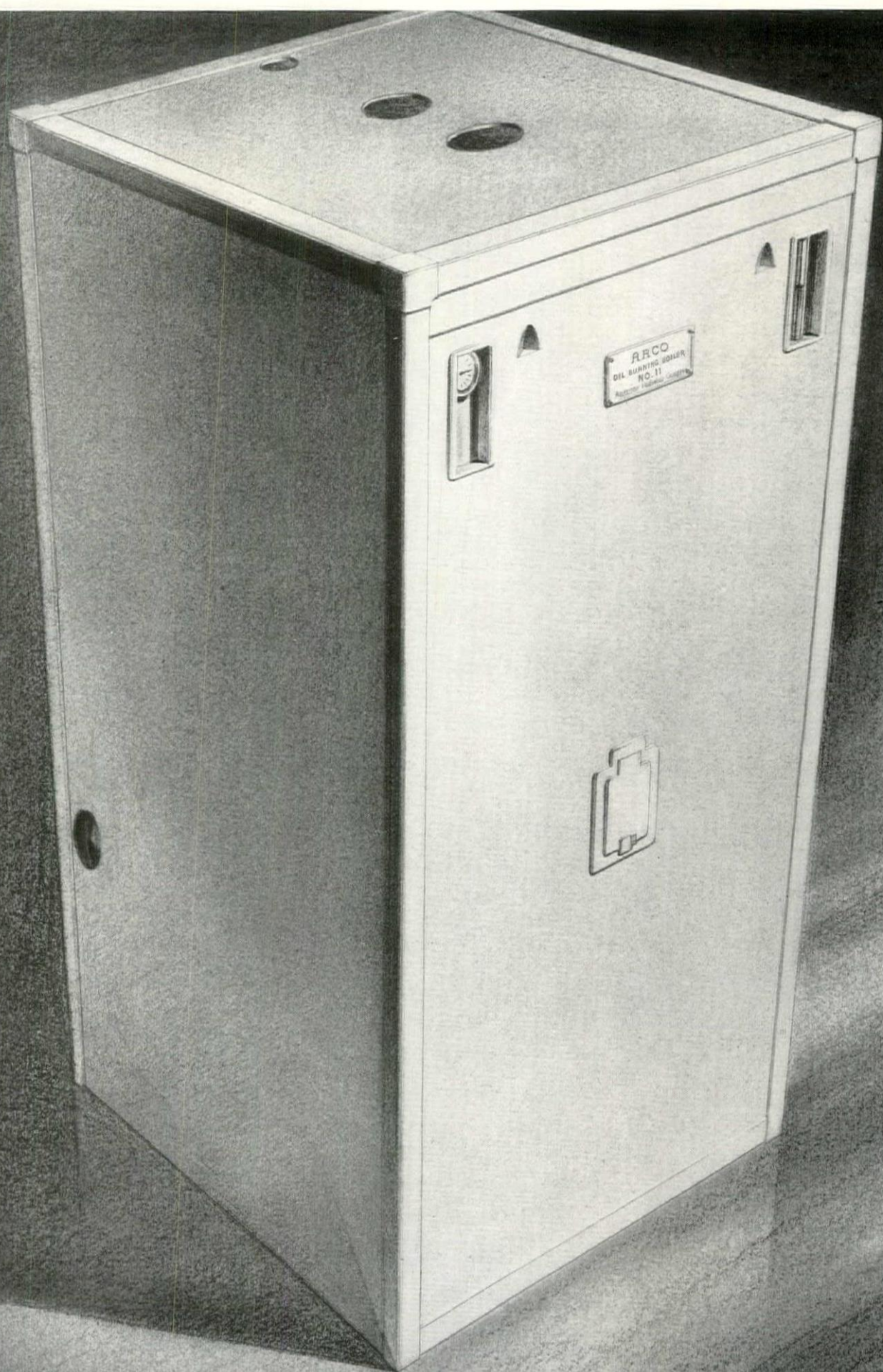
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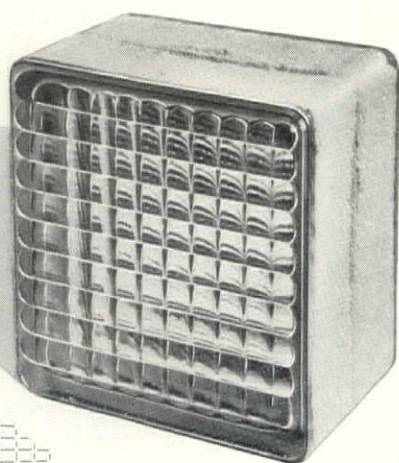
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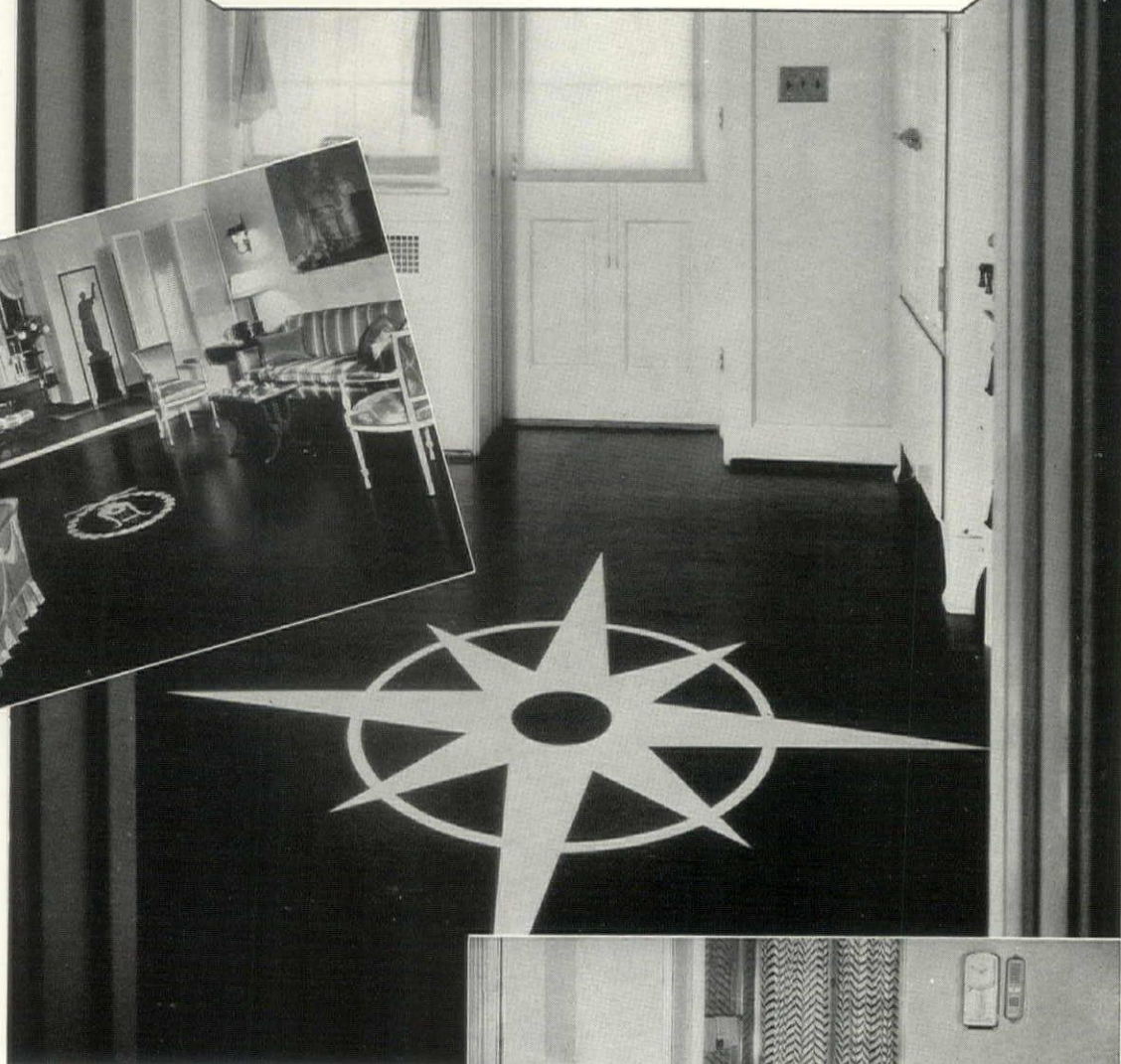


CHEN-ILLINOIS TRANSLUCENT GLASS MASONRY

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SLOANE-BLABON LINOLEUM for small homes



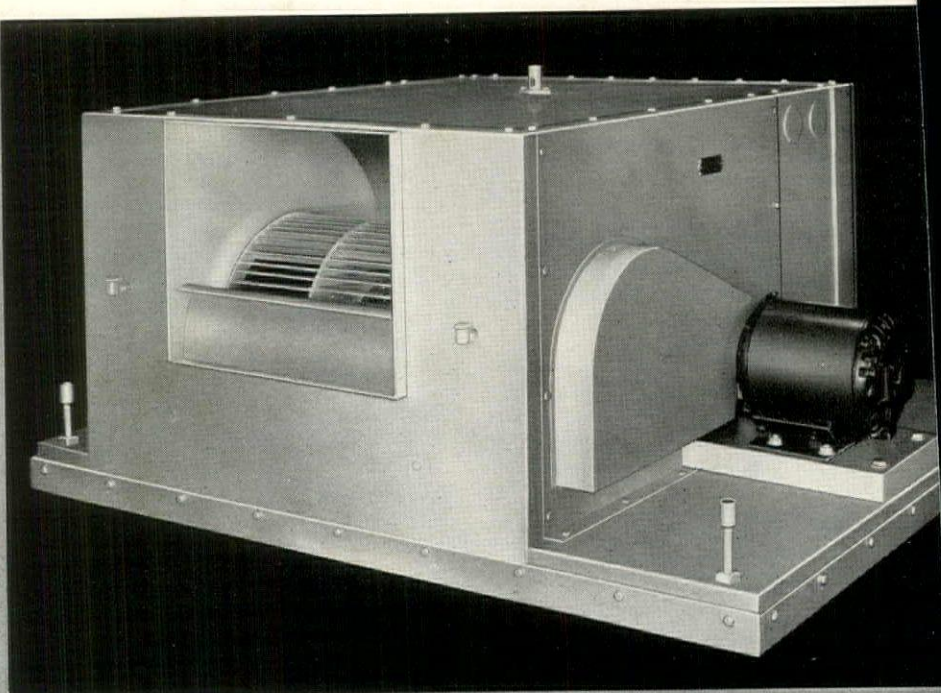
ABOVE: Kitchen. INSET: Living-room

RIGHT: Hall and bathroom



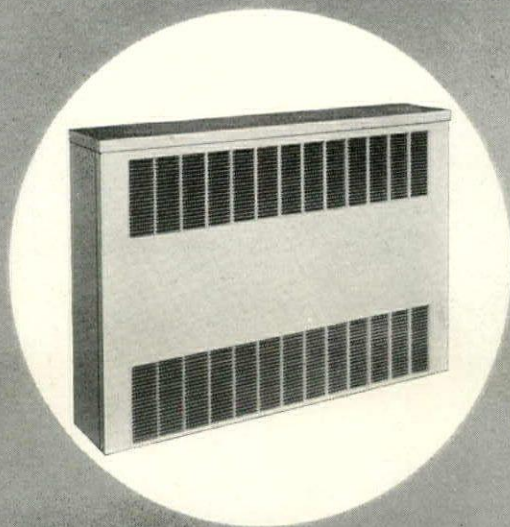
The variety of patterns, colors and qualities available in Sloane-Blabon Linoleum gives you an opportunity to create a really distinctive floor, no matter how small the room. Illustrated are a few small-home rooms which owe their distinctiveness in large part to the use of Sloane-Blabon Linoleum. For pattern reproductions, samples, etc., write Sloane-Blabon Corporation, 577 Fifth Ave., N. Y.

3



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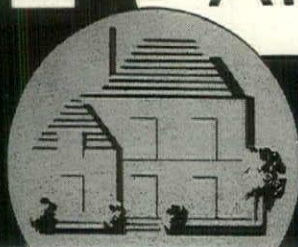
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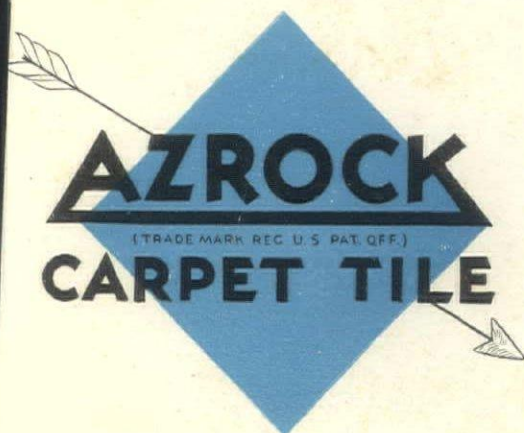
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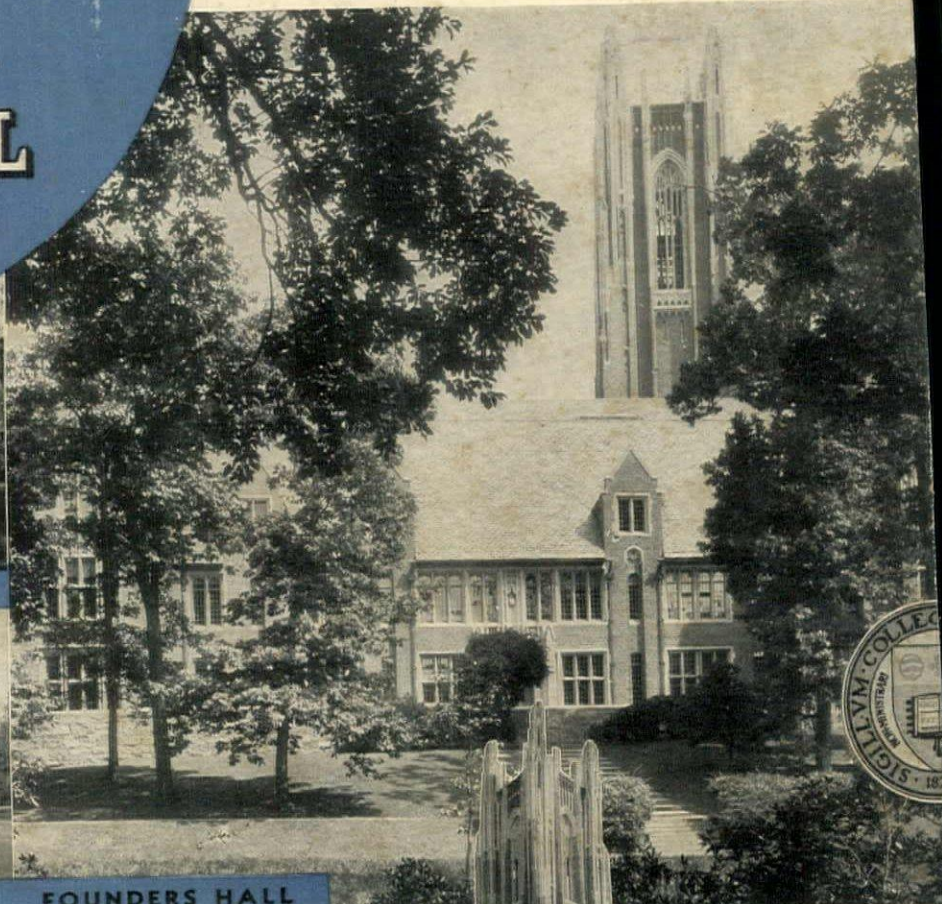
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