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AMERICAN ARCHITECT

Charting New Trends of Architectural Practice

Architectural practice is an art and a business. Like civilization it is always in a state of flux; always it changes to meet new needs of mankind. As an art it rises and falls with the pendulum of time, meeting and solving the problems, ideas, aspirations and moods of the people it serves. Designers come and go leaving their impress upon the monuments they build—records of the age in which they lived and worked. As a business architectural practice ranges from a simple procedure to one complex, highly technical and involved. Building processes are never static. New materials, new construction methods, new mechanical equipment are constantly in the making. As the business of architecture becomes more complex and the units of building become more complicated, it becomes increasingly difficult for the architect—the coordinator of building elements—to retain a thorough familiarity with all necessary details. Keeping architects abreast of the changing needs for buildings and of new trends of planning and construction has been the unaltered, fundamental policy of American Architect for nearly sixty years. Today the art and business of architecture are more than ever shaken by shifting patterns of new needs and practices. And American Architect is accurately charting the course of architectural practice for every member of the profession.

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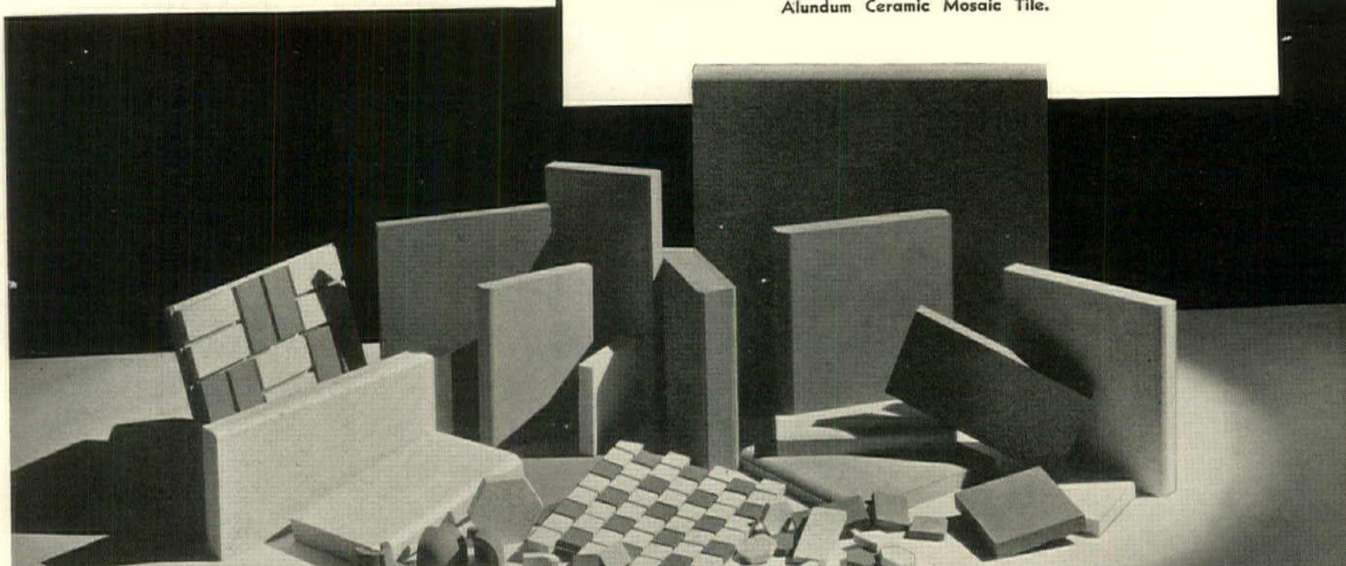

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Open the Door to Architects

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

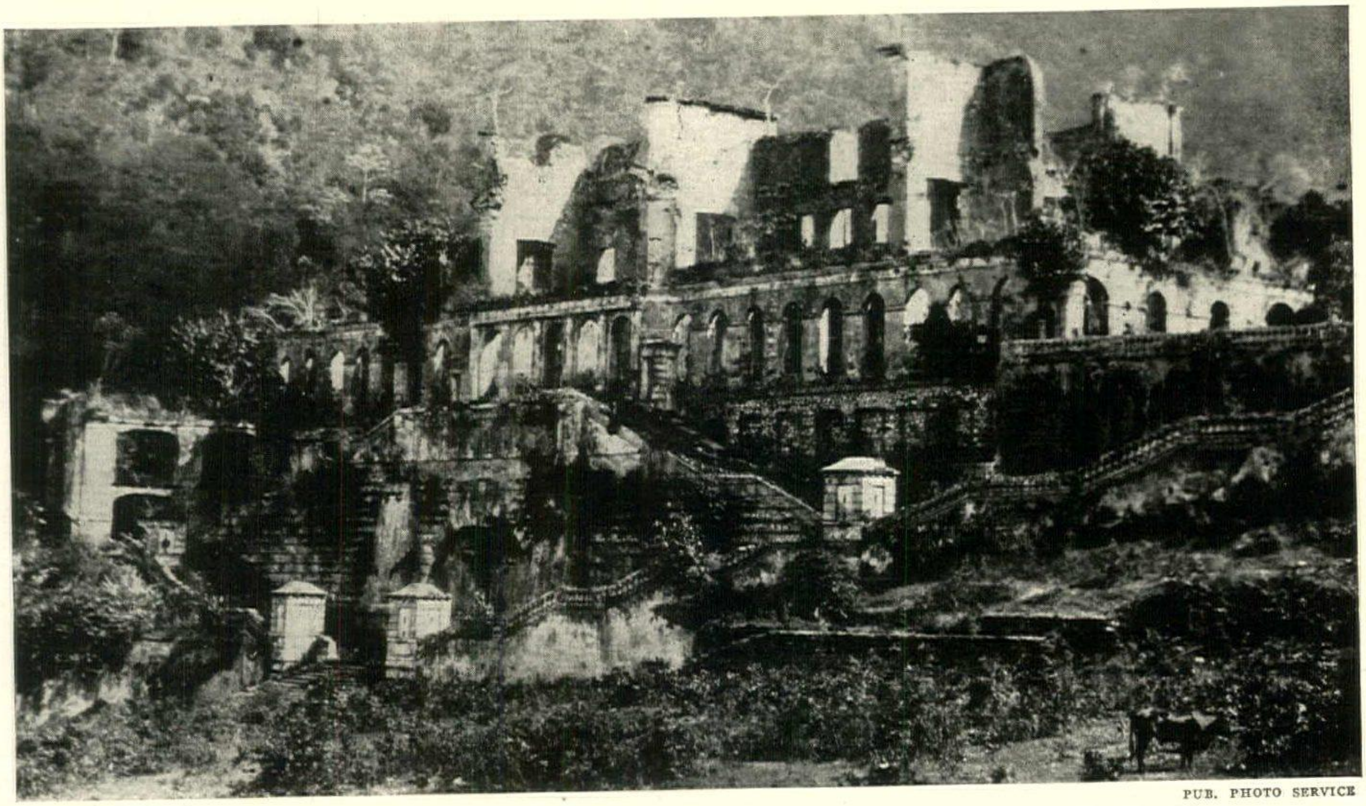
ARCHITECTS will no longer be employed in an independent professional capacity by the Procurement Division of the Treasury Department. An executive order barring use of architectural services except by salaried employment by the Supervising Architect was issued June 29th, 1934 and but recently made public.

Thus even the discretionary power to engage non-bureau architects held by the Supervising Architect under the Keyes-Elliot Act has been abrogated. And the Office of the Supervising Architect is again being enlarged. With but few exceptions all architectural work for the Government is now being done in governmental bureaus.

Conditions applying to Federal work apply with nearly equal force to State, County and even City Administrations. So-called "relief agencies" have been—in many cases still are—doing architectural work normally done by private architectural firms. With private work almost at a standstill, Government is more than ever in the architectural business.

The recent executive order—signed undoubtedly in good faith but probably with advice of counsel—involves much more than unemployment in the ranks of private architects. In the building industry—admitted to be a key industry of vital importance—the architectural profession has always been a leavening component of cultural and social advancement. The profession's jealously guarded independence of advice and action has established an integrity of purpose deeply rooted in all professional practices and regarded as authority by the entire industry. Loss of this independence means loss also of architectural ambition and initiative. And these losses cannot fail to result disastrously to an architectural future, which should be counted upon to vitalize the cultural and economic life of the nation.

The door now closed to architects should be immediately opened. The unfortunate executive order should be rescinded. The Government's policy should be reversed and immediate steps taken to preserve the architectural profession which is equal in importance to the building industry itself.



PUB. PHOTO SERVICE

The Black Emperor's Capitol

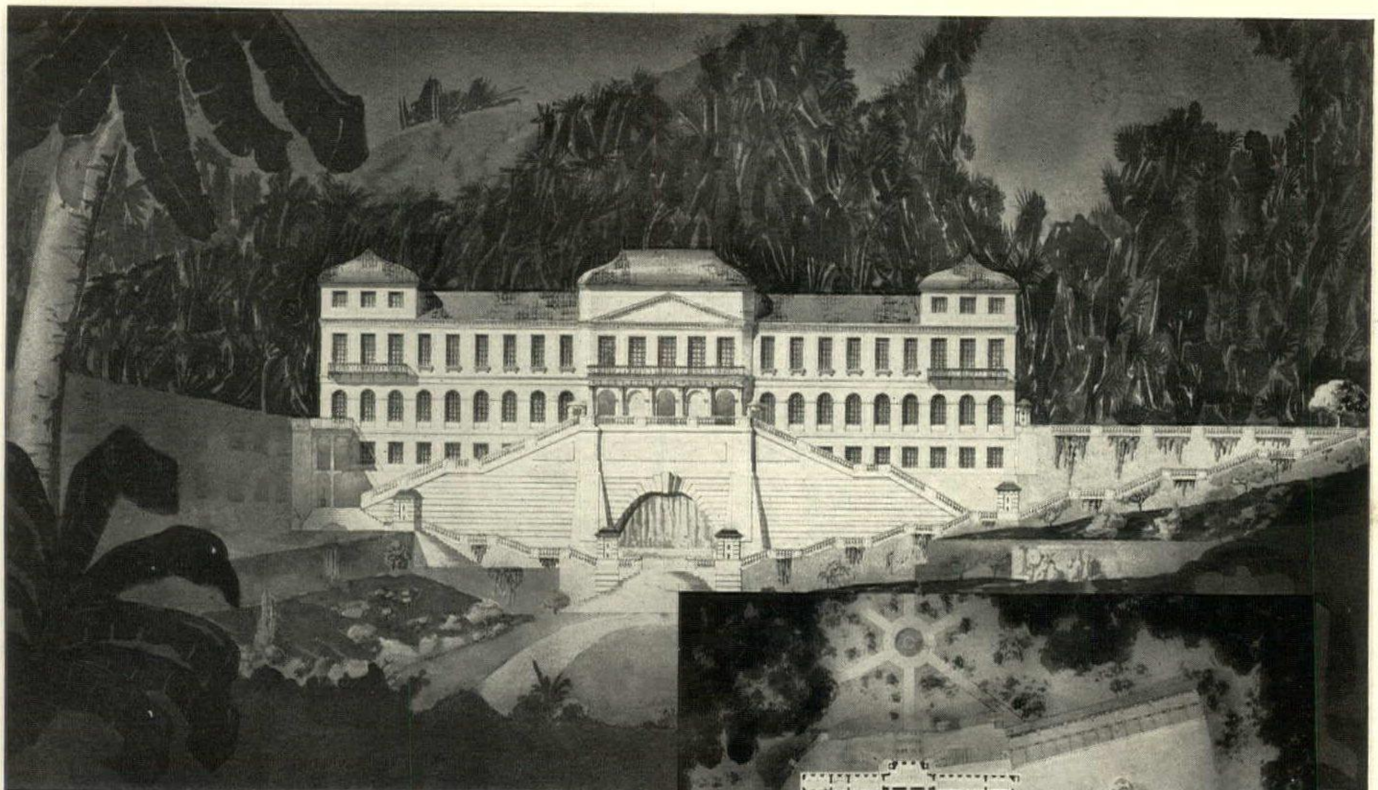
BY LEWIS F. PILCHER, A.I.A.

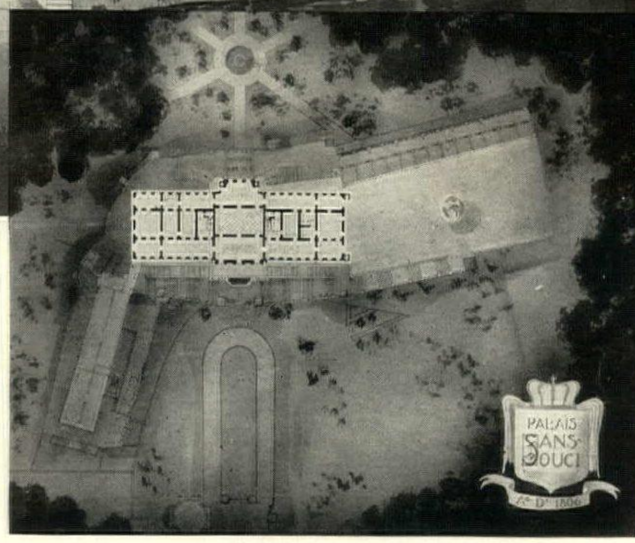
LATE in 1933 an architectural survey trip was made to Haiti with the Palace of Sans Souci as the objective. Sans Souci, today a ruin, was, more than a century ago, the spacious palace of the Black Emperor Christophe, from which he directed his kingdom. The ruins not only conjure up in the imagination the colorful story of a romantic figure in history, but also reveal a building of architectural significance; a structural expression of the protecting and driving spirit of a personality of great organizing force who made from slaves a productive, agricultural people and developed a building craft.

To many Henri Christophe is only a name that recalls stories of a mysterious voodoo in Haiti. To but few of us does he represent a creative, impassioned force that wrought a marvel of system in a wild country of magic-ridden blacks. Too little known is the fact that Christophe—once a slave, then a waiter in a hotel at Cap Francaise—rose to be a power that formed a rich and thriving kingdom among the slaves he helped to liberate, proclaimed himself Emperor with the title of Henri I and lived with all the pomp and splendor of a European court. With the grand gesture of a Pharaoh he built his Citadel and Sans Souci. They were the seat of glamorous empire; and in the ruins of Christophe's monuments is written the history of an exotic, colorful activity which ran the gamut of human aspirations, plots, victories, hopes and despair.

The monuments of a race—never the result of chance—survive as indices of the fundamental standards of a people, a locality and an epoch. As a reflection of military, social and political environment, architectural form embodies the spirit of an era. Christophe's Palace, Sans Souci, was not the result of the caprice of a vainglorious Emperor. It was a material and monumental expression to the world of the economic stability of his Empire and a Governmental ideal of elegance and culture. Above it, on the crest of Le Bonnet a l'Eveque, stood the Citadel as a symbol of national resource and necessary security against an overthrow of Haiti's northern Empire.

Part of this meaning can be gleaned from the present ruins of the buildings. But the thread of





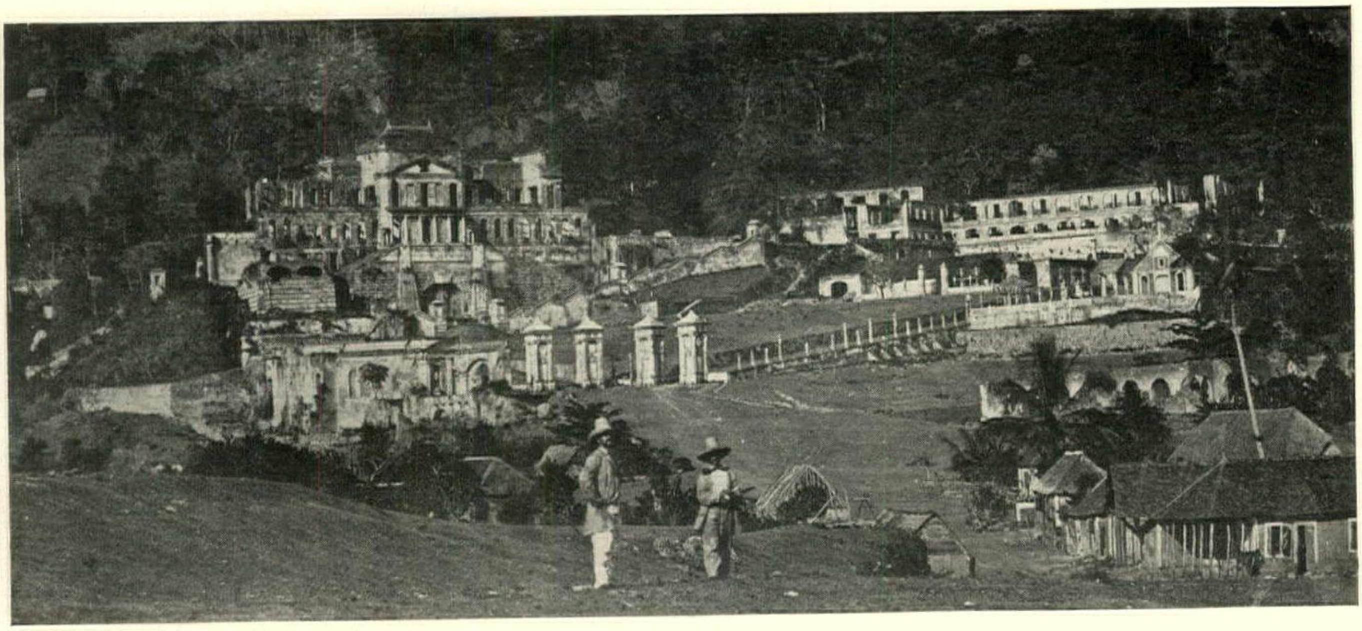
The Palace of Sans Souci was once the seat of a thriving empire and the headquarters of Henri Christophe, the Black Emperor of Haiti. Above is a restoration by Lewis F. Pilcher and Robert A. Bustard showing the palace as it probably looked more than a hundred years ago. On the facing page are the ruins of today

history leads more directly to a full appreciation of the magnificance of Christophe's Palace and its powerful significance as a dominating ideal of Haiti's national existence.

One hundred years after Columbus discovered the Island, the original Caribs had been replaced by African slaves who formed the majority of the population under Spanish domination. After 1630, French buccaneers overran the region and from the resulting intermixture developed the mulatto class.

For many years there was widespread discontent and continuous conflict between the negroes, the free mulattoes, the French landowners, the Spaniards and the English. Finally, Toussaint Louverture, betraying his English associates and espousing the cause of the French, was commissioned by them as Governor of the Island. His power became a menace in the opinion of Europe and, to curb it, Napoleon in 1801 sent 30,000 soldiers to subdue him.

Louverture was captured and exiled in 1802. The negroes revolted and under their leader, Dessalines, defeated the French, proclaimed independence on January 1st, 1804 and abolished the institution of slavery. Christophe, long an adherent of Louverture, was given command of the North in 1804 and at the direction of Dessalines started the construction of the Citadel on Bonnet a l'Eveque. Dessalines was assassinated in 1805 and Christophe was elected President. He disagreed with the Constitution drafted by the mulatto statesman Pétion. He attacked



Above, the Palace and its dependencies from a photograph taken in 1868. Note particularly the "zwiebel-turm" roof over the central portion that points to German or Austrian origin. On facing page, portions of the present ruins. Above, main stairway and stuccoed arches of the main facade. Below left, remains of the turquoise tile fountain between stairway ramps. Below right, large arches of the interior into which were fitted finishing materials from Europe

Pétion at Port-au-Prince, was repulsed and withdrew to the North where he set up a separate Republic proclaiming himself Emperor Henri I in 1811.

The ruins of Sans Souci (1811-1812) are on a rise of ground on the outskirts of the modern native town of Milot. Milot, once a substantial and attractive suburb of Cap Haitien, then called Cap Francoise, is now a straggling collection of thatched huts.

From the ruins it is easy to read the magnificence of Sans Souci and the peculiar combination of structure and dependencies that made it not only the home of a lavish court life, but also the seat of Haitian tribal law. The Palace is surrounded with open spaces; one for a parade ground, another for the gathering of common people and native tribal chiefs, and a third a sort of retreat for the Emperor.

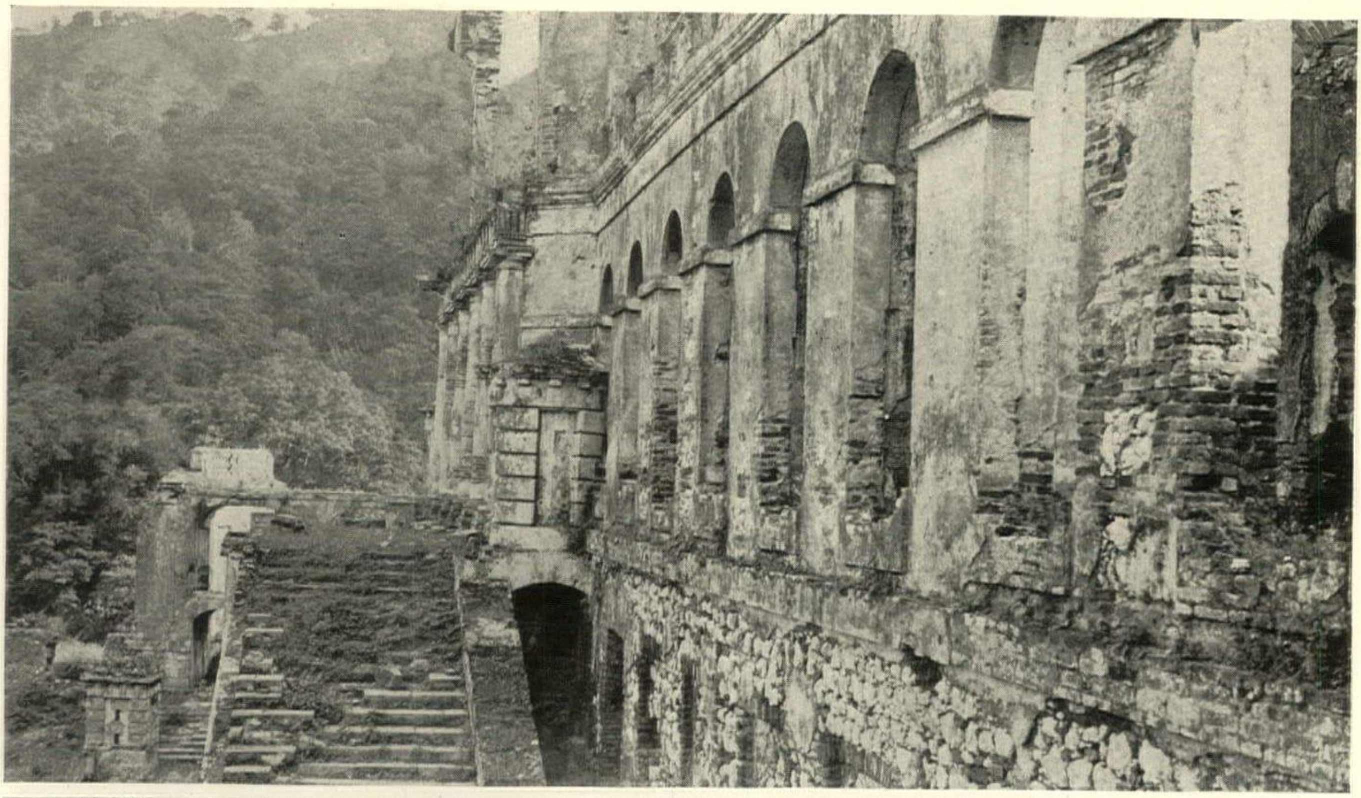
The Palace itself stood on a high masonry substructure ascended by monumental stairways rising to the right and left from an entrance platform nineteen steps above the level of the large fore court. Between the stairway ramps was a huge saffron arch. It framed a background of Seville turquoise tile from the upper center of which gushed out a sparkling fountain fall to splash into a basin at the back of the approach platform. Sun drenched and greenish blue, the waterfall sluiced off in Pompeian red water ways.

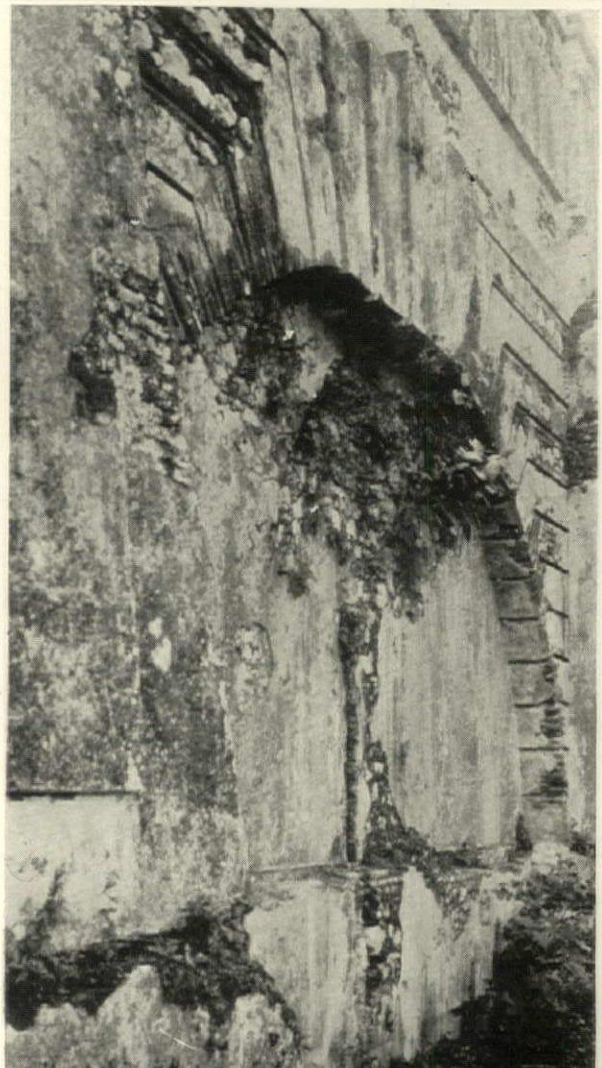
About the entrance court were located the royal dependencies; the chapel (now restored), the royal offices, stables, shops, maintenance buildings, guard quarters, treasury and arsenal. The Esplanade of Justice, a meeting place for the common people, lay west of the Palace. Along the south side, connected to the Palace by a covered passage, were the six offices or ateliers of the Ministry. Below these were a series of seven chambers for the safekeeping of records. The care with which these Batiment des Ministres were integrated with other requirements demonstrates the study given to the evolution of the entire plan.

Within the Palace substructure abundant storeroom and service quarters were provided. Structural provision was made for water conduits, through which mountain water could be passed to cool the stone tiles of the principal story floor and finally to discharge into the turquoise fountain. At the west end is an opening in the foundation wall of the Palace alleged to mark the beginning of a subterranean tunnel, now blocked. Tradition states that through this tunnel—excavated through 3000 feet of rock to the Citadel above—the body of Christophe was carried, after his suicide, to the lime pit in the courtyard of the Citadel. On the west side of the parade court and overlooking it and the main Palace, on the level of the Esplanade of Justice, was the two-storied Palace of the Queen.

Placed at strategic points for defence were sentry boxes, carefully designed to accord with the architectural scheme of the Palace. Those at turns of the great stairway were roofed with ogee coverings, curving gracefully from a heavily modillioned cornice. The boxes guarding the chief front and rear entrances and those fronting the Esplanade were circular in plan. The walls, decorated with engaged columns supporting a full entablature, echoed the facade treatment of the central part of the edifice.

The structure rose three stories above the podium. Walls were of brick, covered with colored stucco. The general tone was a soft yellow relieved by panels of gray blue between the windows and banded with Pompeian red. Engaged columns were lighter





toned against the deeper colors of the stuccoed piers. Under the bright sunlight of the Tropics, the Palace is reputed to have appeared like a mass of old gold inlaid with precious intarsia of soft blues and reds.

The roof was in five parts, the central feature of an ogee type. At the east and west ends the building was carried up an additional story and probably was protected by ogee coverings. Two story bays roofed with a red-tiled gable connected these terminal forms with the chief central feature.

All Governmental restorations show a hipped roof over the central portion. A recently discovered photograph of the building taken in 1868, while the roof was still intact, proves the use of the curved form.

There is no record regarding the designing architect of Sans Souci. The use of the ogee (zwiebelturm or onion-tower) roof points strongly to German or Austrian origin and not, as hitherto advanced, French source for the design influence for the project. So far as is known, the general plan has no affinity with any contemporaneous French palace. Then, too, there is a greater similarity to the scheme of the court development and stair approach of the Palace with the Gardens of the Belvedere, Vienna. The plan, undoubtedly evolved abroad, underwent no local modifications to render it adaptable to the necessities of tropical environment. Lack of an interior court or patio is evidence of its northern origin.

The body of the Palace is a parallelogram 140 feet by 54 feet. The adjoining Justice Esplanade to the west is 155 feet by 62 feet. The exterior is a straight forward exposition of the interior plan. Length is emphasized by horizontal lines of colored string courses developed as full entablatures continuing the Doric motif of the central entrance bay. Projecting beyond the long plane of the front, the mass of this central bay is the focal point of the facade. It was emphasized with a treatment of monumental character employing on the entrance level an engaged Doric order with a carefully detailed, triglyphed entablature supporting a balcony.

The second story, with a window composition proportioned to the arched entrance motive of the first floor, is crowned with an angular pediment. The bay facing the garden at the rear was without columnar embellishment and finished with a curvilinear pediment. It projects some fifteen feet beyond the flanking facades and is joined to them by a curved wall in which entrances are introduced.

The way in which the mechanical difficulties of building an arched opening in a quarter circle curved wall were accomplished forces an appreciation of an extraordinary skill with brick masonry. The question of where the trained workmen came from is hard to answer. Structural difficulties were certainly not within the technical scope of the natives; and the French colonists had been driven from the land.

Interiors were designed with accurate understanding of what was necessary in the housing of a European Court. Fourteen ceremonial rooms on the main floor opened from a spacious, three-divisioned promenade gallery to which three entrances provided ingress from an uncovered platform reached by the double stairway from the entrance court. From this platform the Emperor and his court reviewed military evolutions in the great court below. The central room was the throne chamber where the ruler received his aristocracy on Thursday of each week.

Two stairways flanking the throne room gave access to living quarters on the second floor. From the left of these stair halls an underground passage led to extensive gardens to the south of the building. The center of interest of the royal gardens was a large bathing fountain, water for which was furnished from a reservoir on the hill west of the Palace.

The method of construction is clearly betrayed by existing forms. Walls and partitions were erected of brick, manufactured in the vicinity. The entire skeleton of the structure was built before the finishing material arrived from Europe. In completing the enclosure arched openings were constructed much larger than the finished plan required. This procedure was pursued while trim and finishing work were being detailed and milled in Europe. When the manufactured material arrived, the erected arches were filled in to the exact size necessary to accommodate the imported trim. By this system, work was carried forward with the greatest expedition.

The main story was tiled with imported marble beneath which cool water was conducted so that the high temperature was modified—an interesting and practical system of summer cooling antedating our modern air conditioning systems by a century.

The aboriginal village, jungle girt, centered about a circular, earth-surfaced area in the center of which was a wide branching tree or a totem pole. Within this space tribal observances, magic and dance practices took place. As pompous and ceremonial function was the breath of life to the African chief, so did similar ceremonies play an important part in the life of Christophe's court.

Deeply impregnated with tribal traditions of his ancestry, Christophe developed on the Esplanade of Justice, level with and adjoining his regal halls, the apotheosis of the African tribal center. In the center of the Esplanade was a tree, at the foot of which stood a royal bench for the Emperor and his cabinet. Separating the outdoor throne from the Haitian citizenry, was a brick paved circle beyond the limits of which no one could pass. Opportunity was afforded the common people to see and petition their King just as their negro ancestors had brought their communal problems before their chief.

Royal African antecedents were thus melded with the royal dependencies of 18th Century Europe. Appreciation of the real meaning of the Palace plan and entourage, mirrors completely the true character of the Black Monarchy.

EDITOR'S NOTE: A description of the Citadel and its romantic history will be published in the November issue of AMERICAN ARCHITECT.

FRANK J. FORSTER AND R. A. GALLIMORE, ARCHITECTS

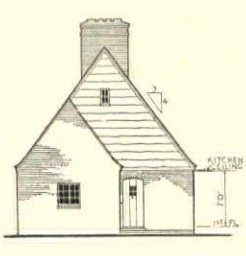
PLAY HOUSE, ESTATE OF J. M. KAPLAN

CROTON - ON - HUDSON, NEW YORK

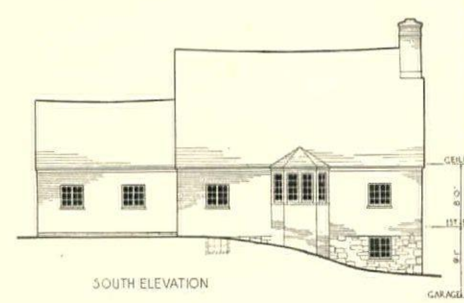
Photographs by Robert Maclean Glasgow

Four Small Houses

Construction: frame, veneered with white-washed common brick. Roof: red and brown hand-made shingle tiles. Exterior woodwork: solid oak, stained with creosote and white-washed. Interior woodwork: oak and pine, stained brown. Upper floor is used exclusively for recreation, independently of shower and locker conveniences in basement. Consequently no stair between the two floors was necessary.

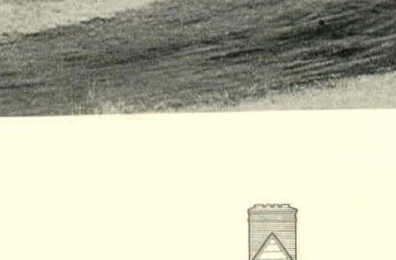


WEST ELEVATION

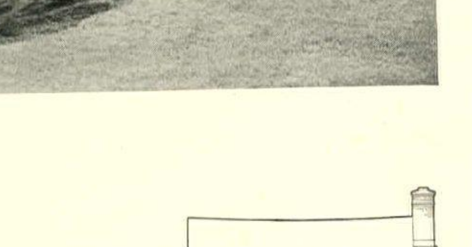


SOUTH ELEVATION

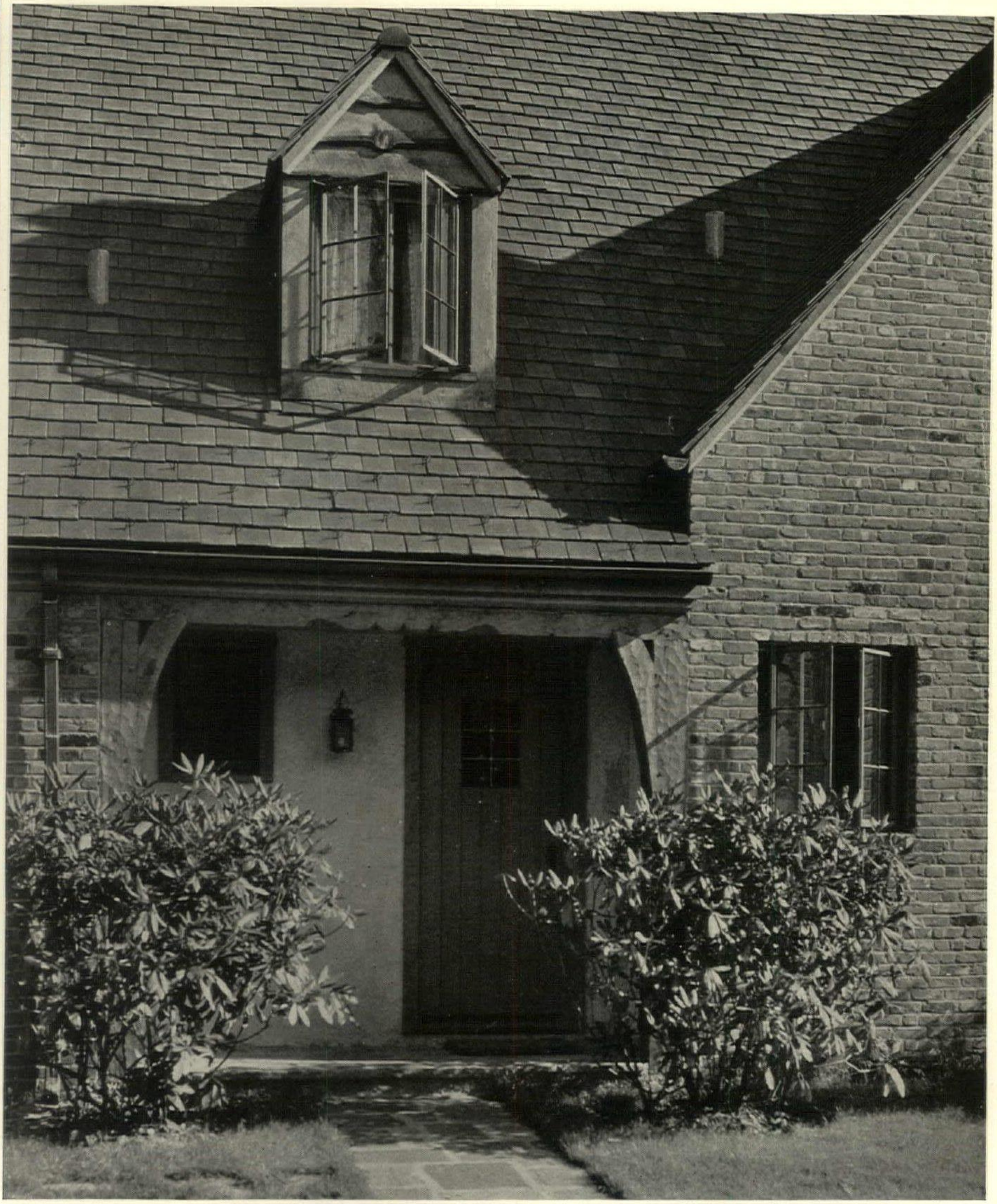
PLAY HOUSE, ESTATE OF J. M. KAPLAN
CROTON-ON-HUDSON, NEW YORK
FRANK J. FORSTER AND R. A. GALLIMORE, ARCHITECTS



CELLAR PLAN



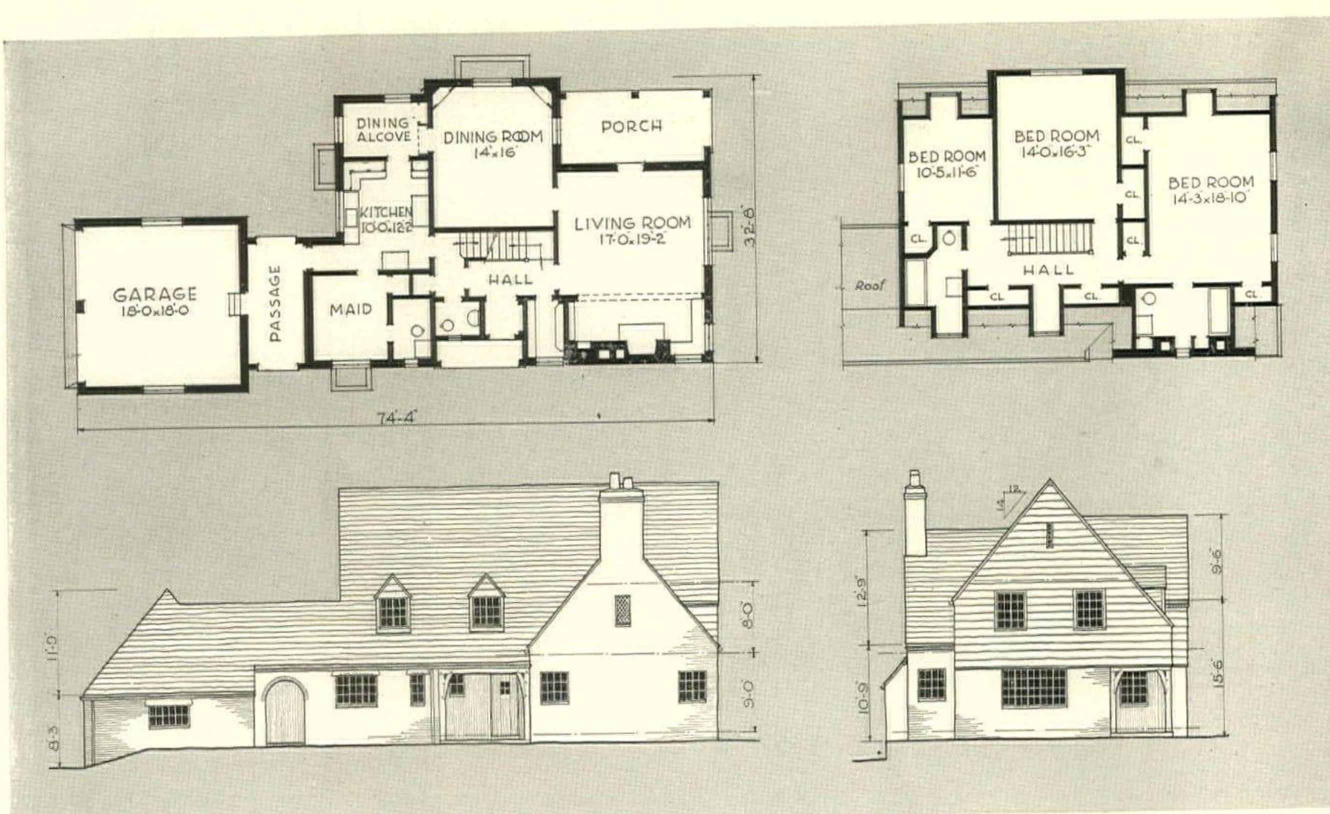
FIRST FLOOR PLAN



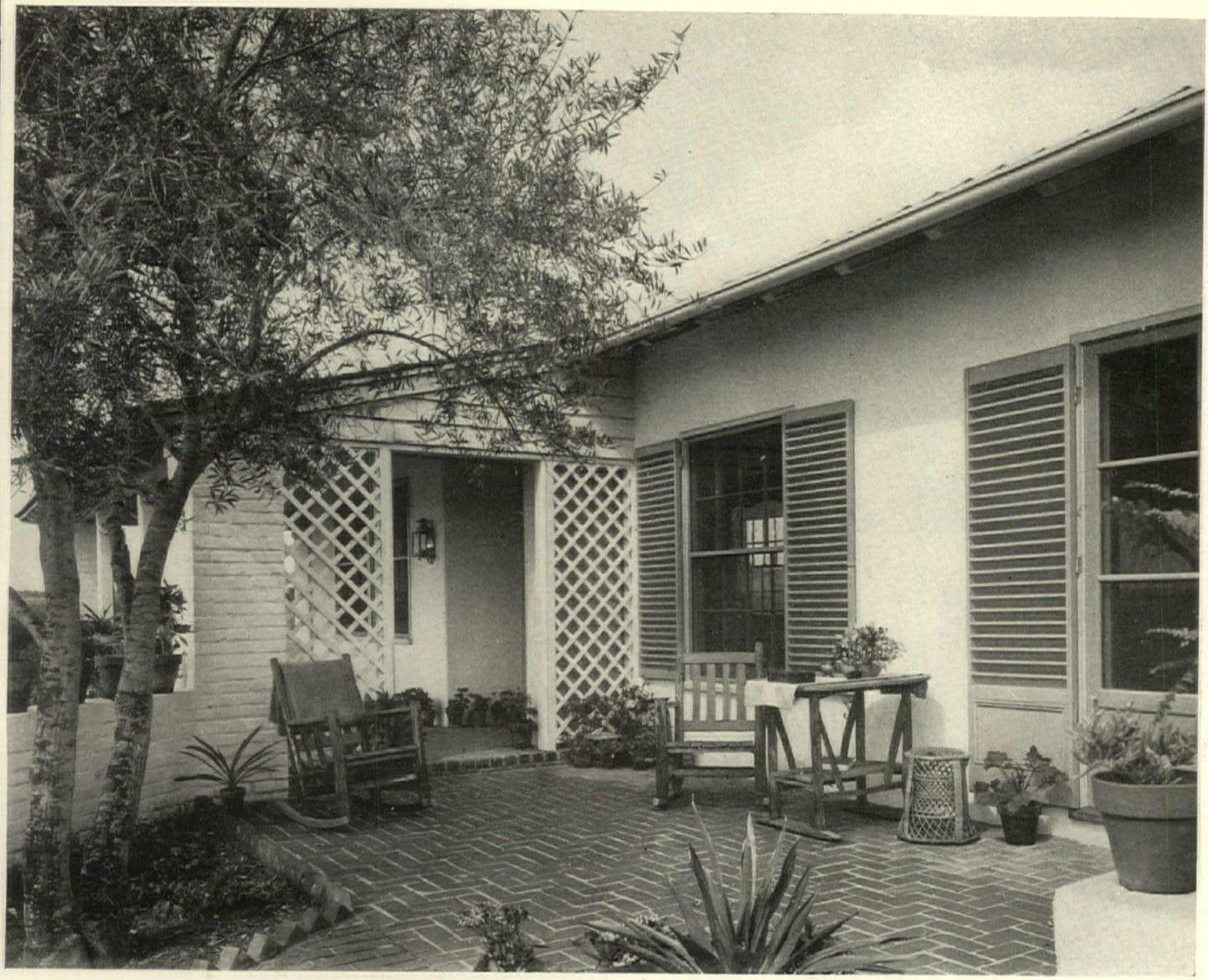
FREDERICK L. ACKERMAN, ARCHITECT.
RAMSEY, SLEEPER AND WORCESTER, ASSOCIATES

HOUSE IN MUNSEY PARK, MANHASSET, LONG ISLAND

Photographs by Samuel H. Gottscho



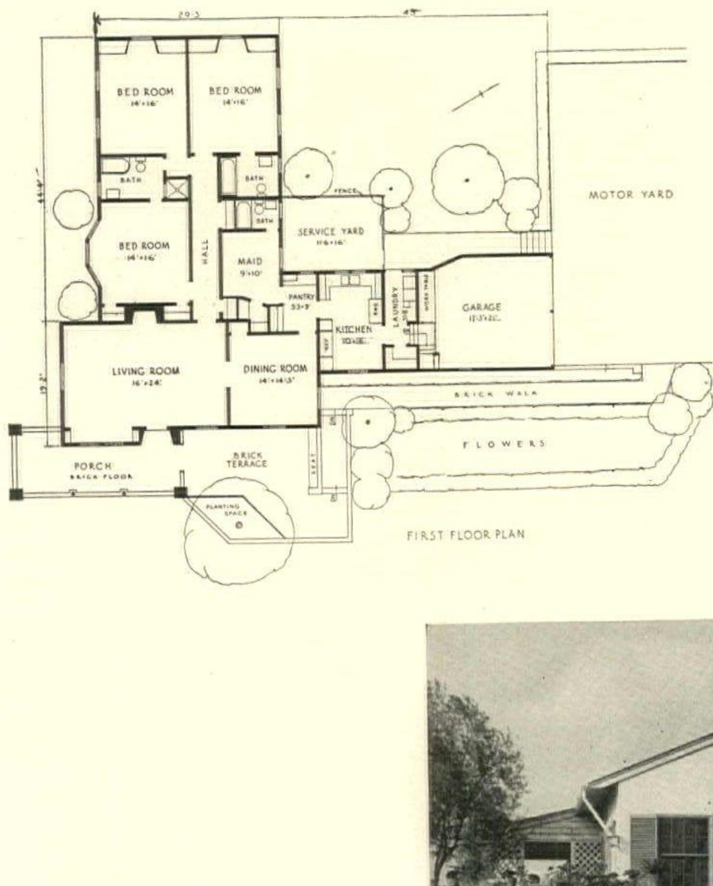
MODEL HOUSE, MANHASSET, L. I. F. L. ACKERMAN, ARCHITECT. RAMSEY, SLEEPER & WORCESTER, ASSOCIATES



WINCHTON LEAMON RISLEY, ARCHITECT

HOUSE AT RANCHO SANTE FE

LOS ANGELES, CALIFORNIA



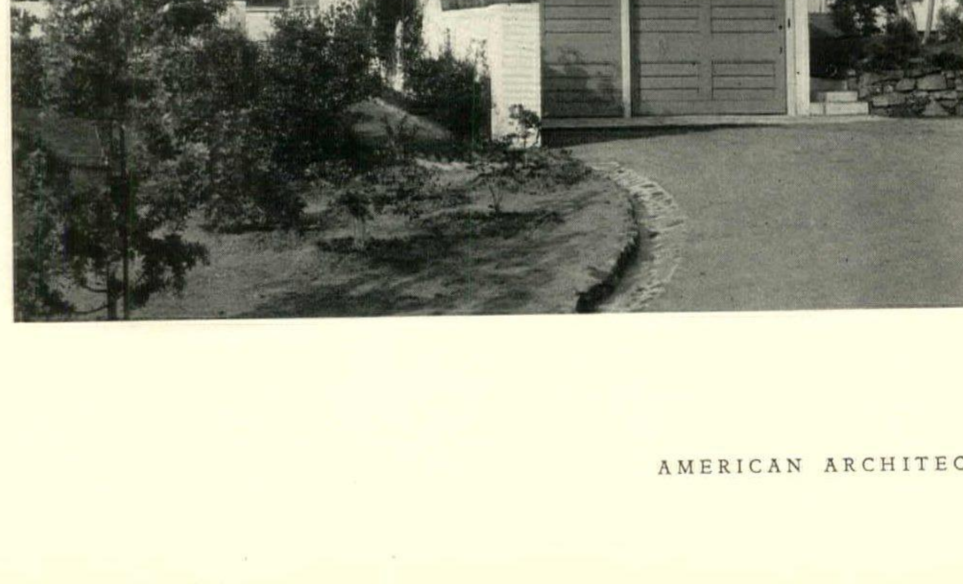
FIRST FLOOR PLAN

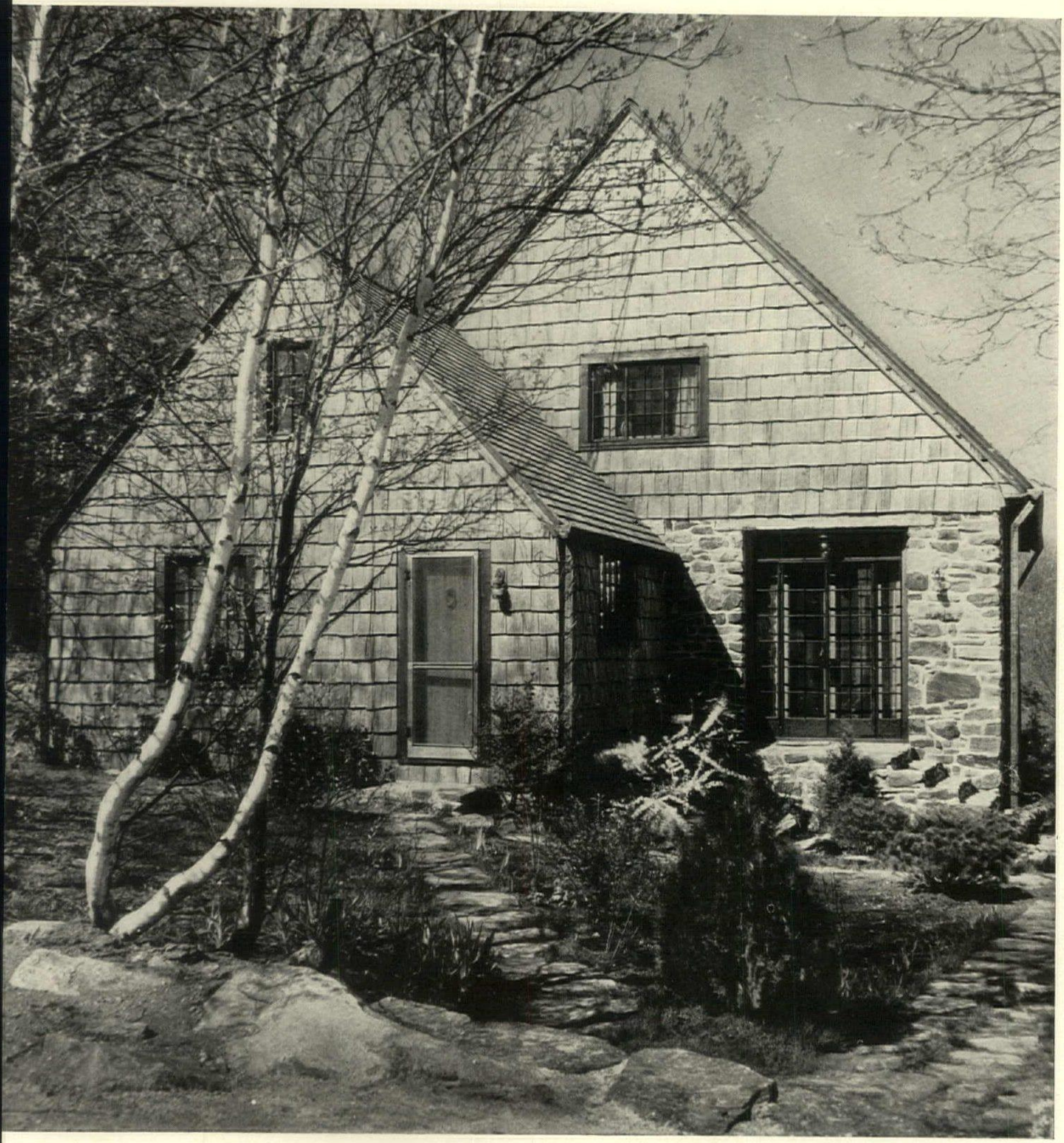
Designed and built for sale in a subdivision overlooking a golf course. Cost, in 1933: just under $10,000. Special requirements included facilities for outdoor living, electrically controlled hot air oil burning furnace and electrically operated hot water heater. Construction: frame, with exterior stuccoed over wire mesh

HOUSE AT RANCHO SANTA FE

LOS ANGELES, CALIFORNIA

WINCHTON LEAMON RISLEY, ARCHITECT



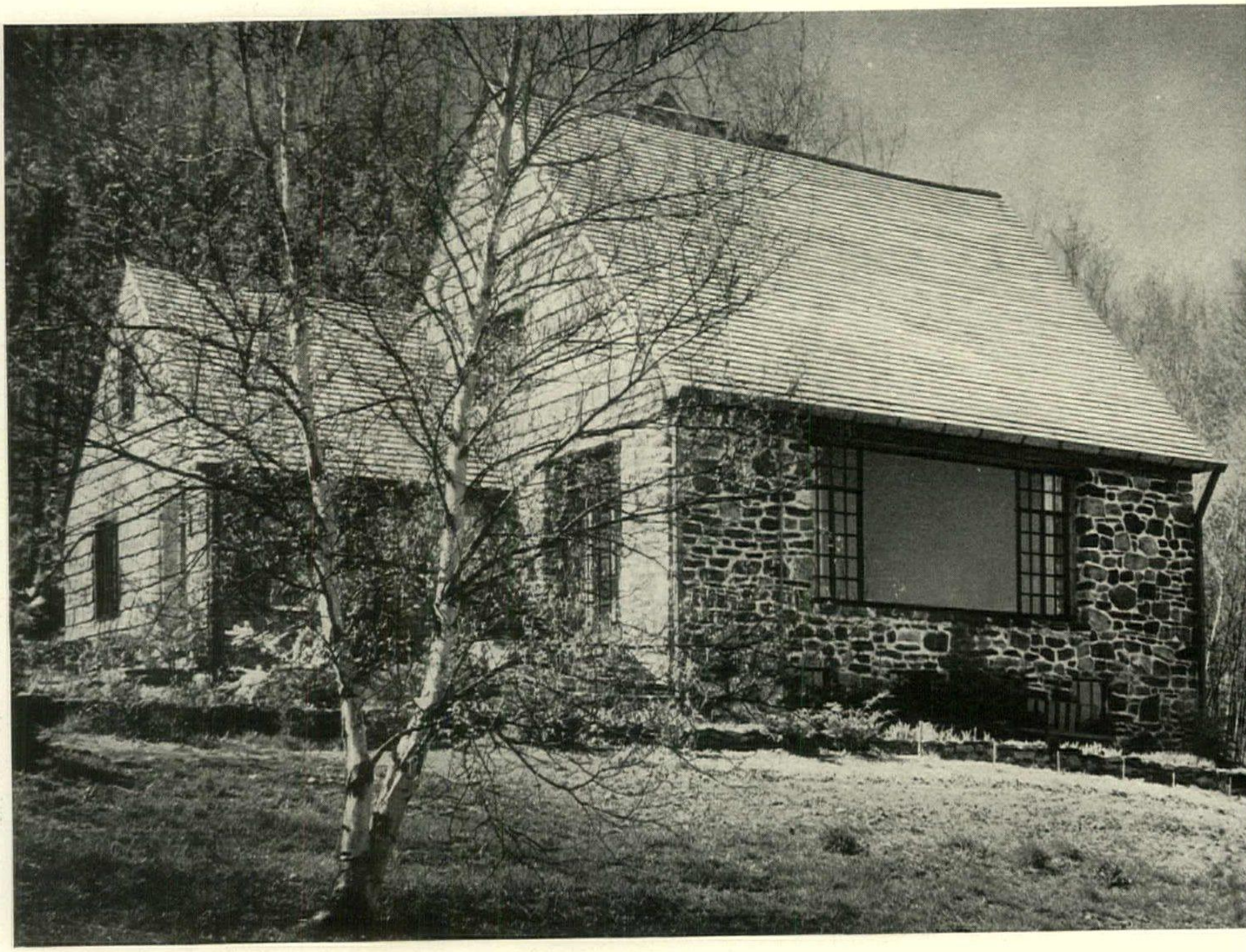


HARRY LEONARD MILLER, ARCHITECT

HOUSE OF GILBERT W. GABRIEL

TOWNERS, NEW YORK

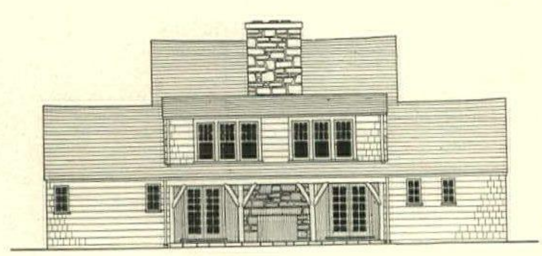
Photographs by George H. Van Anda



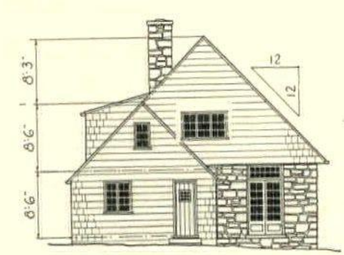
Exterior: walls of weathered native stone and hand-split cedar shingles, oiled and weathered but unpainted. Steel sash painted dark blue. Interior: living room (see facing page) balcony room and studio framed and trimmed with old barn lumber retaining traces of original red paint and weathered dark gray. Rough troweled plaster on ceiling of living room and walls and ceilings of balcony room and studio. Rest of walls papered and trim painted white. Floors: stained pine boards. Contents: 32,400 cu. ft. Cost, in 1930: 32 cents per cu. ft. including board type of insulation in walls

HOUSE OF GILBERT W. GABRIEL
TOWNERS, NEW YORK

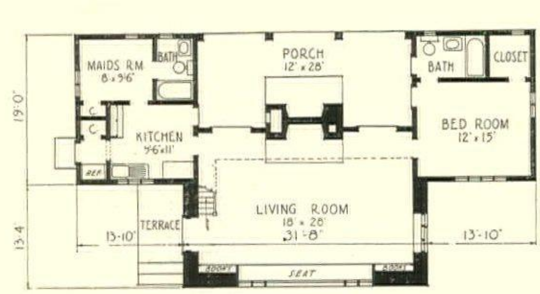
HARRY LEONARD MILLER,
ARCHITECT



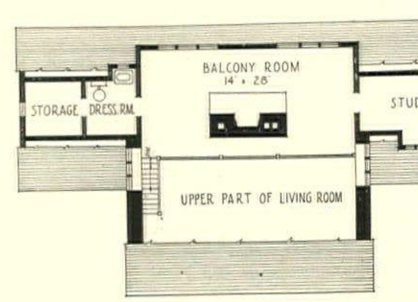
SOUTH ELEVATION



EAST ELEVATION



FIRST FLOOR PLAN



SECOND FLOOR PLAN

HOUSE OF GILBERT W. GABRIEL, TOWNERS, NEW YORK, HARRY LEONARD MILLER, ARCHITECT

How Much Will It Cost?

TODAY—perhaps more than ever before—this question is a particularly important one to both architect and client. Many jobs have been lost because some architect didn't know the answer; and many others—some apparently with a slim chance of proceeding—have gone ahead because the owner knew in advance just how far his budget could be stretched.

A reasonably accurate answer to it demands, on the architect's part, some method of preliminary cost estimation. It must be quick, generally adaptable, inexpensive and simple to use under all ordinary circumstances. From most standpoints the cubic or square foot method apparently works most efficiently in the majority of architectural offices.

ON the following two pages are presented two charts which make the figuring of preliminary costs somewhat easier. One refers to a building's cubic contents; the other applies to its square foot area. From them lump sum costs can be read directly if the cubage or total number of square feet is known. If the total allowable cost is known, the charts will show the allowable number of square or cubic feet the building can contain at a variety of unit rates.

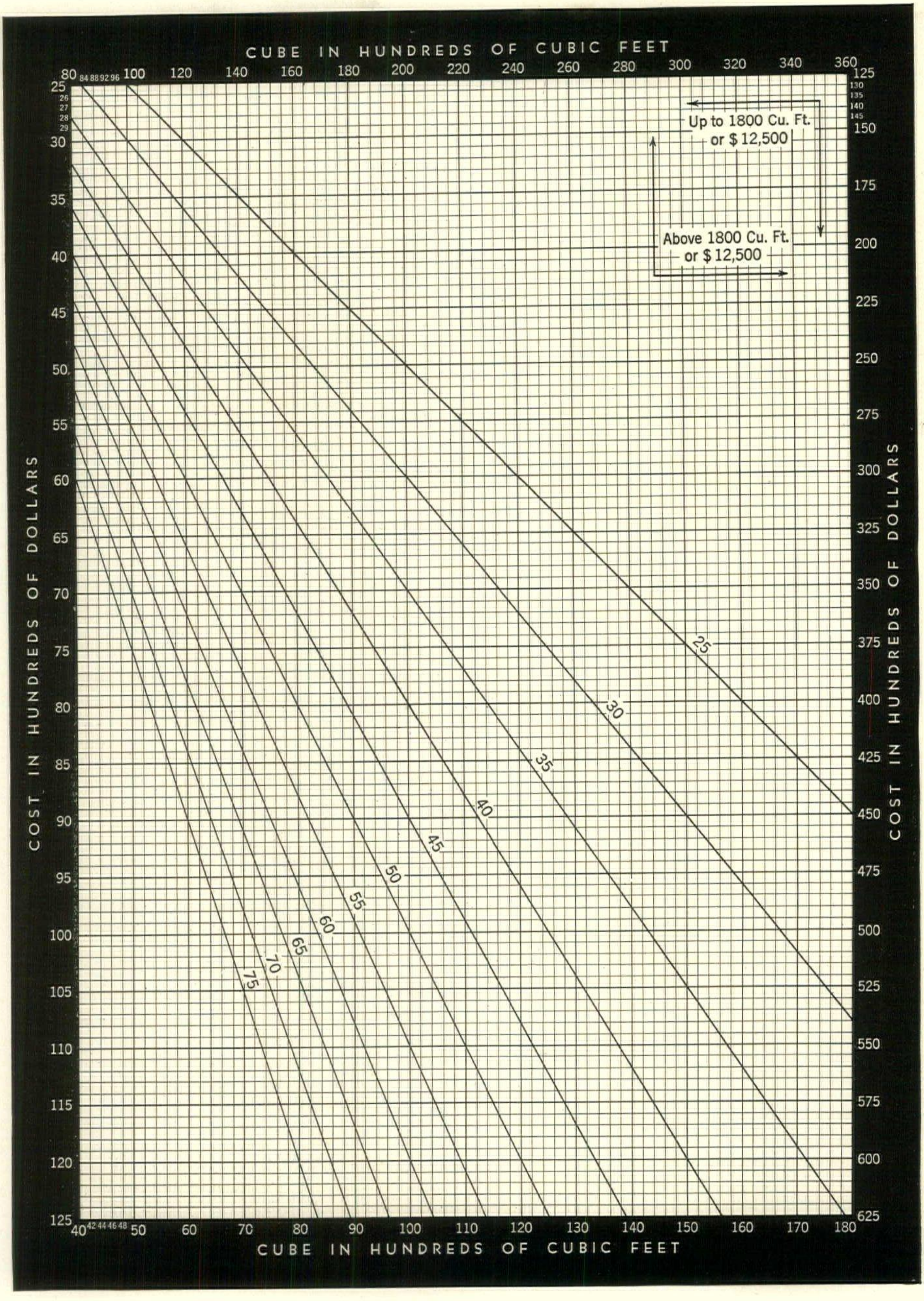
Both charts employ the decimal system of numbering. Building areas or contents can be read as given, or in multiples of ten. Correspondingly, the resulting costs—shown in the cubic foot chart in hundreds of dollars and in the square foot chart in dollars—can be read either as shown or in reference to the resulting amount multiplied by ten, one hundred or a thousand.

No chart, however detailed, can displace accuracy and care in estimating preliminary costs. In some offices the cubic contents method has been discredited because of gross inaccuracies resulting from uncertain quantitative analysis or application of unreliable cost units. Misuse of any method, however, is not necessarily a condemnation of the method itself. In place of a detailed quantity survey—universally accepted as the most accurate way of estimating costs—cubic costs if properly compiled, can furnish a sound basic guide to planning and specification which must adhere to a set of definite budget limitations.

Methods of applying unit costs vary. A common practice that often produces inaccurate results is to apply a cost unit to a blanket lumping of the contents, without regard to variations in construction methods that might occur in different portions of the building. A more accurate method is to cube separately each part of the structure. Lump together those portions having similar characteristics of structure and finish. Apply to them cost units based on contemporary field experience with similar work. To the total add separate lump sums for such special items of construction equipment and finish as chimneys, fireplaces, special interior finish, lighting fixtures, heating plants, etc. The result will be accurate enough in some instances to form the basis of a cost plus, guaranteed maximum contract.

One architect with long and intensive experience in small house work keeps a set of office forms on which are listed costs of various types of building construction, arranged to show the total cost of a unit section installed and including average current prices of both labor and materials. His preliminary estimates are made by ascertaining the extent of construction on a square foot basis minus doors, windows, chimneys, fireplaces and special interior finish, but including all other ordinary parts of the work. Unit costs are applied to the total areas and sums added to include the special items omitted. These last are all priced at an average price for their installation. To the total is added a percentage to cover the builder's profit. The result is an estimate which in one instance was so accurate that the contract for the house was let for a figure very little higher than the preliminary estimate thus assembled.

NO estimate can be more accurate than the soundness of the estimator's knowledge of current building prices. A constant check must be kept of labor and material costs; and in any unit of cost allowance must be included for the cost of job administration and the builder's profit. Included also in any preliminary estimate should be all expenses not obvious in the building contract, but which always represent an out of pocket result to the owner. Naturally, these vary, but usually include such items as insurance, fees for building permits and utility connections, legal and brokerage fees and every other incidental for which someone—usually the owner—must pay.


CUBE IN HUNDREDS OF CUBIC FEET
COST IN HUNDREDS OF DOLLARS
Up to 1800 Cu. Ft. or $ 12,500
Above 1800 Cu. Ft. or $ 12,500
25
30
35
40
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60
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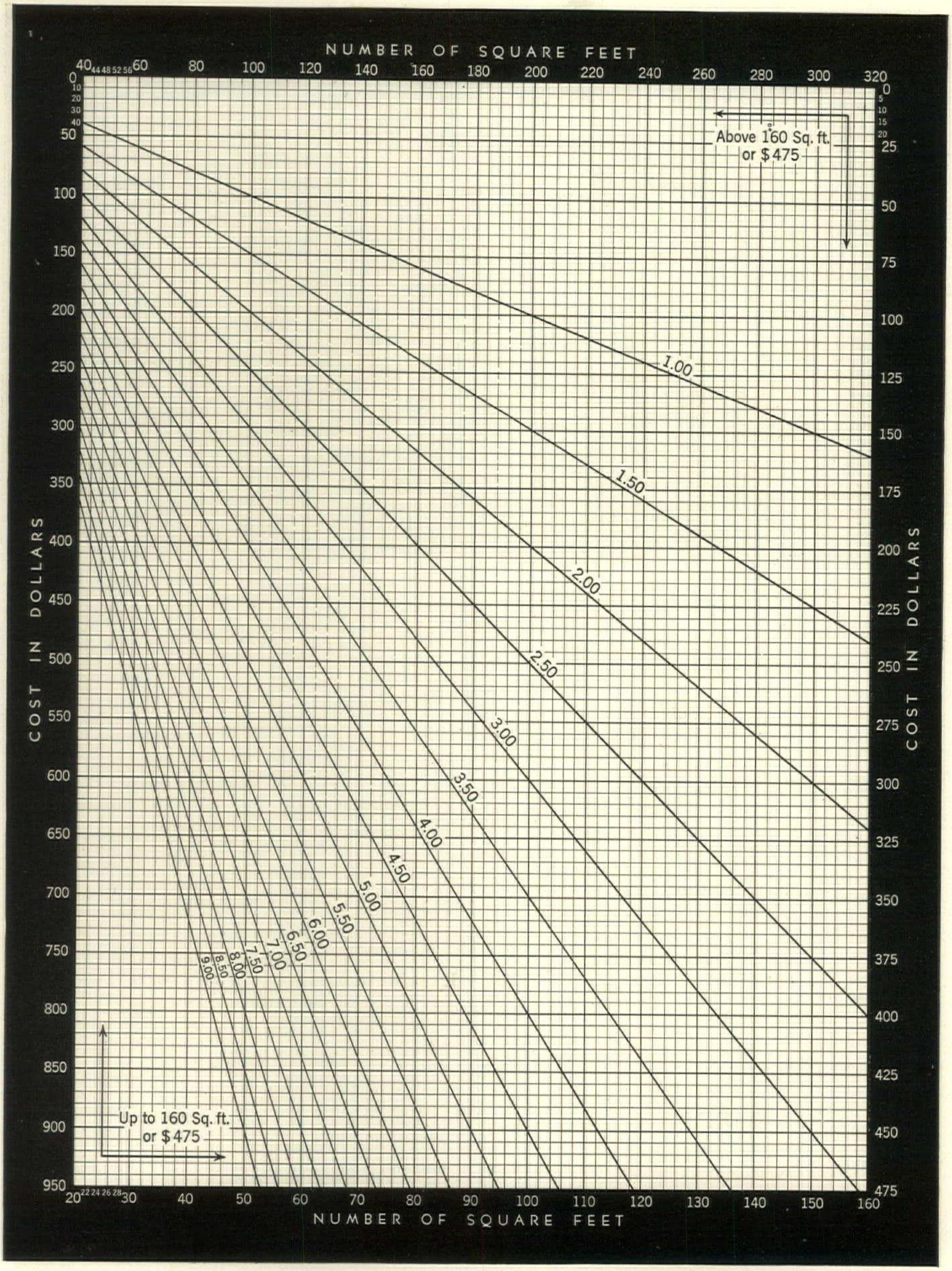
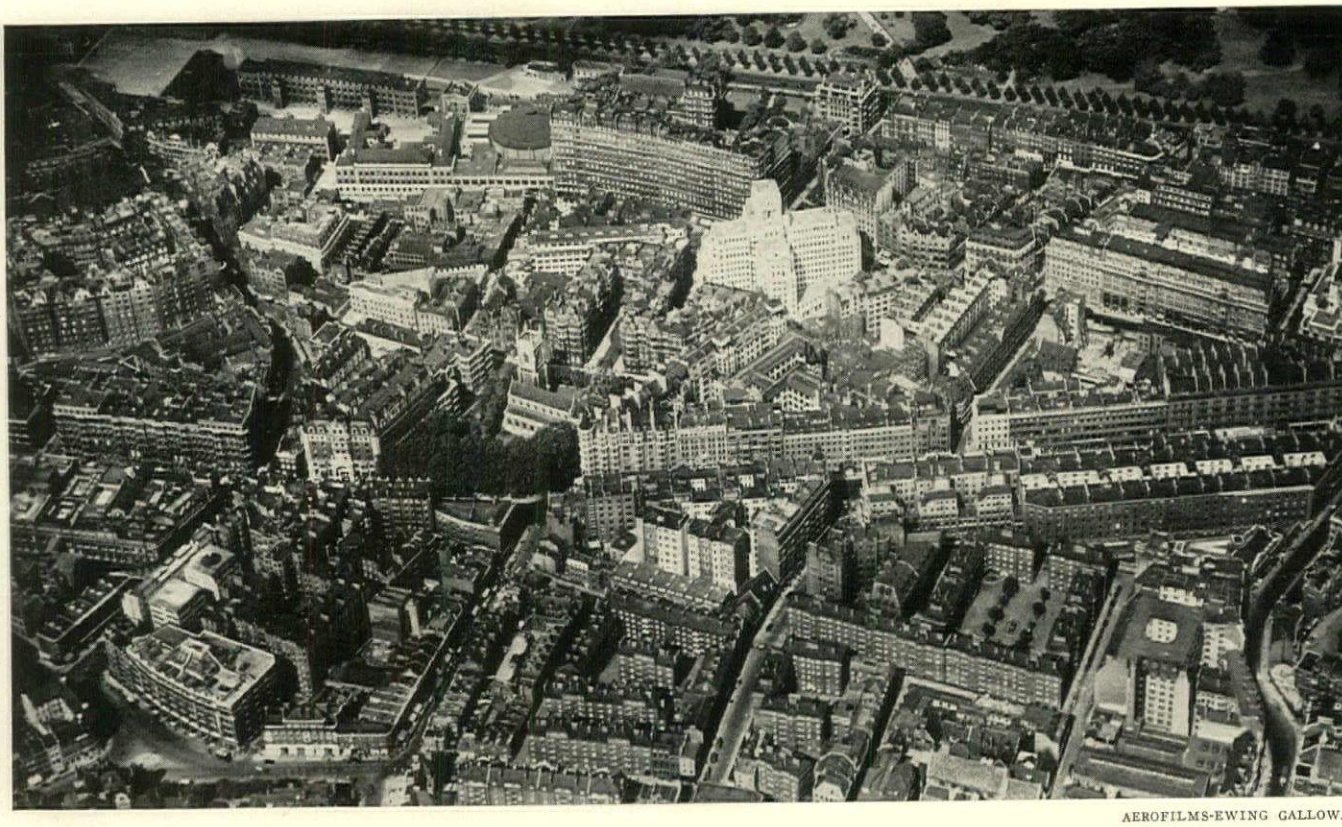
75



TO SIMPLIFY PRELIMINARY ESTIMATING . . . Opposite: FOR CUBIC COSTS . . . Above: FOR SQUARE FOOT COSTS



AEROFILMS-EWING GALLOWAY

Modern London

By THOMAS E. TALMADGE, F.A.I.A.

LONDON is rapidly becoming a splendid city. The old, old days of the Regency when Nash was changing the face of the metropolis with his Greek porticos have been gone long since, but Victorian London, the London of Thackeray and Dickens, and even of Wilde and Du Maurier, the London of our mothers, and even the London of the roseate visits of our own youthful days will soon strain at our memories for recognition.

Not long ago in the stately dining room of the Reform Club—Sir Charles Barry's riposte to the thrust of the Greek Revival—I tried to develop the theory, before an English architect, that London's post-war renascence was due to the example of America. Polite and agreeable as he was, I was unable to wring any concurrence, for he seemed inclined to the belief that if any foreign influence had been operative it was that of Germany rather than the States. Nevertheless, I'm sure that I was right.

To understand the architecture of the present in London and to appreciate the gravitational pull of the example of America, it is necessary to go back to the champagne and filet-mignon days of Edward the Peacemaker. In that happy period England, like America, was lovesick for France—the boulevards, the Latin Quarter, French wines, French cooking, French fashions, and, above all, French architecture. Such buildings as the Admiralty Arch by Sir Aston Webb, 1910, or the vast building on Parliament Street which houses the Office of Works and other governmental activities, rejoice in the same cartouches and floriated capitals that adorned (in a manner of speaking) our own buildings of the same period. However, the strange square blocks which truncate the lower portions of columns, the open corner cupolas, the high and often complicated roofs, and the heavy-handed detail seem to be fancies of their own.

It is the complete metamorphosis of these becolumned, becorniced and bejiggered buildings that I mildly laid to American influence. The real transfiguration of London, however, began about 1920, when England's heart began to beat again.

In the first place, buildings since the World War are in most cases much larger, many of heroic size and mien. Secondly, they have divested themselves of the gaudy Gallic trappings and Saxon clumsiness that made their forebears always fussy and often ridiculous; and third, they are devised of proportions and formed of materials that have introduced a

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New architectural forms are becoming predominant in post-war London. Above, one of the newest, Universal House, Joseph Emberton, F.R.I.B.A., architect. On facing page, The Underground Building, London's tallest structure, dominates its conservative location. Adams, Holden and Pearson, architects

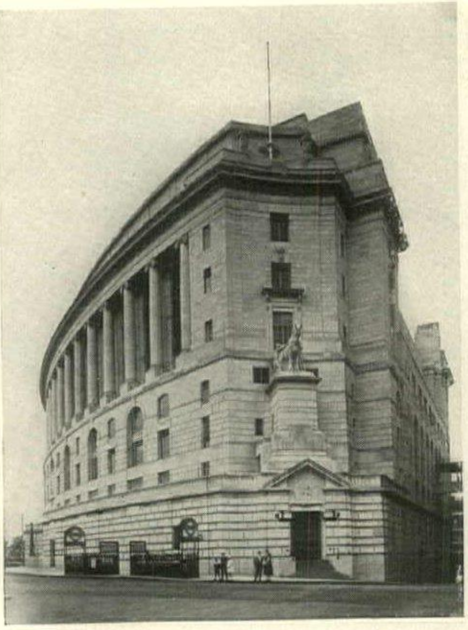
new element of splendor. The centuries-old picture of a city of quiet squares, drab facades and low sky lines—save where they were pierced by the dome of Wren, the vaults of the Confessor and the towers of Victoria—that constitute the "dear old London" of our memories will soon be gone forever.

The influence of America is evident in the will to build great buildings, the use of skeleton steel construction, now universal for every building of magnitude, and a directness and simplicity in planning and purity of detail unknown in pre-war days.

In the first quarter of this century, America developed the most brilliant period of architectural engineering that the world has known since the thirteenth century. It would be strange if the waves of this movement had not lapped the shores of Albion. No wonder then that two buildings built by American architects in London became, in a sense, pioneer monuments in the two great movements that have signalized post-war architecture. The first is Bush House by Helme, Corbett and Harrison, 1920, and the second, Ideal House, by Raymond Hood and Gordon Jeeves, completed in 1928.

Buildings in London built since the war, stylistically at least, fall in to two classes: those that employ Classic detail and those in the International Style. They spring up side by side; and, though those following precedent had some eight years' start, forms of the new architecture are rapidly becoming predominant. Buildings of the first class, of which, in my opinion, Bush House was the precursor, are characterized by recessed and stepped-off masses, walls of smoothly dressed Portland stone, and Classic detail that aspires to the taste and sureness of a Charles Platt or a John Russell Pope.

The best known of these is the huge addition to the Bank of England which rises above Soane's cliff-like wall like a Palatine Palace in the days of Diocletian. Sir Herbert Baker was the architect. Sir Herbert, together with Sir John Burnet, Sir Edwin



Above, Unilever House, designed by Sir John Burnet, Tait and Lorne, is one of the few great modern buildings in a traditional style. Right, New Olympia, a great exposition hall by Joseph Emberton. Below left, Coastal Coaches Station, Buckingham Palace Road, Wallis Gilbert and Partners, architects. Below right, the shining glass home of London's "Daily Express" was built by Ellis and Clarke, architects. On facing page, the Hoover factory, one of several modern plants for which Wallis Gilbert and Partners were architects

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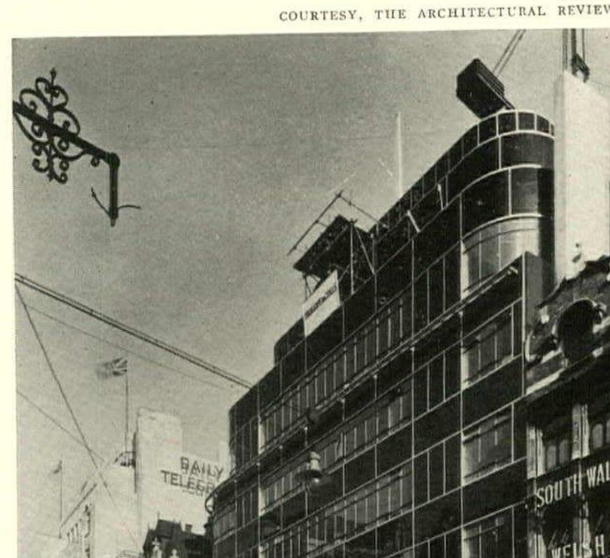
COURTESY, THE ARCHITECTURAL REVIEW



Cooper, and Sir Edwin Lutyens—the King honors his architects—are the four equestrian Knights that bear in the front rank the fasces of the Classic Style.

Sir Edwin Cooper has to his credit The Port of London Authority, a huge, grandiose building which smacks a bit of Edwardian days. It was designed before the War, but not completed until 1922. It is appropriately located on Seething Lane near the old home of Samuel Pepys. Cooper does things on a grand scale. His work bears often a faint Italian tinge, but, fortunately, it is the Italian of Bramanti and Peruzzi; Palladio, who lured the Englishmen of the Eighteenth Century, would pipe in vain today.

The work of Sir John Burnet, as that of the others, stretches over two periods. In fact, his imposing addition to the British Museum furnishes a handsomely formed and beautifully wrought link joining the two. Its colonnaded facade shows unmistakably the final caress of the Beaux Arts and, in my opinion, the rising influence of the arbiters of taste on this side of the Atlantic.

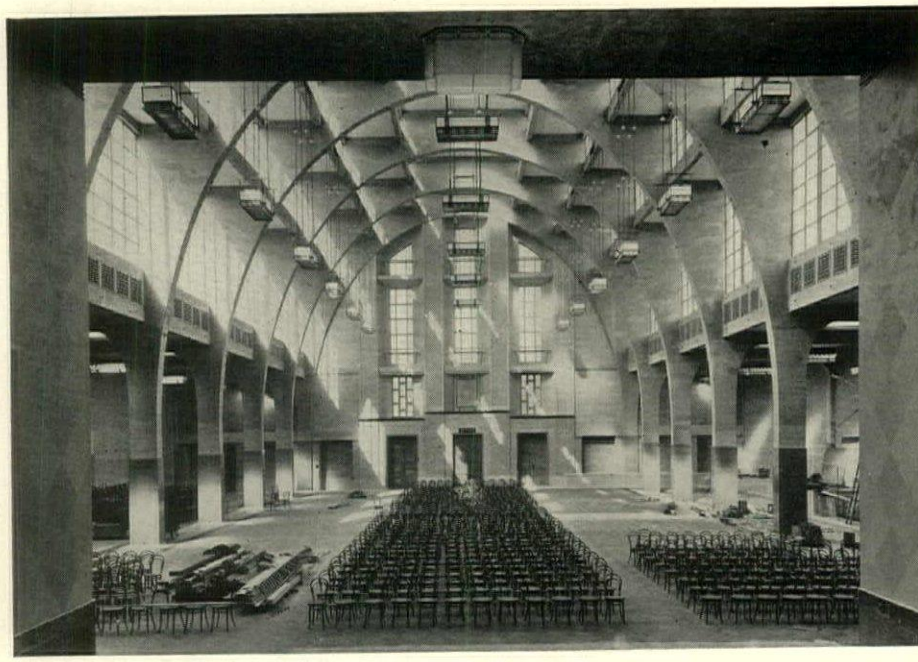
The works of Burnet, Cooper and Baker bear to one another, if not a family resemblance, at least a social one. It is an aristocratic post-war look not unlike the mutual likeness that a briar pipe, wide trousers, and a bare head give to Oxford undergraduates.

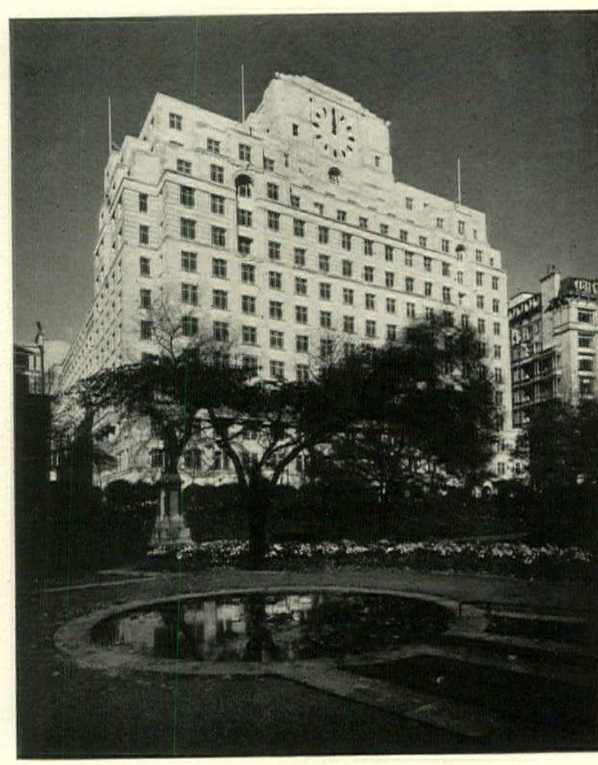
This is not true of Sir Edwin Lutyens. If others' architectural pants are long and baggy, he appears in shorts; and his buildings look as if they had surreptitiously tucked away a quid. Sir Edwin is what the English call a "card" or, in American slang, "a kidder." He certainly introduces the element of humour into architecture. No wonder one smiles on seeing the delightful Midland Bank tickling the shins, so to speak, of its imposing grandmother, Wren's Church of St. James, Piccadilly. Besides the famous Cenotaph—the world's noblest architectural rendering of national sacrifice and its attendant emotions of sorrow, sympathy, pride, and triumph—Lutyens has done Britannic House and the huge building on the corner (there's only one) of Park Lane and Oxford Street.

Rising about, if not above, the close harmonies of this stellar quartet is many another architectural song. In fact, greatest in volume of them all is Thames House by another baronet, Sir Frank Baines. It stretches along the Thames the unbelievable distance of 1,652 feet and must be the largest building in London, not even excepting the Houses of Parliament!

These buildings completed since the War are all eclectic from styles of the past. All are of some variety of Classic with Italian and Georgian flavors

Two buildings that mark an epoch in architectural development of post-war London. Right, the glass-and-ferro-concrete interior of the Royal Horticultural Hall, Easton and Robertson, architects. Below, the Shell-Mex Building, with thirteen stories, is one of London's few large buildings that approach the American skyscraper. Jacob Brothers, architects





predominant; but in their suddenly acquired simplicity and purity, they are widely separated from the architecture that preceded the Great War.

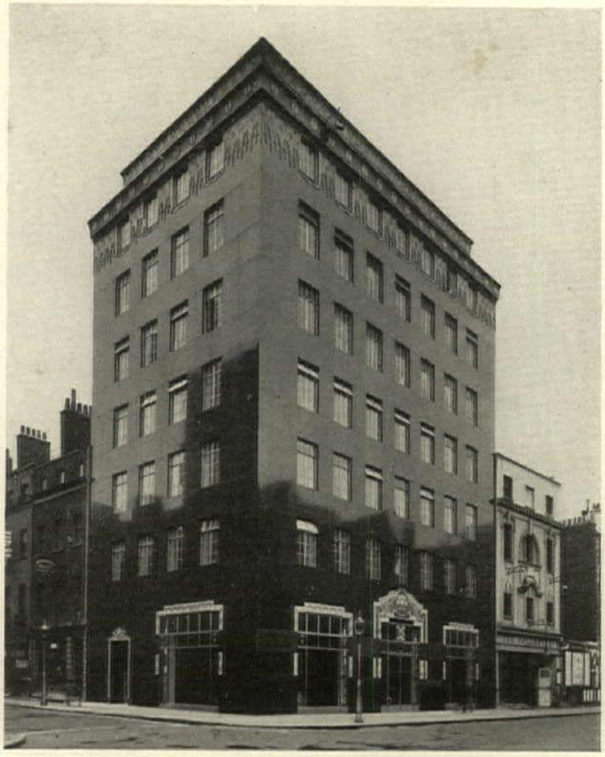
In 1921 there appeared in the *Architectural Review* an article describing the "modernistic" Marine Hotel in Amsterdam under the quaint title of "The Rococco of Today." This is the first recognition I can find of the "new architecture" in English architectural magazines. Yet today in London—in fact, throughout England—the majority of buildings for commercial uses are built in what is well named the International Style. No better commentary on the justness of that title can be found, so far as this writer is concerned, than the fact that he is unable to point out any insular characteristics in these strange, new visitors to architectural England. The same use of new metals and vitreous materials, the same flattened ornament derived, maybe, from the Decorative Arts Exposition of 1925, the same elimination of columns, cornices and pediments, and the same basic quality of treating a building as an aggregation of volumes bound by constraining surfaces, rather than a series of masses hollowed out—all are as evident in these as they are in contemporary structures in Vienna, Chicago or Tokyo.

Eliminating countless store fronts, restaurants, filling stations, etc., one or two buildings in the new architecture are especially significant. There is, first of all, Adelaide House, near London Bridge, by Sir John Burnet, 1924. There are two schools of thought about this building. One regards it as eclectic and the other as a precursor of the new architecture. The easiest thing is to call it transitional, an advance guard of the approaching force. Another is Ideal House, 1928, by Raymond Hood and Gordon Jeeves, which aroused a storm of criticism and a host of disciples.

However, it took the Royal Horticultural Hall on Greycoat Street to placate somewhat the outraged Londoners. One competent critic states that it stands next to the Cathedral of Liverpool as a creative achievement, and says that "it will live, because it is brave, honest and vitally true to the spirit of its age." The architects are Easton and Robertson. Its principal interest lies in the interior composed of huge catenary arches of reinforced concrete supporting a series of stepped back clerestories.

Now on the site of the Church of St. Olave rises the Hays Wharf head offices in a style which would have caused old Inigo Jones and kindly Sir Christo-

Left, Dorchester Hotel, Curtis Green and Partners, architects. Below, Ideal House, Raymond Hood and Gordon Jeeves, architects. Built in 1928, this building was the advance guard of a new architectural London. Faced with black marble and crowned with red and gold, it provoked a storm of criticism and a host of disciples to the new movement in design



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pher Wren to have sworn oaths that would have shamed Henry VIII and even Queen Elizabeth. You will have to get out on the river to see this example of extraordinary architecture with its strange bulkhead windows and huge terra cotta panels depicting, in symbolic style, river scenes. Its creator is Mr. Goodhart-Rendal, popular and elegant apostle of the Fine Arts and, somewhat curiously, the best authority on Victorian architecture.

Directly north of the British Museum, Torrington Square, with its memories of the Rosettis, has sunk into a vast abyss from which will rise the new building of the University of London. This tremendous structure—also in the new style—will be, apparently, the largest in all England.

Perhaps the last word in the denial of the old order is the new home for the Royal Institute of British Architects. For almost a century this ancient and honorable society has occupied the familiar building at No. 9 Conduit Street, built by James Wyatt in Georgian days. Pugin and Barry have talked together in its alcoves; the handsome figure of Professor Cockerel has often graced its rostrum; and Butterfield, Webb and Norman Shaw have watched the hansom cabs from its muntined windows while discussing the influence of pre-Raphaelites. But its columns and cornices, garlands and panels will soon be deserted for a building wherein LeCorbusier and Frank Lloyd Wright have tumbled from their places old Inigo Jones and the many sided Wren; let's hope he falls on a soft side.

A most important part in London's campaign of splendor is the program for an imperial city plan. The Kingsway Aldwich improvement with Bush House as its focus was a brilliant success. The Strand is being widened—one of many streets. The whole matter of zoning is being agitated to the end that the height limit may be greatly increased. Already by special permission the "Underground Building" is 180 feet, not deep but high. Models, drawings and estimates for a new London fill newspapers and call forth wrathful comments from old gentlemen who write to the *Times*.

In making London the most splendid of cities, may I make myself a spokesman for my nation in a plea that there be built a direct route from Trafalgar Square to Piccadilly Circus. The forty million Americans who have been lost on the obliquities of Cornhill and the Haymarket can't be wrong!

Building Reconditioning

A fertile field of business for architects exists in altering or improving properties, held or controlled by financial institutions, to make them more rentable or saleable

BY DEXTER PURINTON

Associate, Voorhees, Gmelin & Walker

CONCENTRATION of public attention on the stimulation of building construction with particular emphasis on remodeling and reconditioning through the National Housing Act and the Reconditioning Division of HOLC, again directs attention to a large field of activity for architects. The Government program contemplates a large volume of relatively small expenditures primarily in the residential field but also having some possibilities in the commercial field.

In addition to the potential volume of work implied by these government-stimulated reconditioning projects, there exists a large and important volume of similar work to be done on properties now possessed or controlled by financial institutions. Many of these properties represent non-liquid assets which cannot be sold in their present condition for even a major portion of the mortgage principal. And in most cases the only solution from the institution's standpoint lies in their modernization and repair as a prerequisite to good management.

The aggregate volume of this necessary work is enormous; and to secure sound economic results it is essential that architectural service be used. It is work which can be best done by architects whose practice does not entail affiliation with an owning institution. Thus they are in a position to exercise independent judgment based upon training and experience free from possible influence of customers' accounts.

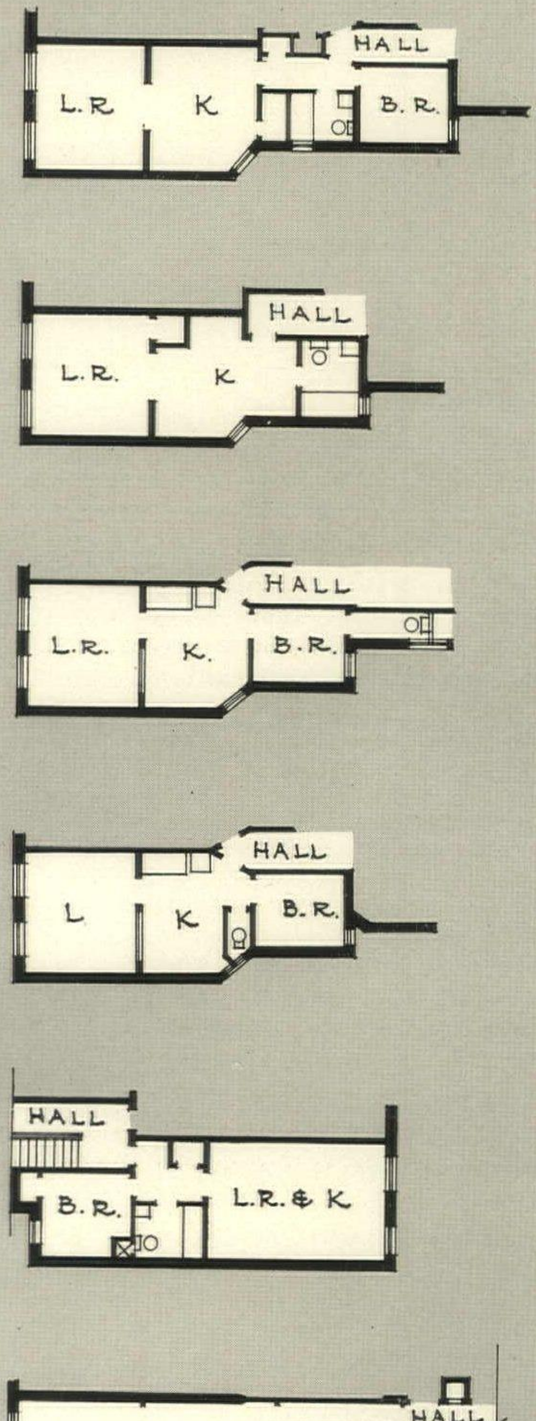
Architects should seek to participate in this extensive modernization program, not only for the direct financial return to them, but also because the problems of obsolete and uneconomic buildings must be properly solved before any community can be financially sound. There are also social aspects of this problem which will commend themselves to every architect.

Two general classes of institutional modernization work exist: first, properties owned by the institution; and second, properties under rent assignment to protect the mortgage interest. A third class, somewhat similar to the second, includes those cases in which the institution has sold a property and increased the amount of the mortgage. In the first class the institution pays directly for modernization cost. In the second and third classes modernization costs are almost always paid by the institution either directly or indirectly by increased mortgages. In any case, the problem from the institutions' viewpoint is entirely economic as they are motivated by the desire to protect their present investment and to make an adequate return upon their total investment.

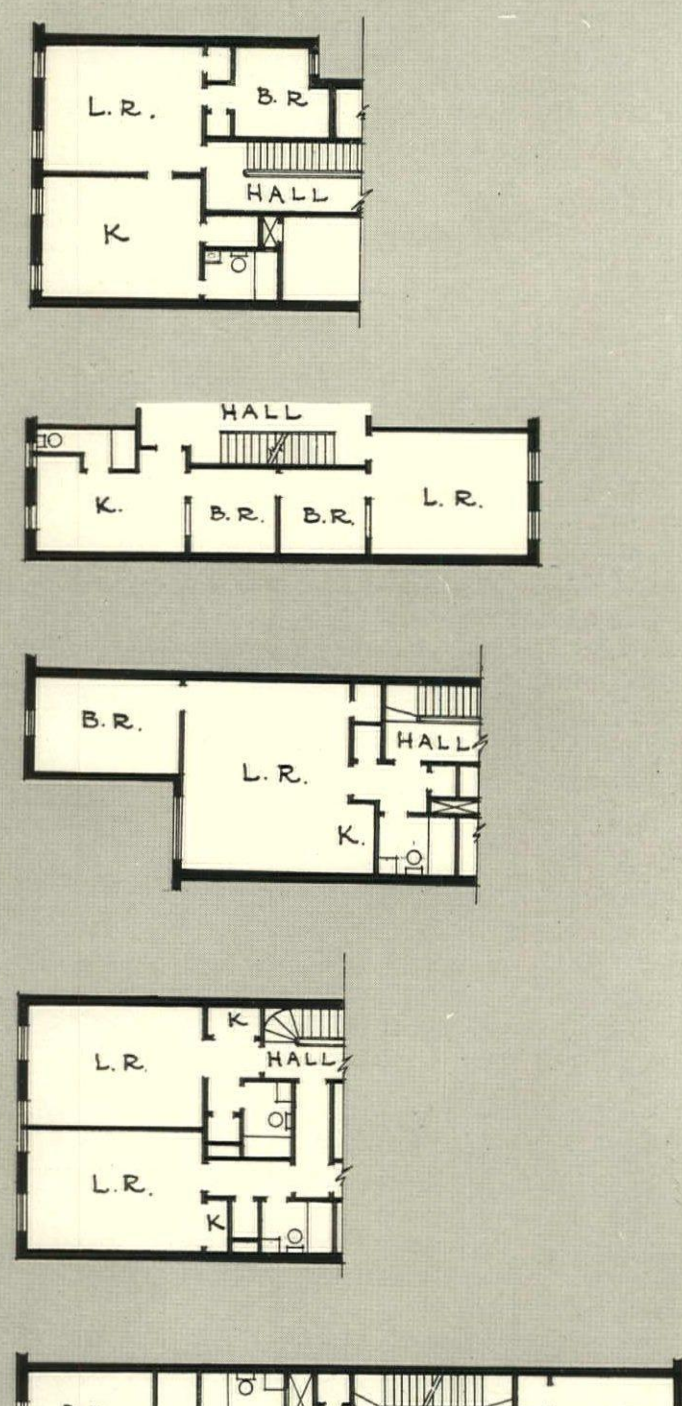
Though details vary in the problems of each institution, both problems and the methods of their solution follow the same general pattern. Typically, the institution has an officer in charge of real estate —usually a senior vice-president—who has a number of assistants specializing in various phases of the work. An architect seeking to do modernization work for the institution should sell this officer his qualifications as an aid in solving the economic problem involved. Institutions are most impressed by the architect's ability in helping to modernize at the lowest possible capital cost; to produce an adequate return on the property over a term of years; to protect the institution's interests where money is lent to others to do the modernization; and to do the work at low cost.

REAL estate agents employed by institutions do certain repair and alteration work extending in some cases to true modernization programs. The line between the agent and architect cannot be clearly defined and each case must be separately considered. In any arrangement for doing modernization work a competent real estate agent is an important factor and should work in close cooperation with the architect to produce the best results.

In some instances architects have obtained desirable institutional contacts by working out specific modernization problems with real estate agents and jointly submitting the solution to an institution. Every solution submitted must not only solve the planning problem, but must also solve—at least in part—the economic problem involved so that the



Six typical remodeling arrangements for conventional "dumbbell tenements"



Five solutions of 1, 2, 3 and 4 room apartments in remodeled tenements

HOW IT PAYS TO RECONDITION

These figures represent an actual case in which $6,000 was invested in the building. This included actual cost of renovation, architect fees, interest and loss of rent during construction. The profit shown amortizes in 4 years the new money invested in the project

	"Before"		"After"
Interest on $15,000 mortgage	$900		$1,260
Taxes	400		500
Heating	...		550
Repairs and insurance . . .	600		450
Total annual cost	$1,900		$2,760
Rent, 10 apartments at $25 per month with 40 per cent vacancy	$1,800	Rent, 10 apartments at $40 per month with 10 per cent vacancy	$4,320
Net loss	$ 100	Net profit	$1,560

institution may readily see what new monies may be necessary and what will be the net return upon all monies invested.

The financial statement submitted will generally be more carefully analyzed than the actual plans and specifications. Architectural offices with strong engineering staffs or connections can sometimes obtain institutional contacts by presenting surveys of properties with recommendations for changes which will decrease operating costs. Some smaller engineering organizations have already built up profitable practices in such survey work in connection with heating plants only.

Real estate owned and controlled by institutions consists mostly of housing, such as residences and apartments, although they also own and control commercial properties, such as office buildings and factories. Before approaching an institution an architect should find out the types of property held by the particular institution so as to be generally familiar with the problems involved.

Many times the location of a particular property determines the solution of the problem, for the character of the neighborhood, particularly in housing projects, is a large factor in determining what should be done. After the architect has established contacts and done some work for the institution, he should endeavor to obtain a general picture of all properties owned and controlled by the institution in his community so that he may help, if possible, to determine the policies to be followed.

Where properties are close together it may be wise to modernize a large group at one time in order to improve the entire neighborhood. This change of neighborhood characteristics has been done successfully and sometimes offers the only solution in so-called "blighted" areas. Where properties are scattered such neighborhood changes may not be possible. But cognizance must be taken of all other properties in a given area and also of what changes will probably occur in the next few years. It is generally true that each neighborhood has a definite rental limit; and no matter how well a building may be modernized, the space cannot rent for more than the neighborhood limit, although its rentability may be greater than adjoining properties.

Architects can be of help to institutions in the sale of property by making definite surveys of present conditions and approximate estimates, and, can sketch plans of proposed changes to make the property income-producing. These estimates and sketches often give potential purchasers a picture of the possibilities which are difficult to visualize without their aid.

Many sales are made where the institution lends further money to the new owner to modernize the property. In these cases an architect should be employed to check the sales agreement—which outlines the work to be done—and to supervise the alterations so that the institution's interests are properly protected. Under this arrangement it is usual for the institution to pay out additional monies only upon the architect's certificate for work actually completed.

EACH state has somewhat different laws governing financial institutions and regulating the way they may handle properties they own and those on which they hold mortgages. These laws should be known by the architect, as all modernization projects must conform with them. The architect should, of course, be familiar with local building laws and the operation of the enforcing departments, for he will find that violations of these laws in foreclosed properties are all too common. One of the architect's important services to the institution will be removal of such violations with the necessary appearances before enforcement officials.

The architect desiring to serve the institution in this huge modernization movement must always remember that the problem is economic and that expenditures are justified only so long as they increase rentability or actual income. The architect who recognizes the economic phases of the problem can be of service not only to the institution but also to his community.

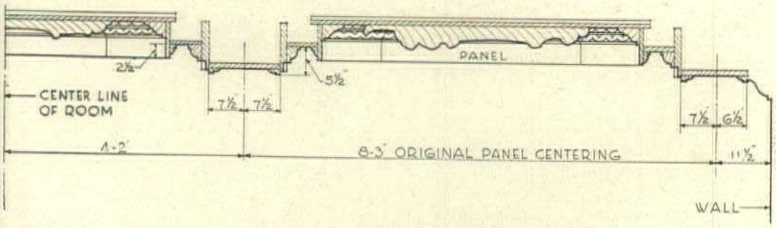
PHOTOGRAPHS BY ROBERTS

REFECTORY AT LA CUESTA ENCANTADA

ESTATE OF WILLIAM RANDOLPH HEARST, SAN SIMEON, CALIFORNIA

JULIA MORGAN, ARCHITECT

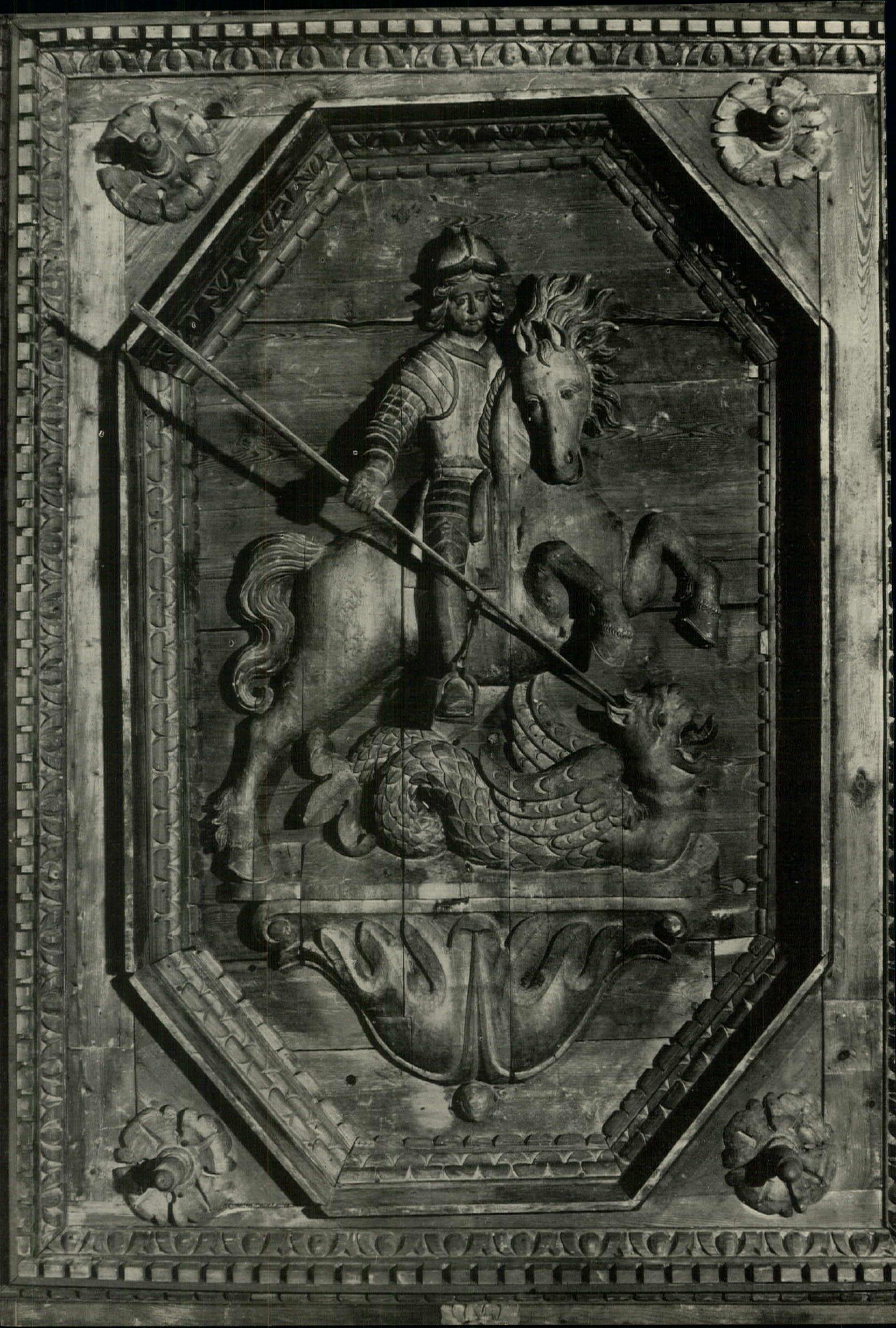
Outstanding among many features of this unusual room is the ceiling. This came from Northern Italy and dates from the 16th Century. It is of natural pine, waxed but unpainted, has an overall size of 32 by 72 feet and contains fifteen full coffers carved with figure effigies in high relief. It was installed after the Refectory had been completed and is set five feet below the original ceiling which was of girder and beam construction 35 feet above the Refectory floor



SECTION THROUGH REFECTORY CEILING

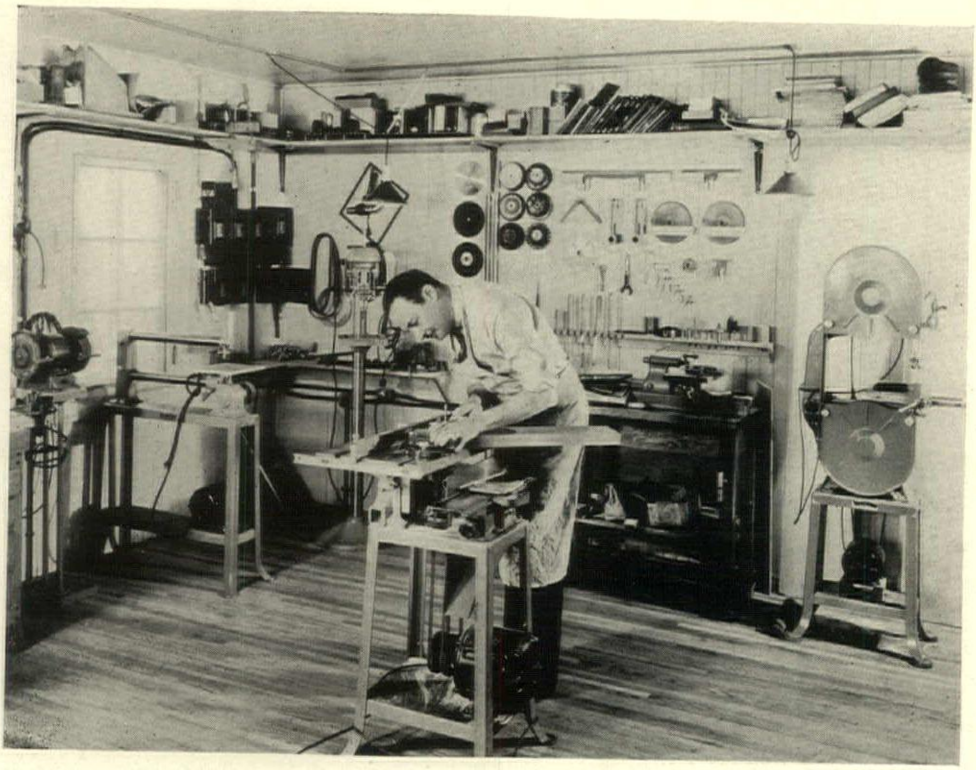
The scale of the ceiling can be judged by comparison with the 16th Century Italian banners. These are approximately 6 feet long. They are of hand-woven silk decorated with painted emblems and insignia

REFECTORY CEILING,
ESTATE OF
WILLIAM RANDOLPH HEARST
SAN SIMEON, CALIFORNIA



Early 14th Century Grille from the Cathedral of Seo de Urgel, Catalonia.
It is of Spanish wrought iron. Pierced work is backed with canvas and red velvet

REFECTORY GRILLES, ESTATE OF WILLIAM RANDOLPH HEARST, SAN SIMEON, CALIFORNIA



Planning for Home Workshops

BY LEON F. URBAIN, A.I.A.

AS a cheerful, healthful place in which to play and rest as well as to indulge the whim for spare time work, the home workshop is rapidly becoming a popular American institution. Stimulated in growth by the characteristic American interest in practical home comforts and mechanical craftsmanship, the workshop idea is applicable to a host of handicraft subjects. Metal and wood work, weaving, leather work, pottery, photography—increasing interest in all these and other handicraft indicates the growing appreciation of a hobby as a pleasurable and profitable activity of leisure time.

Today the home workshop is often scientifically as well planned and mechanically as well equipped as any commercial establishment. On the other hand, it may be a kind of general recreation room where mechanical equipment is subordinated to easy chairs, bookcases and drafting tables with possibly a weaving loom or potter's wheel. In any case such workshops are becoming more and more an essential requirement in residential planning. Whether they be large or small, simple or elaborate, efficiency demands that space be carefully planned and equipment judiciously chosen. The following paragraphs will serve as a general guide to these ends. In addition they indicate an architectural opportunity.

It is impossible to list, within the limited scope of one article, the limiting characteristics for every type of shop or to set forth in minute detail the pros and cons of equipment that is available for every type of handicraft. This article, therefore, will be confined to the requirements of a woodworking shop.

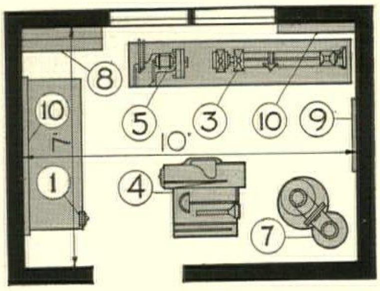
HOUSING THE WORKSHOP

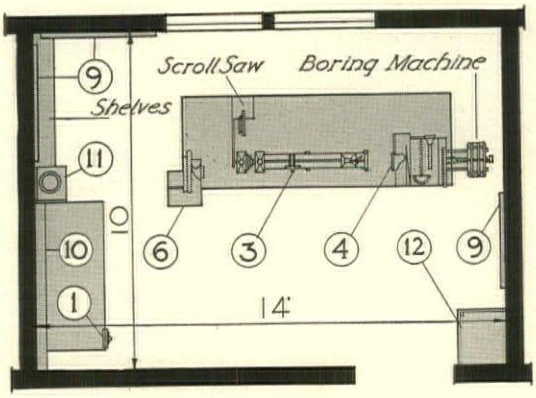
Location of the workshop may have an important bearing on its general usefulness and convenience. For the lighter handicrafts such as weaving, modeling, leather working, etc., space in the attic will probably be adequate. Even for heavier hobby trades such as woodworking and metal craftsmanship a second floor location is satisfactory if the floor construction is sufficiently sturdy to support the necessary heavy equipment without excessive vibration and if provision is made for a large outside access

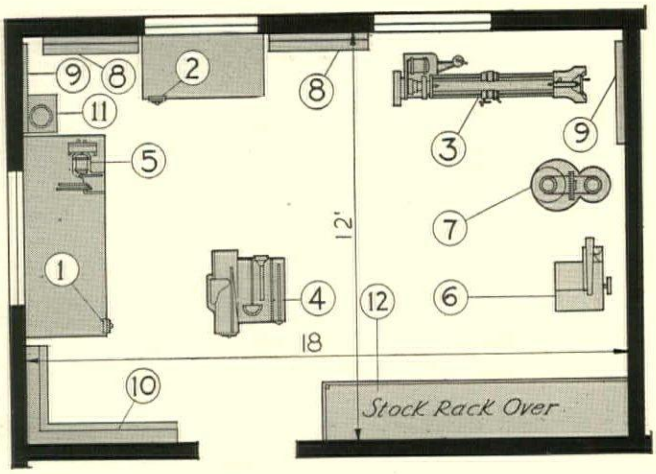
PLANNING

For a small workshop (right); for one of an average size (below left); and for a large, completely equipped space (below right). Arrangement depends upon shop proportion and location of doors, windows, etc. Some equipment is common to all shops.

1 . . Work Bench and Vise	7 . . Drill Press
2 . . Finishing Bench	8 . . Tool Cabinets
3 . . Lathe	9 . . Tool Panels
4 . . Circular Saw and Jointer	10 . . Tool Racks and Shelves
5 . . Scroll Saw and Disc Sander	11 . . Glue Pot
6 . . Band Saw	12 . . Scrape Box







through which to take in materials and remove finished products which may be bulky. The basement, first floor or over the garage is preferable. Any location should provide the workshop with good natural light, ventilation and as much privacy as possible.

Sizes and Shapes will vary with the equipment and activity to be housed and with the degree of completeness desired. Woodworking for example, requires more free working area than most other trades. Generous wall space for racks, storage cabinets and panels, benches and machinery stands is necessary to all activities. In addition some space must be available for material storage. A shape which approaches the square is to be preferred, since this permits arrangement of machinery and other equipment in most convenient working relationships. For a small woodworking shop 7' x 10' is nearly an ideal size. An efficient medium-sized shop would measure 9' x 12'; and a most completely equipped shop requires an area of at least 15' x 20'.

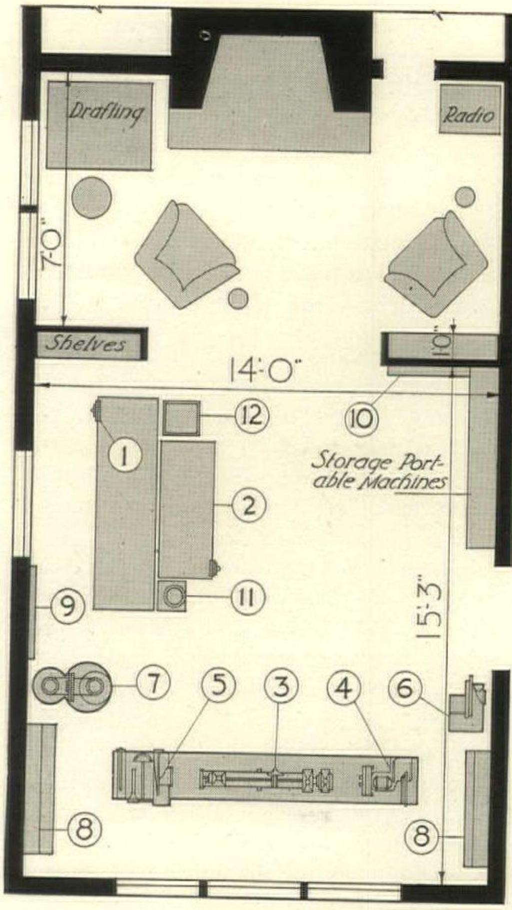
Good natural lighting is not only important to the health, convenience and comfort of the worker, but also may influence the quality of his work. The main source of light should be on the long side of the shop preferably at the worker's left. A glass area of 12 per cent of the floor space should be ample.

Artificial lighting should combine both general and local types. The first may be obtained from one or more fixtures of the diffusing store-fixture type, placed close to the ceiling. In a shop 15' square and about 8' high a 300 watt lamp would give an intensity of about eight foot candles, which is ample for general illumination. For local lighting, each machine should be provided with a special fixture. These use a 50 watt lamp and are adjustable.

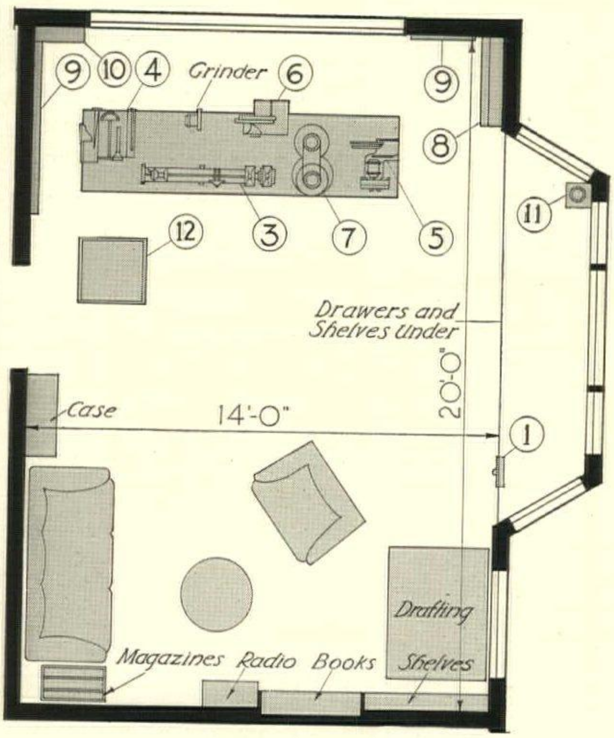
Ventilation is as important as good lighting. The simplest way to provide it naturally is to utilize cross air currents normally present at a corner location. Windows may be of any type provided they are equipped with hardware to assure necessary adjustment. In an attic location, globe or air driven ventilators may be used to advantage.

Mechanical ventilation is best accomplished by means of an exhaust fan rather than a blower, but some provision should be made for fresh air intake. Good practice in shop ventilation is to provide for ten to twelve changes of air per hour. For a woodworking shop containing 1600 cubic feet a 12" exhaust fan—such as a standard kitchen unit—would be ample. When this type of apparatus is used, heating provisions should be increased about 15 per cent.

The means of mechanical ventilation is often determined or modified by dust, color and fume conditions. The only practical way to rid the shop of dust is to equip dust producing machines with hose or pipe conductors which can be connected to the



Workshop facilities can often be combined with lounge areas. Two possibilities shown here include equipment listed on facing page



exhaust system or fitted with individual blowers connected to a sack or box as is done in the ordinary vacuum cleaner. The largest dust producer in a woodworking shop is the circular saw. This requires a 3½" pipe. In general no dust collector should be smaller than this.

Heating equipment should keep temperatures at about 60 degrees F. in shops where the type of work demands constant exertion. Where work is normally done sitting, as in weaving, an average temperature of 68 degrees F. can be maintained.

The unit heater presents the most generally economical and adaptable form of shop heating. A small unit heater in addition to heating, provides air circulation; and if the unit is connected to a fresh air duct it can also be made to ventilate the shop. When hot water or steam is not available electrically heated units have been found practical.

If the building is heated with a gravity hot air furnace and if the shop is located in the basement, it will be necessary to install a small blower in the duct that serves the shop. Ceiling radiators save valuable floor and wall space, though they are not the most satisfactory from a heating standpoint and have the added disadvantage of concentrating the heat over the worker's head.

Electrical requirements vary with types and sizes of shops. Always, however, shop power should be on a separate circuit. If a separate circuit is not installed, light flickering caused by overloading the house circuit will result. A total load of two horsepower is adequate for most shops; and a circuit using number 12 or 14 wire should be provided for this load. Even a small shop will require at least six outlets, located on both walls and ceiling.

Floors of well-laid and finished maple are most generally satisfactory for shops. For first or second floor shops and in basement locations that are known to be permanently dry a good grade of battleship linoleum or asphalt tile is satisfactory.

Sound-deadening may be unnecessary in many shops, but in those containing much machinery it will prove desirable from the standpoint of the worker himself as well as the other occupants of the building. Under average conditions it can be easily installed at small cost. Most acoustical products—roll types, tiles or slabs—are well adapted to use in a shop, preference being given to those most easily cleaned and maintained. In a new building sound insulation of the quilt or bat type should always be installed in the walls and ceiling. Vibration mats of alternating layers of lead and cork can well be placed beneath bench legs and the heavier detached machines. This is particularly to be desired when the shop is located in an apartment building or on an upper floor of a residence.

Air conditioning of a shop is often a desirable contribution to the comfort and health of the worker. In many cases also, it makes materials—such as leather, wood and textiles—easier to work with, thus assuring a product of a more uniformly better quality. Changes in relative humidities attending radical temperature changes may cause serious expansion or contraction and possibly ruinous distortion of expensive material stocks. In shops where particularly accurate work with moisture-absorbing materials will be done, control of relative humidities should be considered as almost a necessity.

Utility services, such as hot and cold water, gas and toilet facilities are, of course, desirable conveniences that, when installed in one corner of the shop, save the worker time and add greatly to his convenience.

Other general requirements of the workshop ought to be considered in planning preliminary to installation of any equipment. *Basic purpose:* Is the work to be only of a hobby nature, or may it eventually become at least semi-professional? How many kinds of work will be done, wood or metal working, weaving, etc.? Will it be heavy, full-sized work or confined to relatively small models? *Personal:* Are physical characteristics of the worker usual, or is he —or she—left-handed or crippled in any influential manner? How large is the shop budget? *Equipment:* In general, will power equipment be used, or solely hand tools? How extensive are storage requirements; and how bulky is the material itself? What special construction may be necessary for heavy, noisy machines and what is desired for expanding the future capacity of the shop?

WOODWORKING SHOP EQUIPMENT

IN most cases, a worker starts with a small or an average shop, but hopes ultimately to have a fully equipped shop. By providing for expansion at the start, the shop can be completed systematically, conveniently and economically.

One might suppose that a small shop would be equipped with machines of small capacities and large shops with larger machines. But actually this may not be the case. First, capacities of shop equipment are not dictated by the size of the shop, but by the nature of work to be done. Secondly, the shop designer will find that there are narrow limits of size and capacity within which home workshop equipment must be kept, regardless of the size or purpose of the shop. Manufacturers have adopted standards that are fairly uniform, that are based upon average requirements and that vary little from the dimensions, capacities and floor requirements described and illustrated in this article.

Few woodworkers now use only hand tools. Much of the dimensioning, shaping, jointing and sanding—all ungrateful hard work—can be done easier, faster and better by machines, giving the worker more time for planning, designing and finishing. Motor-driven tools increase shop production, the variety of the objects that can be made and give an interest to shop work that is only to be gained from moving machinery. Thus they have become standard equipment in all well planned shops.

Machines for every shop operation can be obtained either as detached, motor-driven, single-purpose machines or as bench units. Many of them are obtainable as detached, motor-driven, combination machines and as attachments to be used with the circular saw, drill press, lathe or disc sander.

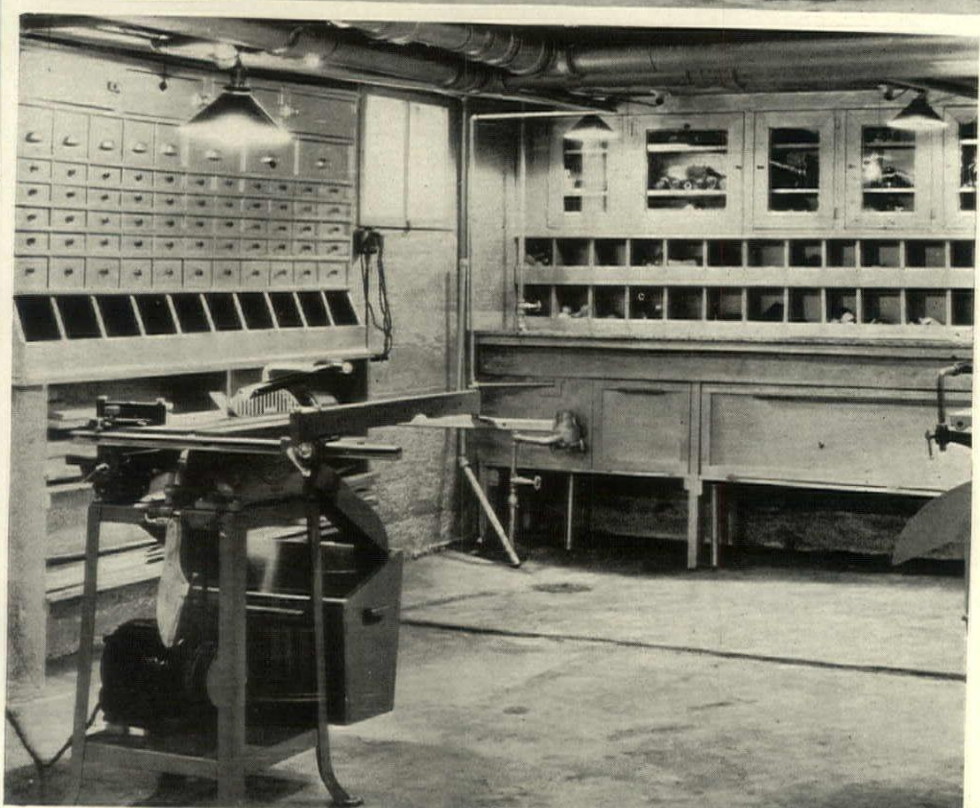
The circular saw is usually the first machine to be installed and is used primarily to cut up rough sticks into workable sizes. It must be provided with proper guards and is far safer and more practical as a detached unit, set free standing with plenty of working space around it. The most popular all-around type is the unit with an 8-inch diameter saw. This model weighs about 125 lbs. and requires with clearance a floor space of about 2′-6″ x 2′-6″. It is powered with a ½ H.P. motor and is a high speed machine working best at about 3500 R.P.M.

Good machines are equipped with tilting tables which permit bevel cutting up to 45 degrees. Tables are usually too small, however, and extensions are available which add only 8″ to the front and 16″ to the side, but make it possible to cut stock up to four feet wide. Gauges are obtainable for accurate mitre cutting, dado heads for the cutting of grooves and various types of blades for saw-cutting.

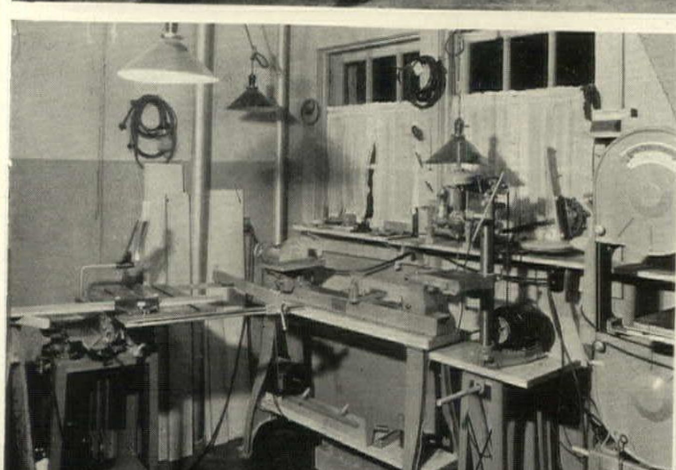
A combination unit of circular saw, jointer and boring machine, is most efficient. The jointer of 4″ capacity measures about 8″ wide and is usually attached to the left of the saw. The boring machine will project about 14″ under the saw table extension. This combination saw can be used for cross cutting, ripping, mitreing, dadoing, boring, plowing, mortising, moulding, rabbeting and jointing—all these operations can be done with a ½ H.P. motor.

The lathe is usually the second power tool to be installed, although installation of the drill press sometimes precedes it. It greatly increases the production variety of the shop and makes possible wood-turning, an operation that can be done on no other tool. A lathe is specified by its "swing," which refers to the diameter of the piece it will turn. Many sizes are available, but a lathe with an 11″ swing and measuring from 36″ to 42″ between centers is large enough for the average shop.

A bench type of lathe operates as well as any other, but a detached unit is more convenient. The latter can be set along a wall or in front of a window in a space 6′ long by 1′-6″ deep. It weighs about 200 lbs.; the bench type, about half that. Both operate with a ⅓ H.P. motor (a repulsion-induction type is preferable), but require four speeds; 900, 1460, 2200, and 3400 R.P.M. By providing the proper standard attachments, metals can be turned as well as wood; and the machine can be used for boring, sanding and grinding as well as turning.

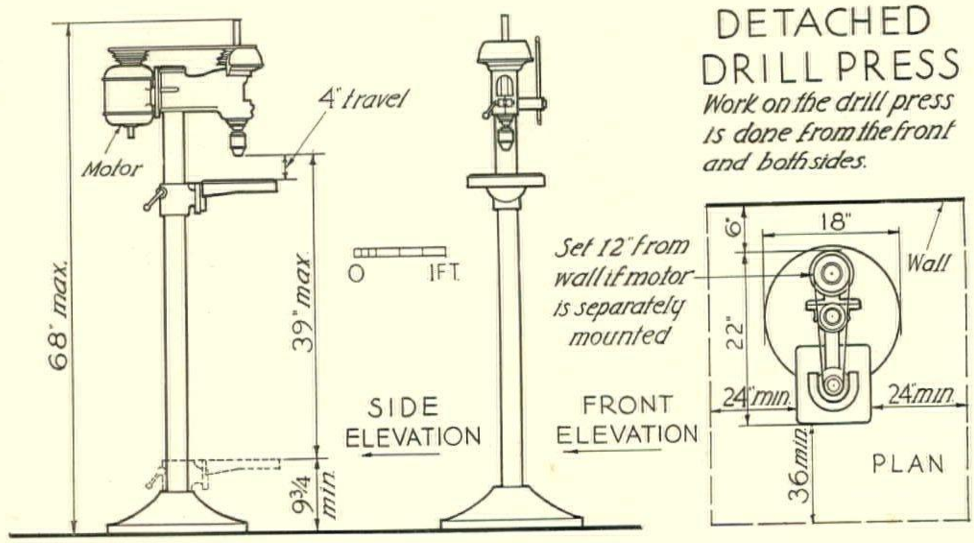


Size of a home workshop is not always a criterion of completeness in equipment or efficiency in plan. Both of these shops are in basements. That above is large enough to provide all necessary facilities for extensive and professional woodworking activities. Most of the machines are of the detached, stationary type. Particularly noteworthy in this shop is the kind of cabinets used for storing tools, machine attachments and small sections of material. The two pictures below illustrate adaptability of movable equipment units. In a small shop of this kind machines not in use can be stored out of the way, as shown at the left, or they can be moved about at will to facilitate production. Such units can often gear up production possibilities in a shop otherwise of too small a size. In the picture directly below note the individual lights installed on the machines themselves



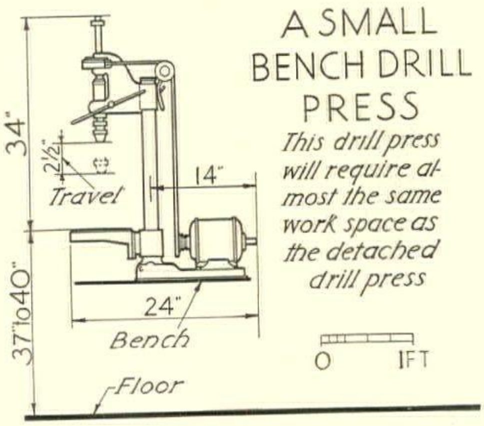
DETACHED DRILL PRESS

Work on the drill press is done from the front and both sides.



A SMALL BENCH DRILL PRESS

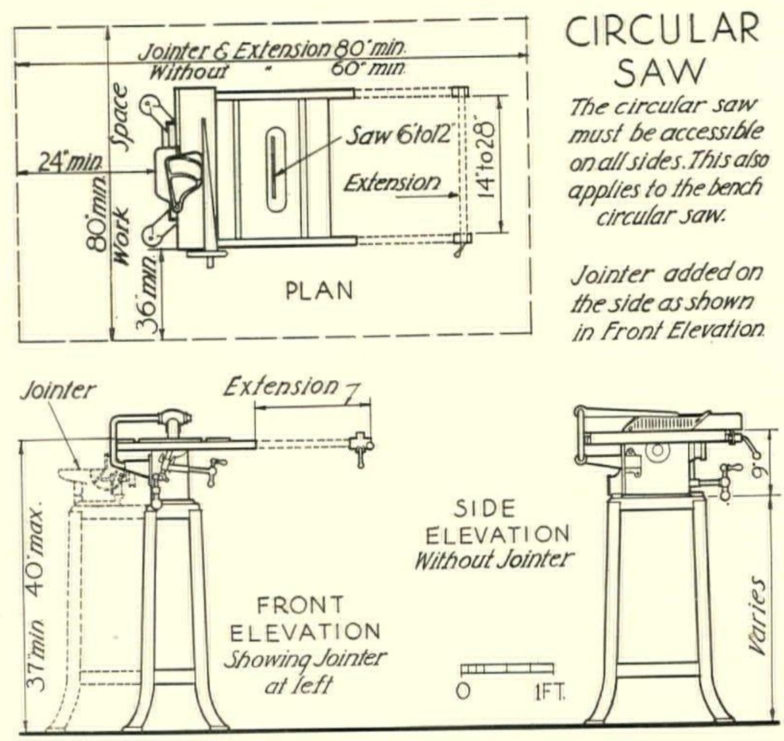
This drill press will require almost the same work space as the detached drill press



CIRCULAR SAW

The circular saw must be accessible on all sides. This also applies to the bench circular saw.

Jointer added on the side as shown in Front Elevation.

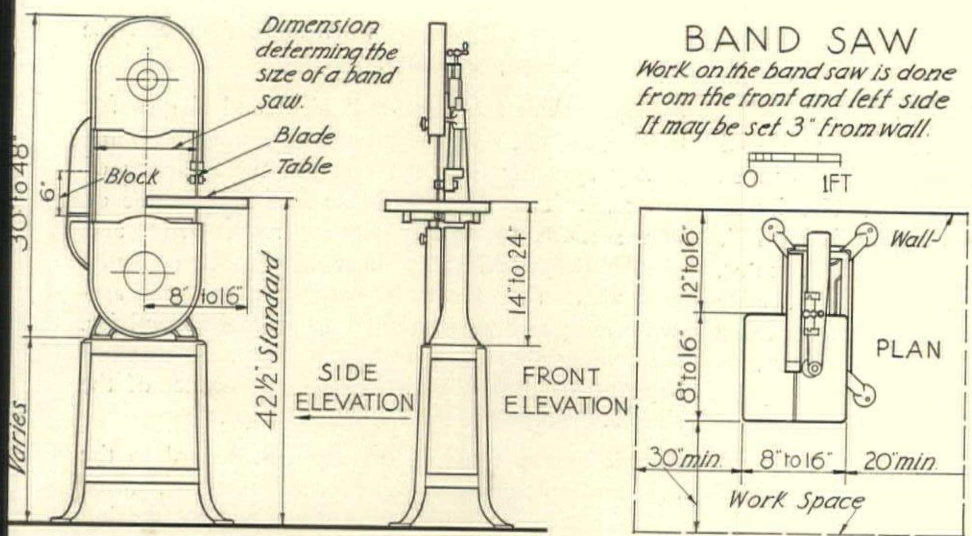


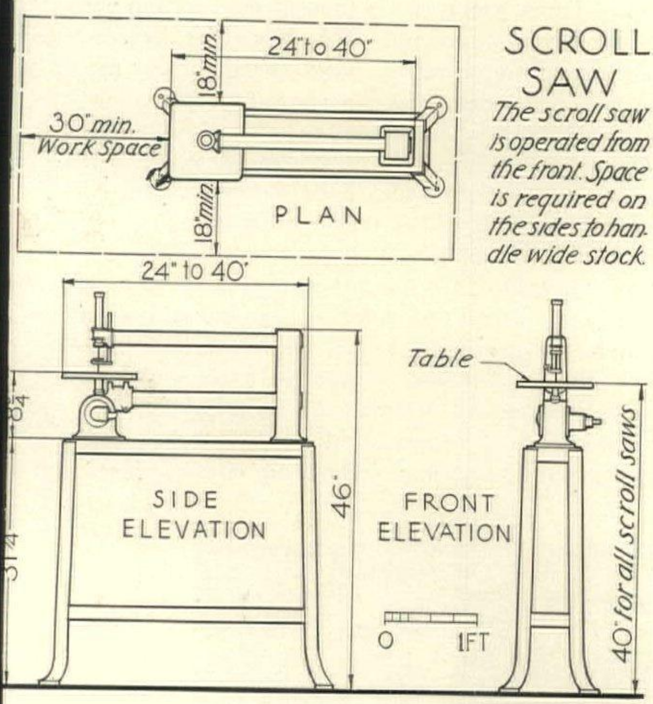
Standards of machine equipment manufacturers are fairly uniform as applied to sizes and capacities of motor driven units. Average dimensions and space requirements shown here will be found adequate as information for space planning. All machines illustrated are available as free standing units as shown or as bench installations

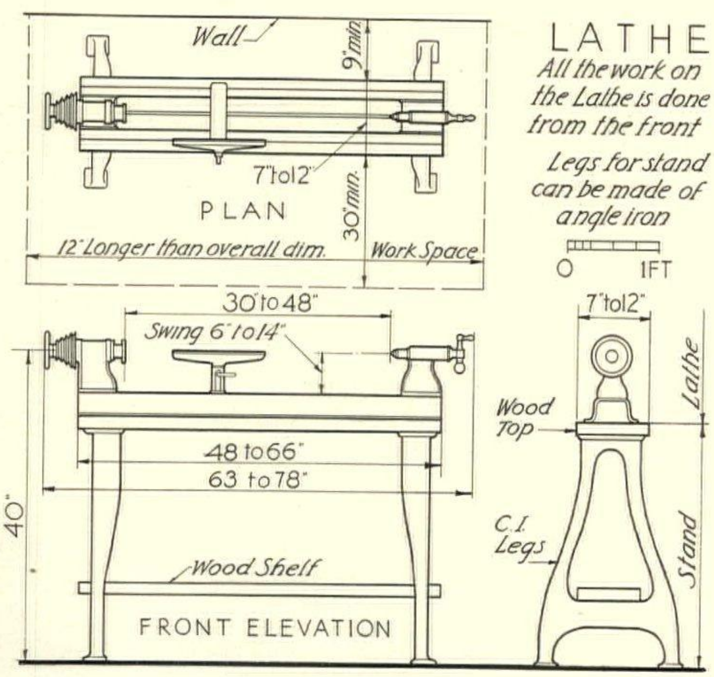
The drill press requires a space only 12" x 20". If detached it can be set within 3" of the wall. Since it can be used for more than drilling, working space at front and at both sides should be available. These machines are made in several sizes based on the maximum diameter of the drill they take. However, other important dimensions must be considered when specifying a drill press. For average requirements it should take drills up to ½", have a table travel of at least 36", drill to the center of a 14" circle, be provided with four speeds—600, 1200, 2400, and 5000 R.P.M.—use a ⅓ or ½ H.P. motor and weigh not more than 150 lbs. with stand. The drill press is one of the most useful machines in the shop, though this is not generally appreciated. Attachments can be had that make it useful for boring, routing, carving, shaping both straight and curved stock, grinding, sanding and mortising.

The foregoing machines are what may be termed basic units—those without which no workshop can be more than a pleasant place to putter. Choice of the following equipment machines will depend upon the nature of the work to be done and upon the tastes and mechanical preferences of the owner. All of them will be useful in a well equipped shop and space for their installation should be carefully considered in the planning of the workshop area.

The band saw in the home workshop is used for cutting heavy stock to thinner dimensions and for







curve-cutting. A band saw is sized according to the diameter of its wheels. A 10″ saw will cut widths up to 20″ and meet the requirements of most shops. It is practical as a bench machine, occupies a space of only 12″ x 18″, extends 36″ above the table, weighs about 50 lbs., and requires a ⅓ H.P. motor. A band saw requires only one speed. A 14″ detached machine will cut 28″ stock, stand about 72″ above the floor, occupy a space 18″ x 24″, weigh 150 lbs., and require a ⅓ H.P. motor. By introducing a 6″ extension block in the column, stock up to 12″ in thickness can be sawed. All band saws should be fitted with tilting tables and good saw guides. The unit may also be used as a scroll saw and can cut metals when fitted with the proper blade. It is also useful as a sander when the blade is replaced by a sanding blade.

Scroll saws are usually installed as bench machines, for they are small and light in weight. They are used for sawing irregular curves and are obtainable in all sizes, shapes and capacities, from hand-operated playthings to heavy industrial units. For the average home shop a 24″ saw is best. It will take stock up to 48″ in width. Operating with an up and down motion instead of the circular motion of all other machines, scroll saws are subject to vibration; but a good unit will work satisfactorily at 1800 R.P.M. Three other speeds are necessary: 650, 1000, and 1300. A 24″ saw weighs fifty lbs.

and will operate with a ⅓ H.P. motor. Many attachments interchangeable with saw blades permit sanding and filing in curves, corners, etc.

Other woodworking machines are usually considered as accessories, but a 9" disc sander saves so much hard work that it is almost a necessity. Usually of the bench type, it requires a space only 24" x 12", and should be powered with a ¼ or ⅓ H.P. motor, with pulleys for four speeds. It must have a table adjustable for mitred, bevelled and square faced stock. Special attachments make it useful for boring, routing, mortising and grinding.

Portable machines, such as saws, drills, sanders, etc., are valuable when the work is partially built up, bulky or heavy. These machines are individually powered with small self-contained universal motors.

Line drives can be used for bench installations where economy of space or money precludes the use of detached machines. Heavy benches will be required, but the machines may be set so that all can be operated from a single motor belted to an under-slung drive shaft. As only one or two machines are in use at the same time a ½ H.P. motor is adequate.

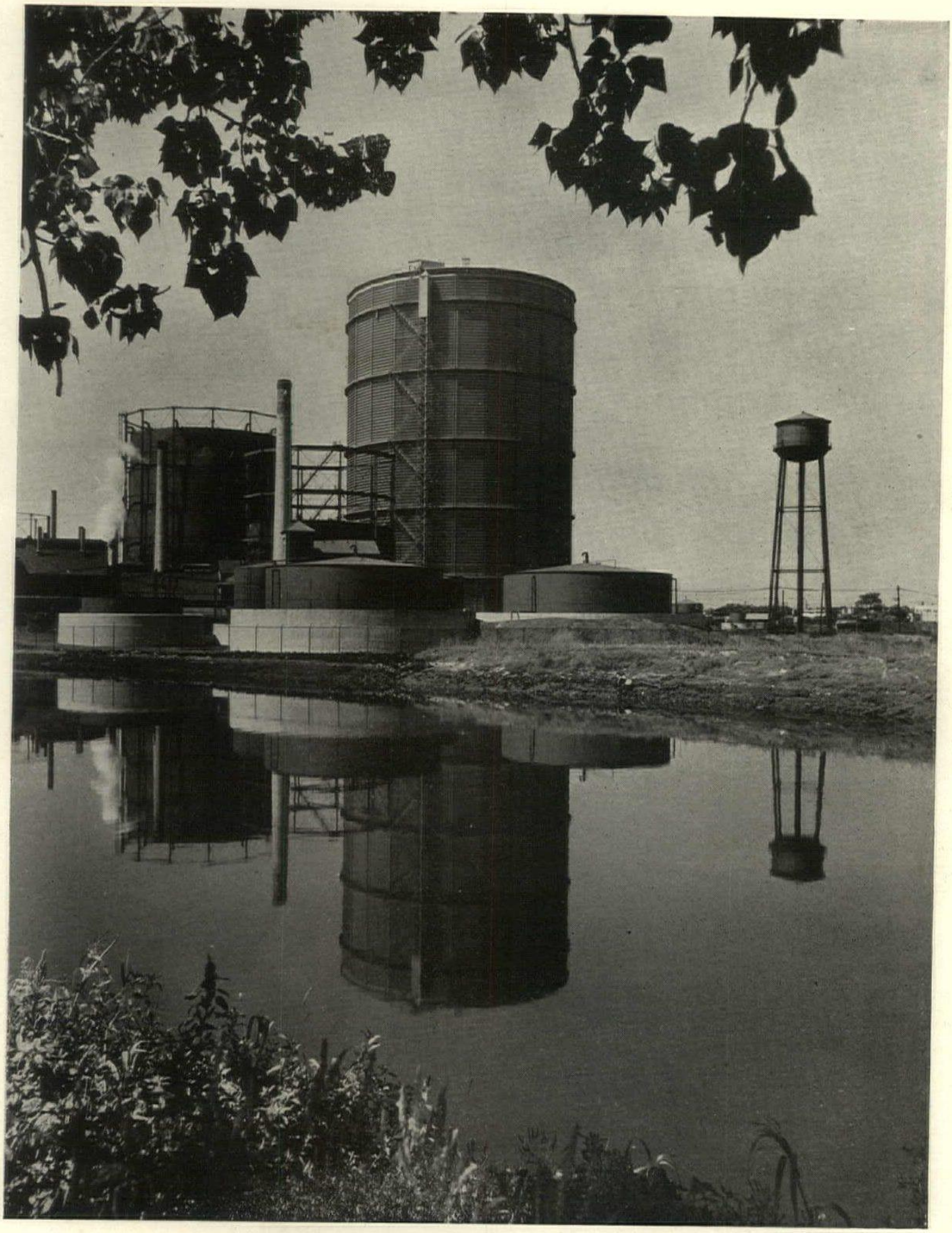
Work benches must be of heavy stock solidly braced. A large one measuring 2' x 7', fitted with a 7" vise, a 2" thick top of laminated maple, a shelf across the bottom and a drawer about 36" long and 4½" deep will be adequate for all shop purposes, though a 2' x 4' finishing bench is a desirable convenience.

Hand tools are still necessary for fine finishing. Selection of them is a matter of personal preference, but they should be stored always near their place of use. The relative amount of space they will require depends upon the type of work to be done and the extent of shop production.

Storage cabinets of standard sizes and shapes for hand tools and machine attachments are preferable to any specially designed cases in the majority of instances. They are obtainable in a wide range of unit sections to fit any storage requirement and should always be installed near the machine or bench with which they are to be used. Such an arrangement brings orderly method to workshop activity, saves time otherwise lost hunting for tools that are haphazardly stored, improves the appearance of the shop and keeps the tools in good shape.

Electric motors must be chosen with regard to the type and voltage of current locally available. Most house circuits use 110 volt, single phase, alternating current. *Standard D.C. motors* of 1750 R.P.M. are satisfactory for shops where direct current is available. They cannot be used, however, with an A.C. circuit. Three phase A.C. motors can seldom be used for home workshops, since more circuits employ single phase currents. *Single phase motors* are most ordinarily used, the split-phase type being low in price and consequently most popular. *Split-phase motors* require some form of starting device which uses so much current that light dimming is often an attendant evil. Also their special winding too often burns out under small overloads. They are not recommended for machines requiring over ⅓ horsepower. *Repulsion-induction motors* utilize a minimum of current, carry a large overload with safety, are reliable and should be used when the owner's budget will permit. All motors should be equipped with switches. Motors, switches and plugs should be grounded and all circuits fused.

Whether as a part-time hobby or full-time trade, a home workshop is an architectural opportunity

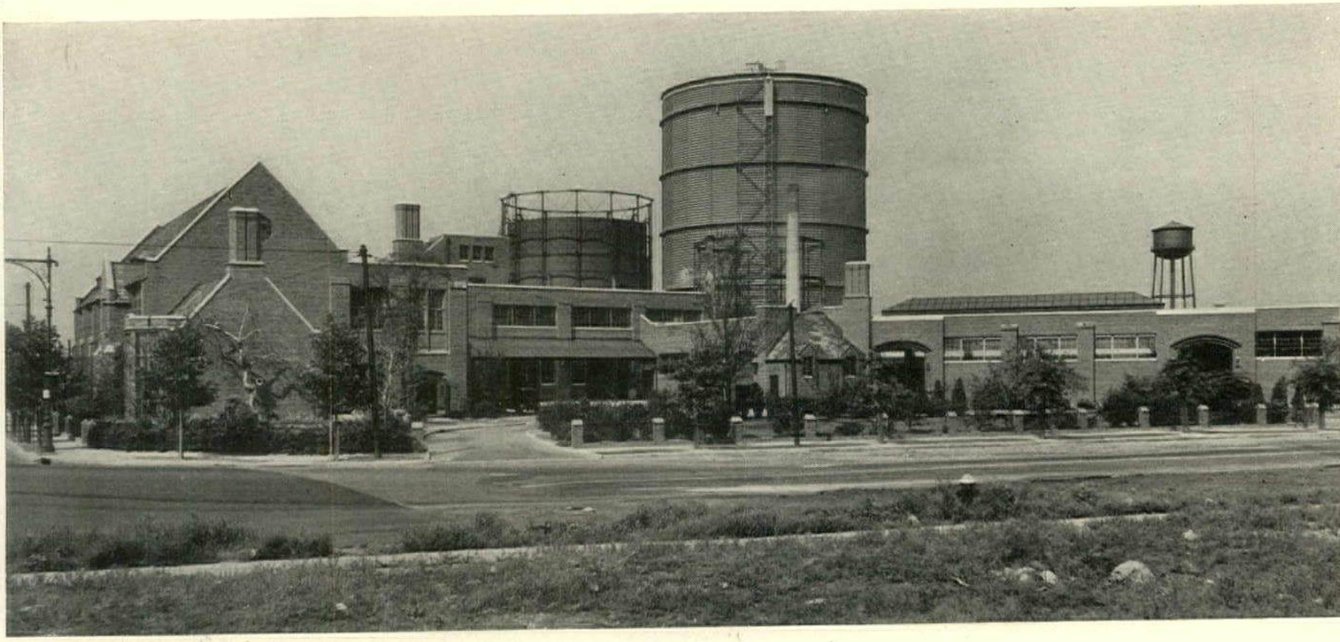


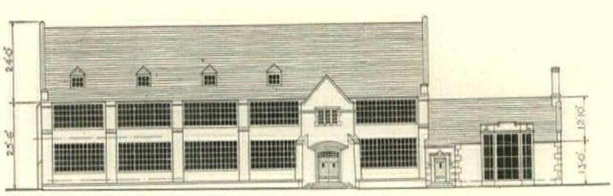
BLOCH AND HESSE, ARCHITECTS

BROOKLYN BOROUGH GAS COMPANY

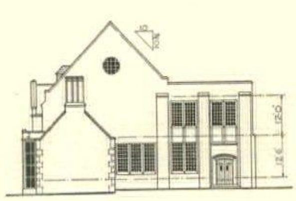
BROOKLYN, LONG ISLAND, N. Y.

Photographs by Samuel H. Gottscho

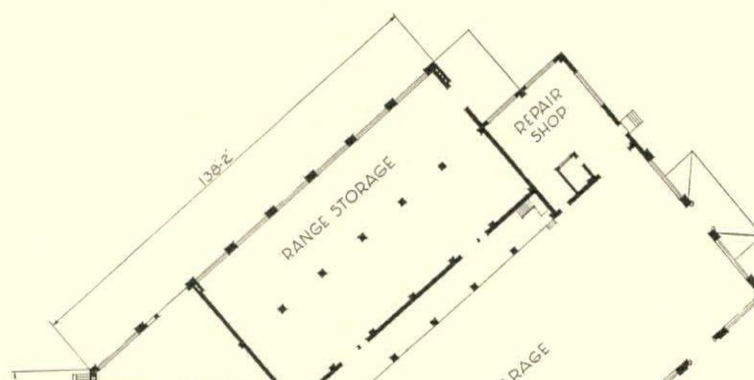




FRONT ELEVATION

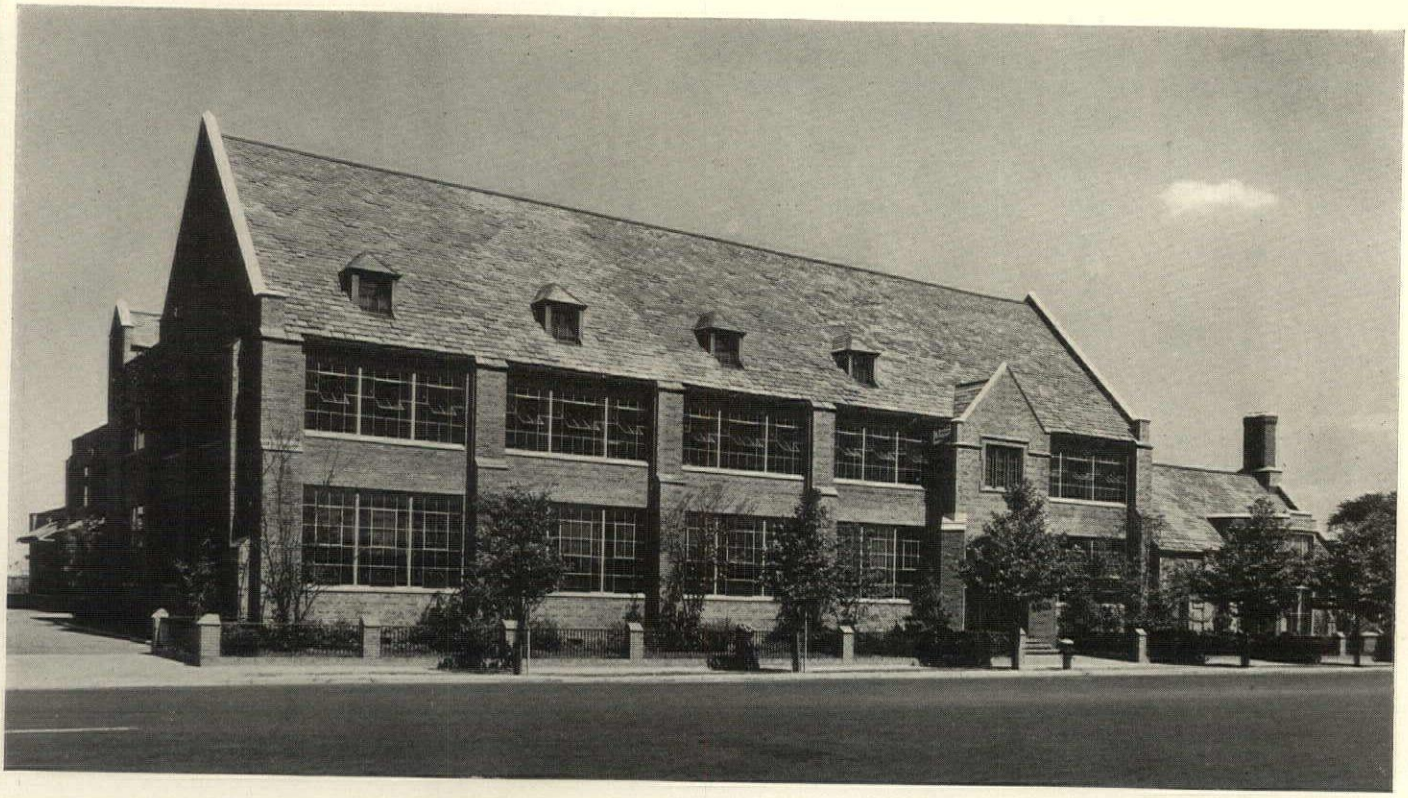


END ELEVATION



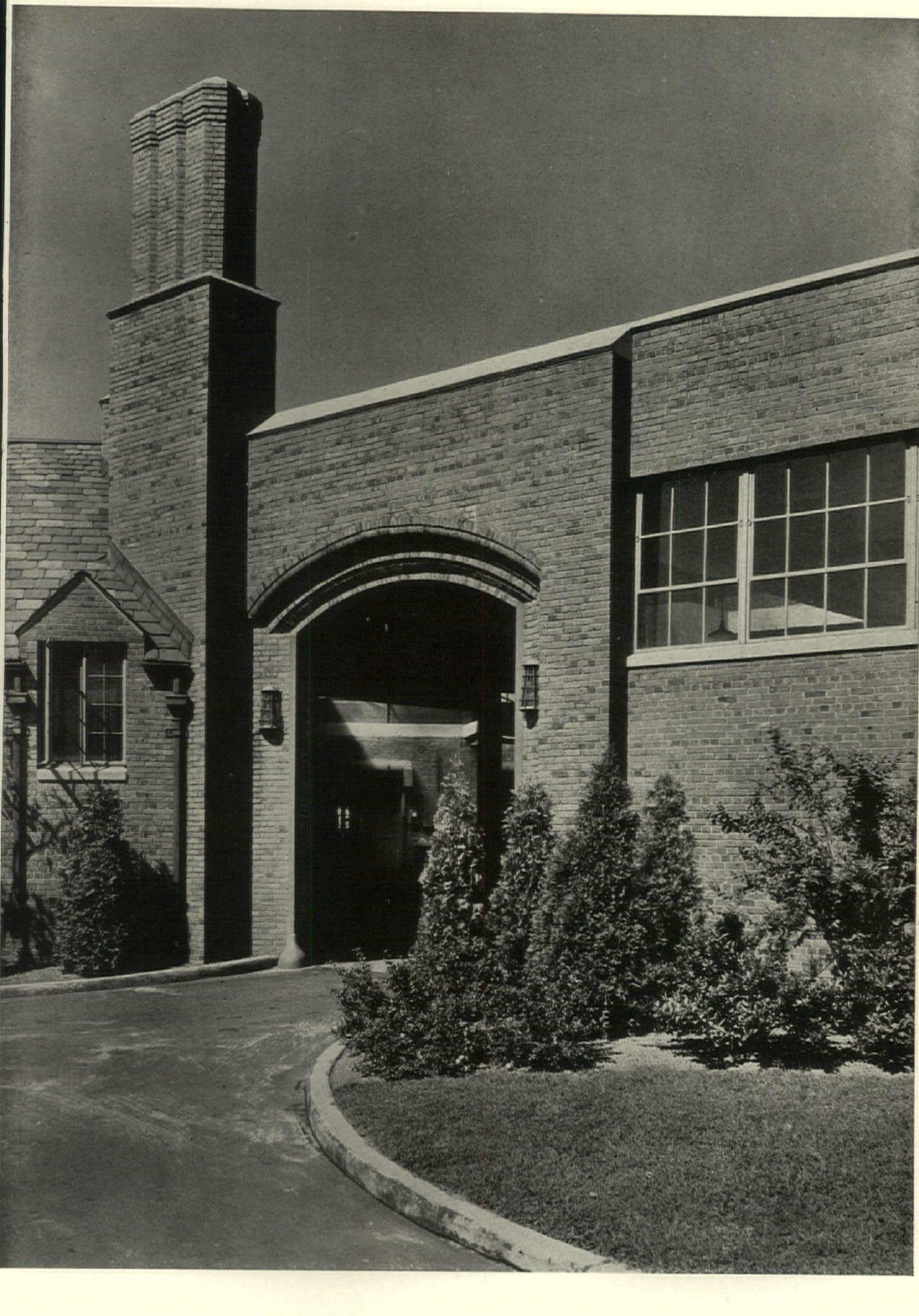
A residential type of design resulted from a desire to link the industrial portion of the Gas Company's activities with the retail sales and requirements for commercial display of equipment

SALES AND SERVICE BUILDING, BROOKLYN BOROUGH GAS COMPANY, BLOCH AND HESSE, ARCHITECTS



Top of page, front of office building. Above, rear of offices from garage court

SALES AND SERVICE BUILDING, BROOKLYN BOROUGH GAS COMPANY, BLOCH AND HESSE, ARCHITECTS



Above, show room. Right, meter repair and storage room

SALES AND SERVICE BUILDING, BROOKLYN BOROUGH GAS COMPANY, BLOCH AND HESSE, ARCHITECTS

A New Deal in the Small House Field

BY WILLIAM F. DREWRY, JR.

THE National Housing Act offers a method of financing the building and remodeling of houses which has vast potential possibilities for extending the activity of architects in the small house field. In the past speculative builders have usurped the majority of work represented by moderate or low cost houses. Under the new Federal plan, the speculative builder will no longer have an advantage over the professional man. Thus to architects the Act presents a much needed opportunity. Though not a cure for all the ills of the small house building field the Act does offer encouragement to architects who can obtain results through hard work and aggressive methods.

Every consideration of the small house field invariably comes back to financing as the one thing that has kept the speculative builder in power. The promoters have been ever-willing to arrange financing and terms, a practice that has constituted a successful major sales-point. In contrast, few architects have been of much assistance to their clients in the financing of projects. They were unfamiliar with the unorganized and involved machinery of house financing or were unwilling to be a party to "wildcat" methods too commonly used. If the field of finance can be organized and standardized throughout the United States so that the architect and his client will have open and direct access to finance sources, a distinct advantage will accrue to the architect. The National Housing Act can bring this about.

This small house opportunity for the architectural profession is of equal importance to other much discussed benefits, which may be broadly classified as: (1) Large scale loosening of credit for building construction, the benefits of which architects will share; (2) Possible consideration of architects' fees as a part of the appraised cost of a house; (3) Possible preference by the Administration for loans on houses on which architectural services are employed.

The last two are uncertain and can be obtained only by organized effort to make the administrators of the Act recognize the practical value of architectural service. The first is an inevitable benefit to the profession, though somewhat limited in scope. For instance, funds lent on large housing developments will surely bring work to the drafting board, for this type of work is seldom attempted without an architect. In the individual house field, on the other hand, it may put the architect back to his relative position of predepression days. This is not enough, for at that time only a small percentage of small houses built, benefited by architectural services of any nature. The Act will provide only the opportunity. To take advantage of this opportunity architects must become persistent and aggressive.

As far as small houses are concerned, the Act could work successfully if architects were out of existence. Apparently it was formulated and passed for two explicit purposes. First, to provide credit for the building industry which will stimulate real estate, sale of building materials, transportation, and the employment of millions of people normally engaged in these activities. The second purpose was to stabilize the demoralized field of finance and to remove the causes of demoralization. Obviously the architectural profession constitutes a negligible percentage of the number of people designated as beneficiaries.

The section of the Act dealing with loans of less than $2,000 for remodeling and renovating is an emergency measure of small benefit to the profession. The section dealing with mortgage loan insurance is apparently designed as a permanent measure; and in its provision lies the architects' opportunity.

The Government's plan points toward a complete revision of financing methods. Large bonuses for putting through loans and large fees for refinancing short term loans should disappear. Wild-cat financing and trick selling terms will be difficult to disguise. With all due respect to those who have followed sound principles in real estate financing, here is a potential death-blow to real estate financing as we have known it.

SUCCESSFUL administration of this Act means that for the first time real estate financing will be an open book. The speculator or promoter will no longer be in a position to tell a prospect confidentially that he thinks he can arrange things—as if he were doing the prospect a great favor. With a little effort on their part architects will be in just as good a position either to arrange for or to advise on loans for their prospective clients.

It rests with the architect to keep in touch with officers of his local lending institutions and familiarize himself with all details as they develop. Many of these officers are progressive, many have profited by recent experiences which will make them more willing than in the past to analyze and evaluate architectural services.

We cannot afford to sit calmly by and await our former meagre percentage of small house work. Architects have an opportunity and they cannot afford to let it pass.

. . . A National Campaign to

. . . and to Promote the widest Use of Architects' Services for All Kinds of Immediate Building and Modernization

IN the August issues of magazines published by the Stuyvesant Building Group thousands of families in every part of the country read the first promotional broadside of AMERICAN ARCHITECT's national campaign for architects. In *House Beautiful* and *Town and Country*—magazines affiliated with AMERICAN ARCHITECT—full page advertisements, similar to those shown opposite, urged many hundreds of potential home owners to "Build Now . . . and Consult Your Architect!"

In the July issue of this magazine high points of the campaign were outlined. Individual architects and professional organizations were urged to co-operate with AMERICAN ARCHITECT in telling the public about architectural service; in getting recognition of the architect in Government and private building programs; in promoting immediate building and modernization. And to all such architects and organizations AMERICAN ARCHITECT offered aid in charting an effective course for local action.

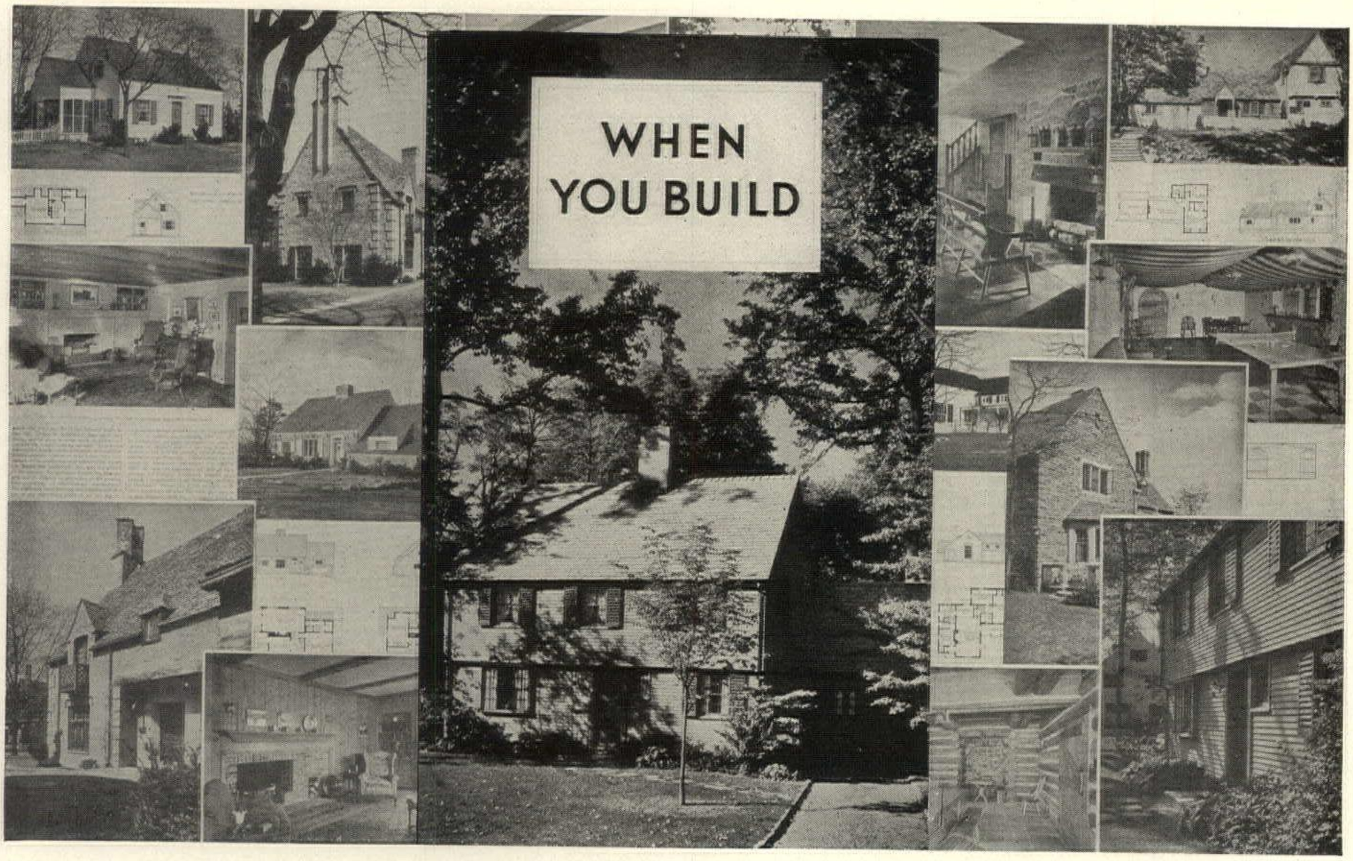
Listed in brief paragraphs of the July issue—page 72—were nine practical means of apprising the public as to the various values of architectural service. As a further stimulus to local action, AMERICAN ARCHITECT announced—as did *House Beautiful* and *Town and Country*—preparation of a 24-page booklet, written by the editors of AMERICAN ARCHITECT, entitled "When You Build."

"When You Build" has been written and illustrated *for* the architect, *to* the architect's future client—the consumer of architectural service. In brief, non-technical language it tells prospective owners how they can most easily get the greatest value, pleasure and satisfaction from building dollars. It outlines today's home-financing opportunities, including—the new National Housing Act. It points to common pitfalls of building and tells the owner how an architect can avoid the unfortunate results of poor planning, shoddy construction and improper equipment.

For the architect it is a well-rounded answer to many questions common to every client. The booklet describes how an architect actually works, the various ways by which he can be paid; and constitutes in general a dignified, informative piece of effective professional promotion.

Distribution of "When You Build" should be as widespread as possible if architects everywhere are to reap the benefit of the public's participation in immediate building and modernization activity. Toward this end AMERICAN ARCHITECT will send to any architect, upon application to the editors, a copy of "When You Build." Prices covering the production costs of additional copies in quantity will be furnished promptly upon request.

Stimulate Building Activity



"When You Build"—a 24-page illustrated booklet written to the prospective owner for the architect—is the second of its kind issued by American Architect. The first, entitled "If You Are Going To Build," was widely distributed in 1931

The National Campaign for Architects—launched by AMERICAN ARCHITECT in cooperation with the magazines with which it is affiliated—is only one part of a nation-wide effort to make the building industry once more a force in the upward progress of American Business.

Upon the National Housing Act, President Roosevelt is pinning his hopes for revival of building—a factor of prime importance to general economic recovery. In Washington, James A. Moffett, the Housing Act's administrator, has already organized the repair and reconditioning division. Plans for widespread publicity for all phases of building are now being completed by Albert L. Deane and Ward M. Canaday, two of Administrator Moffett's closest aids. In the early fall the Repair and Reconditioning Program will be in full swing; and in every part of the country home owners will be borrowing sums for remodeling from authorized financial agencies whose cooperation has already been assured.

Within ninety days Administrator Moffett plans to put in motion all details of home-financing machinery. The Housing Act permits owners to borrow up to $16,000—80 per cent of the combined value of house and lot. Loans will be insured. It is stated that interest rates will be moderate and more favorable than generally available in the past. Repayment terms eliminate the financial curse of the short term mortgage with its high renewal charges. Money is ready and waiting. Houses by the thousands are necessary. At last conditions are ripe in almost every particular for a sound resumption of building.

Such conditions have long been advocated by AMERICAN ARCHITECT. This magazine has long urged Government action of just this kind. It has come. Today AMERICAN ARCHITECT urges every architect in every section of the country to cooperate to the fullest in developing all the potent possibilities of the National Housing Act. In doing so he will be helping not only himself, but the general prosperity of the community in which he lives.

As It Looks

ARCHITECTURAL PUBLIC SERVICE

ARCHITECTURAL advice for all types of remodeling is recognized as valuable at least by one Governmental agency. The Reconditioning Division of the HOLC, with $300,000,000 to lend on remodeling, has organized a huge drive to improve properties saved from mortgage foreclosures by HOLC loans. It has established regional and state agencies to administer the fund, many of which are directed by architects. In all cases the Reconditioning Division is urging that architectural advice be sought and architectural service be retained whereever possible.

Unquestionably this means opportunity for all architects. True, individual projects will not involve large expenditures; and in most cases will not bear a normal architectural fee. But a large volume of work with small individual profits—the 5 and 10 idea—can be made to return a reasonable amount for the time involved. Probably such work would not be a paying venture for an office with large overhead. In every case office expenses must be rigidly curtailed to produce a professional profit. But this is possible in the case of an architect working as an individual. The work must be viewed in the light of a public service. It is an expedient which, for the architect, can bridge an economic gulf and retain his local identity and contact with the building public.

A RESPONSIBILITY OF THE PUBLIC

IN the design of a fountain-pen, an automobile, coffee pot or refrigerator the public has no hand. Manufacturers sell them—and the public buys—usually with no reference to the individual who designed them. But in the case of building design, the public very definitely has a hand; for whether the designers be carpenters, masons or architects, the public is the instrument for their individual selection. Though reflecting in some measure the technique of the designer, buildings more accurately mirror the competence or impotence of the public's taste in buildings. Responsibility in the choice of proper designers for buildings rests heavily with the public. Ample evidence in every community is proof of this and emphasizes the fact that the public should be made more conscious of the important part played by architectural design in improving the appearance of our towns and cities.

IS THE ARCHITECTURAL PROFESSION CHANGING?

A CONVICTION that architecture as a profession must undergo a radical change to conform with new social and economic trends is apparently becoming stronger. Certainly it seems that officialdom in the guise of Federal, State and Municipal Bureaus has already settled the question to its satisfaction, if not to the architects'. Apparently the architect is largely looked upon as a factor in the building industry to be tolerated only in a salaried capacity as a designer. Sometimes straws do more than show which way the wind is blowing. Too many of them can also break a camel's back; and if Federal, State and Municipal administrations continue to pile bureaucratic straws, the back of the architectural profession cannot much longer stand the strain. It is an important question. The editors of AMERICAN ARCHITECT would like to hear from every architect who has any comment upon the question or can advance any solution to the problem it implies. Is the architectural profession changing?

A BREAK WITH TRADITION

TRADITION is one of the strongest influences of the human race. Most architects can still recall a time when nothing was designed without assurance that it followed precedent—another word for tradition. Among the outstanding breaks with tradition in architecture none is quite so famous as the Nebraska State Capitol. When Bertram Goodhue designed it, every state capitol had a dome; Nebraska has a tower. This building is therefore interesting as a courageous departure from what had gone before and also because it is the last great monument that Goodhue designed. Built over a period of years and painlessly paid for by every Nebraska taxpayer, it stands also as a beacon of economic solidity in a wild sea of reckless spending, a gratifying example for other cities to follow.

The October issue of AMERICAN ARCHITECT will be given over entirely to a comprehensive story and new pictures of the Nebraska Capitol. In so doing this magazine also breaks with tradition, for but seldom in its history has an entire issue been devoted entirely to one building. The Nebraska Capitol will be dedicated in October. Although fragments of it have been published formerly, AMERICAN ARCHITECT in October will be first to present the work as a complete unit.

lars were dug and baseme[illegible] regard for the house to be placed upon [illegible] ties were just as improperly arranged; and the whole project showed an appalling ignorance of practical solutions to any number of elementary building problems.

Perhaps such inefficiencies are the result of political interference. Perhaps they come from incompetent or amateurish technical direction. Perhaps they just indicate bad luck. Whatever the cause, the fact remains that probably all of them could have been eliminated. The incompetent "experts" could have been thrown off the job before a shovelful of earth had been turned and in their place installed an able architect, skilled in technicalities of planning and experienced in the intricacies of building construction

PROFIT—AND PRACTICALLY NO LOSS

ONE encouraging sign that business is definitely on the upgrade can be seen in the recently issued business statements of two large manufacturing companies. The statements of both organizations—each closely allied to the building industry—cover the first six months of 1934 and show marked gains over the corresponding period of last year. One showed an increase of almost $30,000,000 in sales volume and a net profit almost double that of last year. Though the second company showed no net profit, operating loss had fallen to approximately $30,000 as against a loss of over $5,500,000 during the first six months of 1933. Business during the second quarter of 1934 was decidedly better than for the first quarter. Ultimately such radical gains cannot help but raise the present sluggish trend of general business activity.

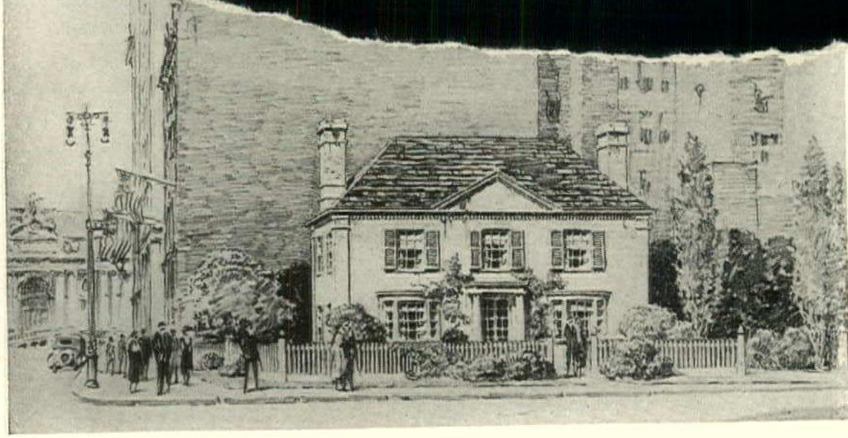
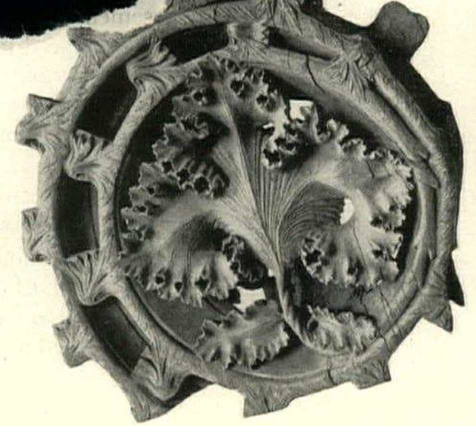
[illegible]ishment con- [illegible] a scroll saw; where [illegible] not one hint of beauty; where life must be lived in terms of indescribable ugliness, bleakness and discomfort."

In the remaking of these cities—and all of them will, in time, be entirely remade—the architectural profession certainly has plenty to do. Not the least of the job is education of the public along lines of proper architectural appreciation.

LOCAL INITIATIVE ESSENTIAL

CREDIT and moral support but no actual cash will be provided by the Government in the administration of the National Housing Act. And since building funds must come from private sources—even though these may be authorized under provisions of the Act—the Administration apparently feels that employment of an architect cannot be made a mandatory provision of loan applications. Thus initiative for their own participation in the new building programs rests entirely upon the shoulders of architects themselves. Group effort can be effectively employed. Best direct results will probably come through convincing local financial agencies that loans are safer when skillfully expended under technical supervision.

Equally important from all professional standpoints are practical demonstrations to the public that architectural service makes more valuable and satisfactory buildings. Active cooperation with the Federal Housing Administration in furthering immediate building activity should be an important part of every architect's work today. Progress of the building program will be largely dependent upon public support; and architects can do much toward properly advising the public on matters of building remodeling and modernization.

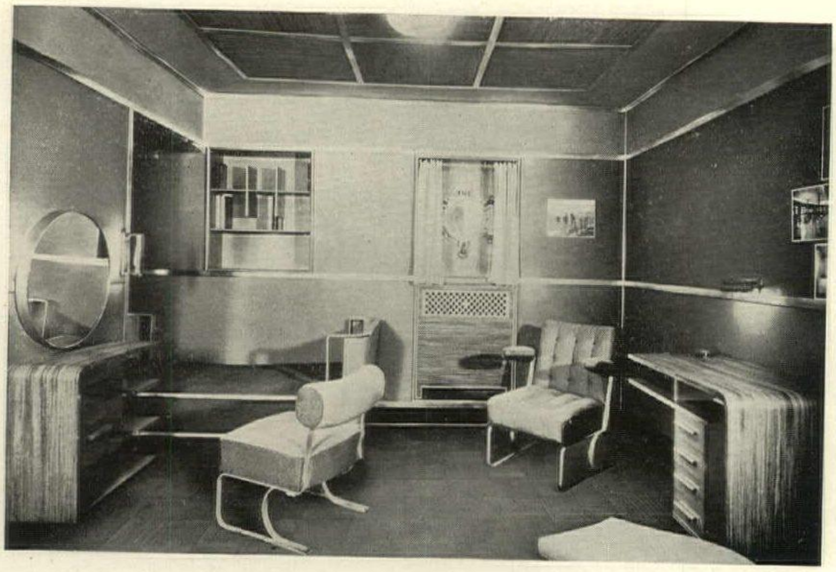



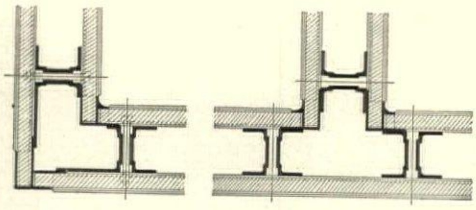
Trends and Topics

• Evidence of encouraging results from the President's housing program seems reflected in amount of building permits for July, according to Dun & Bradstreet, Inc. Permits in 215 cities in all sections of the country showed a gain of 18.2 per cent in gross amount as compared with July, 1933. The gain in New York City was particularly favorable, permits showing an increase of 75.3 per cent. Only the West Central and Pacific groups failed to show improvement.

• In an effort to show what the 1934 building dollar will buy for an average family of five, a house building project among New York's skyscrapers has recently been announced. Sponsored by the National Better Homes movement and designed by Roger H. Bullard and Clifford Wendehack, the house is being built near the Grand Central Terminal, just three blocks from the busiest street in the world. According to authorities it will be possible to build similar houses in any small city or suburb at a cost between $6,000 and $8,000. The small Georgian structure will be maintained for a year by the Columbia Broadcasting system which will publicize through the air the educational aims of the Better Homes plan.

• Herbert G. Wenzell of Detroit feels that architectural publicity to "the man in the street" is a waste of time and effort. In a recent comment as a member of the Committees on Professional Practice and Publicity of the Detroit Chapter of the A. I. A., Mr. Wenzell says "the best publicity for architects is an increasingly greater percentage of successful buildings." The architect's client is not the average man, he maintains, and publicity directed at him





A prefabricated, demountable, fire and soundproof ship's cabin with many features adaptable to residential use was shown at the Fifteenth Sample Fair at Milan, Italy. Wall construction (above) is panular, units being composed of light metal plates and channels supporting slabs of fireproof insulating material covered on both sides with aluminum sheets. Floor, walls and ceiling of the cabin are covered with linoleum. Floor, dark-brown linoleum tiles. Walls, light green with pearl-gray top band. Ceiling, light green jaspe panels. Trim, grilles, furniture, aluminum. Tables and desk surfaced with linoleum

Remodeling possibilities were effectively shown when an old house, above, was changed into a modern dwelling during a recent home modernization campaign at Denver, Colorado. Architectural work was done by members of the Colorado Chapter of the A.I.A. All construction trades cooperated

of the Times . . . .

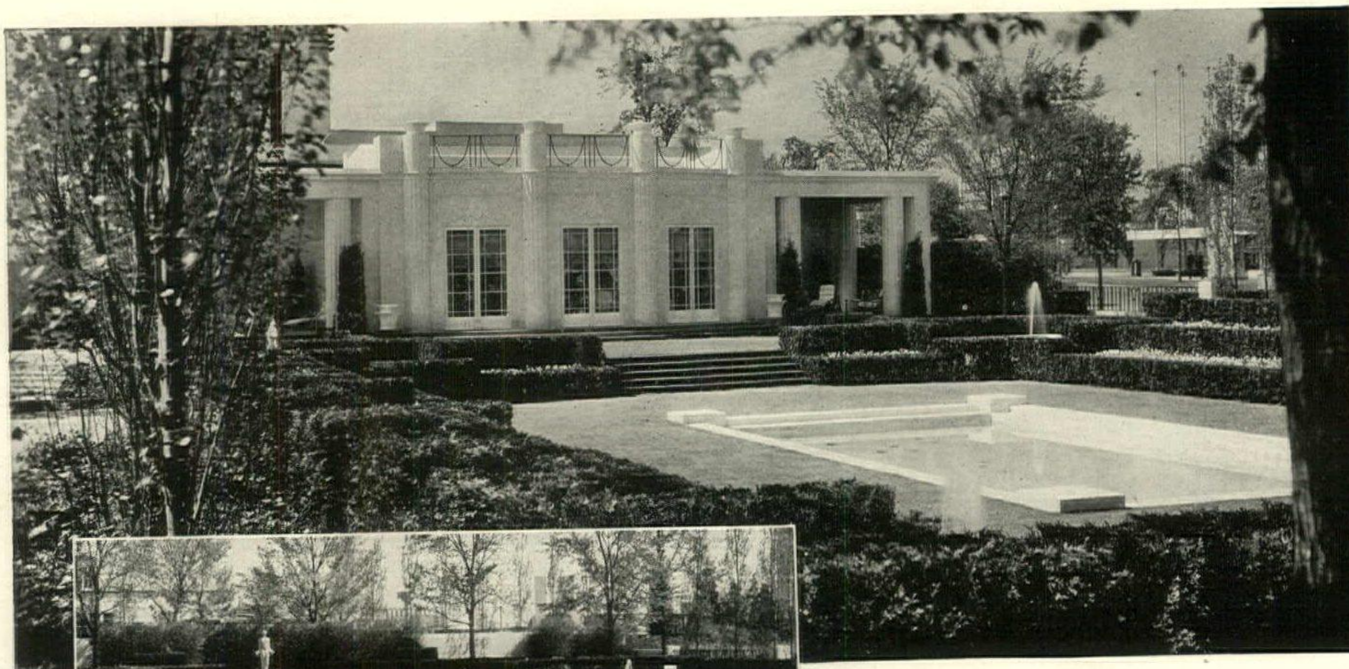
would be more effective if aimed at state capitols in an effort to achieve strict and enforceable laws requiring the services of competent registered architects. Only through legal means can architects be employed on a high percentage of all structures built, Mr. Wenzell thinks.

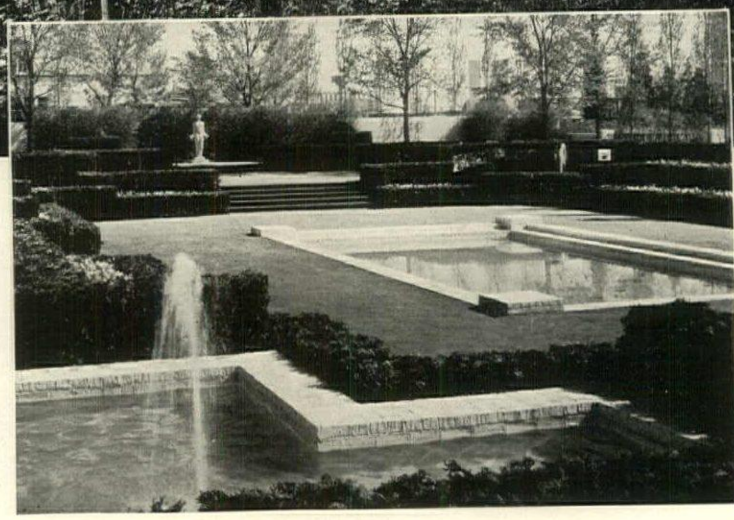
• *The Blue Eagle,* a weekly publication issued by the NRA states that the cost of building has dropped some 8⅓ per cent since the first of this year, although it is still 28 per cent higher than a year ago.

• From the same source comes the statement that NRA is making every effort to bring about reduction of material prices in order to stimulate building activity. In proof thereof reduction of over 14 per cent in the prices of 60,000 items produced by the lumber and timber products industry was cited.

• The New York Metropolitan Museum of Art is planning a comprehensive display of contemporary American industrial art to be held during the months of November and December. The Museum has invited three architects—Paul Phillipe Cret, Arthur Loomis Harmon and Ely Jacques Kahn—to supervise the design of three major exhibition units. They will be assisted by several groups of industrial designers. An important part of the exhibition will be six complete interiors erected under direction of Archibald M. Brown, William E. Lescaze, John W. Root, Eliel Saarinen, Eugene Schoen and Ralph T. Walker.

• The National Association of Housing Officials is an important—though young—organization. Started barely seven months ago it is now apparently the chief agency concerned primarily with administra-





Good Housekeeping's 1934 Exhibit at A Century of Progress, Dwight James Baum, Architect. The pavilion, executed in white stucco consists of a living room with a 20-foot loggia at either end

tive problems of low-cost housing. Most of its work is done through a variety of committees that advise on questions of organization, procedure and legislation. The organization's headquarters at 850 East 58th Street, Chicago serves as a clearing house for housing information. Recently the Association announced that Coleman Woodbury, Secretary of the Illinois State Board of Housing and Consultant to the housing Division of PWA would be executive director.

• In a booklet entitled "New Money for Your Home," the Crowell Publishing Company has explained in simple language for the average American the workings of the National Housing Act. The booklets are for distribution to trades benefitted by the new legislation.

• Future hotels will probably contain air conditioning in addition to everything else that adds to people's comfort. The Statler Hotel systems which pioneered the use of radio in every room has announced that the Detroit Statler will be completely air-conditioned and claim that it will be the first hotel in the world to be so equipped. Each room will be subject to individual control and will contain units rated at one-half ton capacity and 225 C.f.m. They will be supplied by a central cooling system of 167 ton capacity operating on the principle of steam-jet refrigeration.

• This year's Good Housekeeping exhibit at A Century of Progress—created by Good Housekeeping Studio, of which Helen Koues is director—combines architectural and landscape design. A pavilion, simulating a one-story wing of a house and designed by Dwight James Baum, architect, overlooks a severely simple three-level garden designed by Annette E Flanders. Dramatic effect is heightened because the simplicity of the entire scheme. Characteri as "Classic Modern," the building design dep almost entirely upon proportions, balance of m and simple surfaces. In harmony with the pa the garden was designed to show that basic scape beauty depends upon the design itsel than upon plants or building materials used

• Electrical current so powerful that whatever it touches has been artificiall and controlled by engineers of the Ger Company at Pittsfield, Mass. The severe as a stroke of natural lighting. inforced concrete to a (*Continue*

The Legal Side of Architecture

BY CLINTON H. BLAKE

Blake and Voorhees, Counsellors-at-Law

Registration Laws Protect Both Architect and Public

WHILE license or registration laws differ materially in many states, substantially the same purpose underlies them all, namely, the assurance that those practicing architecture shall be qualified to do so by training and by ability. This is in accord with policies long followed with respect to the legal and medical professions and is a recognition of the interest which the public has in the character and ability of the practicing architect.

Various legal questions of importance to architects have necessarily arisen under registration statutes. Chief among these, probably, is the question of what constitutes the practice of architecture. Necessarily there must be somewhere a borderline between services which are essentially those of an architect and services which, while they may have many of the characteristics of architectural services, may nevertheless be performed without rendering the person performing them subject to registration requirements.

One of the most interesting of recent decisions was rendered by the Supreme Court of Tennessee in an action brought by the "State Board of Examiners for Architects and Engineers" of that State to enjoin the defendant from practicing architecture without complying with the Tennessee registration statute. The Tennessee law provided that "only properly qualified persons shall practice architecture" in Tennessee; that anyone practicing architecture in that State "shall be required to submit evidence that he is qualified to practice and shall be registered as hereinafter provided," and that it "shall be unlawful for any person to practice architecture" without examination and registration.

Another section of the statute provided for the following exceptions: "Nothing in this chapter shall be construed as requiring registering for the purpose of practicing architecture or engineering by a person unless the same involves the public safety or health, provided he does not use the appellation, 'architect' or 'engineer,' or an appellation which is a compounding, modifying, or qualifying by an adjective of the words 'architect' or 'engineer' or both, and which gives or is designed to give the impression that the person using same is an architect or engineer."

The defendant contended that his plan and method of business did not amount to the practice of architecture; that he was a designer of structures and might properly be classed as a decorator and designer. The decision of the Appellate Court turned largely on the question of whether the services which the defendant performed might properly be classified in fact as the services of an architect and whether, assuming his services were those of an architect, they involved the public safety or health.

The Court found that the defendant in some cases associated himself with a firm of registered architects, but that in others the plans were furnished by his own office which did not include a registered architect and that under his contract with the owner he was also charged with the responsibility of supervising the work of construction.

The Appellate Court in its decision made the following statements among others:

"The elements of stability and strength are combined with ornamentation in all practical concepts and definitions of architecture." . . . "The practice of architecture necessarily includes the designing and drawing of plans for buildings; and since the defendant admits that he draws and furnishes building plans, his business is in clear violation of the statute, unless saved by its exceptions."

The Court then proceeded to a consideration of the section already quoted, providing that the statute does not require registration where the term "architect" or the term "engineer" is implied, unless the public safety or health is involved. In this connection the Court said:

"This section of the Code is clearly in the nature of an exception to the general provisions of the preceding section, and as such may not be liberally or freely construed. It provides that if a person does not represent himself to be an architect, he may practice architecture without registration, 'unless the same involves the public safety or health.'

"The application of this exception to the case before us depends upon the meaning of the words 'unless the same involves the public safety or health.' If the practice of architecture as pursued by the defendant does involve the public safety or health, he is required to be registered, regardless of whether he refers to himself as an architect or by some other name or descriptive term.

"WE are of opinion that the business of drawing plans and specifications for dwelling houses is a business which involves the public safety and health. It is on this hypothesis that architects may be required to demonstrate their ability by examination before they are permitted to offer their services to the public. In the construction of such buildings, it is contemplated that members of the public will enter and use them. . . . The safety of all such persons may be involved in the sound and stable construction of the building. The proper ventilation and sanitation of buildings involve the health of all who use them as habitations. Therefore one who offers himself to the public to design, plan and superintend the construction of buildings is engaged in a business which involves the public safety and health, notwithstanding his business is limited to the designing and construction of buildings intended to be used as private dwellings.

"Applied to the business of the defendant, section 7099 (the section involving the exception to the statute) permits him to exercise many functions ordinarily included in the work of an architect, if he does not use an appellation designed to give the impression that he is an architect. But he is clearly prohibited from holding himself out to the public as qualified to draw building plans or to undertake the responsibility of superintending the work of construction, which involve the safety of the structure and therefore the safety of the public. These things he may not do, by himself or by his agents who are not registered architects."

The Court found that the defendant had practiced architecture in violation of the statute; and since his work involved the public safety, it was immaterial whether or not he publicly represented himself as an architect.

The defendant also had raised a constitutional question, claiming that: "The attempted regulation of architects insofar as the planning, designing and building of private residences is concerned, does not bear such relation to the public health and safety as to render such regulations justifiable under the police power." With respect to this the Court held: "that there is a reasonable relation between the practice of architecture, although limited to the construction of dwelling houses, and the public safety and health. We have no doubt that the exclusion of incompetent persons from that profession has a tendency to protect the public safety and health, and therefore must conclude that the regulatory statute was enacted for that purpose."

In concluding its decision, the Court approved an injunction enjoining the defendant:

"(1) from representing himself in the conduct of his business as qualified to design, draw or furnish plans and specifications for the construction of buildings, or to supervise their construction; and (2) from entering into contracts to provide, or providing, such plans and specifications."

Taken literally, the second provision of the injunction approved by the Court and quoted above would seem to prevent a person from agreeing to provide, or providing, plans and specifications. I have some doubt whether the Court meant by this to class as unlawful an agreement to provide plans and specifications, where it is made clear that the plans and specifications are not to be prepared by the person making the agreement but are to be supplied through a third person who is a registered architect and therefore authorized to perform these services.

There have been many cases where agreements have been made by persons who are not registered architects and can not themselves practice architecture to provide plans and specifications and architectural services through other specified and duly qualified architects. I can see no objection in the ordinary case to such a proceeding.

THE ordinary registration law aims in the first place, to prevent a person from representing himself as an architect when he is not duly qualified and has not been duly registered as such; and second, to prevent performance of architectural services by a person when he has not by license or registration been authorized to perform them. These objectives of the registration laws are obviously sound. I can see no conflict with them, however, in the ordinary case. Nor can I see that they are contravened by Tom Jones agreeing that through Bill Smith, a qualified and registered architect, he will provide plans, specifications and supervisory service for a third party.

I am not at all sure that in the Tennessee case, to which I have been referring, the decision might not have favored the defendant, had he undertaken merely to act through registered architects whose identity was disclosed and had the architectural services been performed by these architects, rather than by the defendant himself. Some questions involved in this phase of the matter will be considered in a future issue of AMERICAN ARCHITECT.

Distribution Equipment

FOR HEATING, COOLING AND AIR CONDITIONING

AMERICAN ARCHITECT REFERENCE DATA

Number 13, September, 1934

DISTRIBUTION EQUIPMENT

for Heating, Cooling and Air Conditioning

AMERICAN ARCHITECT REFERENCE DATA

Number 13, September 1934

This is the third and concluding article of a series dealing with closely related subjects. The first, "Thermal Insulation of Buildings" appeared in May 1934 and presented data on insulation, multiple glazing and weatherstripping as factors in reducing heating and cooling costs. The second, "Heating, Cooling and Air Conditioning" appeared in July 1934 and presented a basis for determining the loads to be carried by such equipment. It also contained reference tables and four Time-Saver Work Sheets designed to simplify these computations and the selection of suitable equipment. The article, which follows, relates to the design of distribution systems which carry heat, cooling effect or conditioned air into individual rooms, and to important considerations affecting choice of equipment.

IT is part of the architect's function to work out heating, cooling and air conditioning distribution systems in sufficient detail to determine their effect upon the plan. The ability to make such a study has these advantages: (1) it provides a means of checking the proper size or capacity of boiler, furnace, fans and other essential units; (2) it enables the architect to supervise the installation and assure its satisfactory performance; (3) it offers the only sound basis for evaluating different distribution methods, and (4) it provides essential planning information. The latter includes location and size of radiators, convectors or inlet and return air registers, space required in partitions or floors to conceal pipes and ducts, ceiling heights required in basement, etc.

Methods of making such a study are presented herewith. Simplified rules of procedure enable the architect to make all essential computations. Engineering details not absolutely required to solve the architect's major problems are omitted, on the assumption that the services of an engineer will be available on projects of any considerable magnitude or special character.

DESIGN OBJECTIVES

MANY types of distribution systems are available. In making a definite selection the purpose should be to meet the four objectives here listed in order of their importance:

(1) Uniformity of indoor conditions regardless of daily and seasonal weather variations. The ideal conditions of temperature, humidity, air motion and air cleanliness which were presented in detail in the preceding reference article ("Heating, Cooling and Air Conditioning," July, 1934) should always be maintained. There should be uniformity within the building from floor to floor and room to room, and even within the living or so-called breathing zone of each room.

In detail this means that the ideal distribution system should (a) eliminate air stratification or "cold 70" and keep the temperature difference per foot of height within each room under 0.75 F; (b) be capable of counteracting sun effect, wind exposure and the vertical variation experienced in tall buildings known as chimney effect; (c) be capable of maintaining the desired temperature regardless of the remoteness or proximity of the room to the central plant and (d) be responsive to changes in outdoor conditions at all seasons.

(2) Convenience of operation and control, which requires that desired uniformity be maintained automatically at predetermined standards, while permitting manual variation whenever it is desired temporarily to modify these standards.

(3) Minimum operating costs, which involve maintaining uniform conditions with the least possible fuel, minimum consumption of power or water by accessories, and low overhead, repair and replacement costs.

(4) Minimum initial cost, consistent with the foregoing objectives.

No one system fully meets these requirements under all conditions of service; else there would be only one type in common use. But practically any type of system can be made to perform satisfactorily and to meet the first three essentials of uniformity, convenience and operating economy if initial cost is not considered.

SIMPLE DEFINITIONS OF TERMS RELATING TO DISTRIBUTION SYSTEMS

Mains—the principal pipes through which the heating medium is carried and to which branches and connections are made.

Risers—vertical pipes throughout a building including the vertical connections to radiators.

Branches—pipes connecting the mains with the base of risers.

Runouts or Radiator Runouts—pipes connecting the base of the vertical connection for radiators with the risers or mains.

Dry Returns—return mains or branches run above the water line of a boiler, receiver or seal to which they connect.

Wet Returns—return mains or branches run below the water line of a boiler, receiver or seal to which they connect.

Drips—connections for draining the condensate from mains, base of risers, etc.

Equalizer—a pipe for equalizing the pressure between two points in a system.

Equalizer Drip—a drip without trap or other obstruction for draining the condensate from one point to another and for equalizing the pressures between these two points.

Hartford Connection or Underwriters' Loop—an arrangement of piping used on low pressure steam boilers to prevent water being backed out of the boiler into the returns when the pressure in the boiler exceeds that in the returns. The wet return is brought up to the level of the water line of the boiler where it meets an equalizer pipe connecting to the supply header before dropping again to the return inlet.

Alternating Return Trap or Alternating Return Trap and Receiver—returns water to a boiler and alternately permits the condensate to flow into the receiver and from the receiver to the boiler, and prevents water from backing from the boiler into the receiver and from the returns being backed out of the receiver into the return system.

Register—is a grille with a built-in damper or shutter, for installation at air inlets and outlets.

Grille—is a perforated covering for an air inlet or outlet usually made of wire screen, pressed steel, cast iron or other decorative materials.

Damper—is a butterfly or shutter device for shutting off or regulating the air flow in ducts, etc.

Deflector—is a plate or partition in ducts for deflecting or directing the flow of air.

Diffusers or Splitters—are plates or partitions in ducts for directing or properly diffusing the air over the area of the duct.

Velocity Head—denotes the pressure—usually measured in inches of water—necessary to create a corresponding air velocity without considering the effects of friction.

Static Pressure or Head—denotes the pressure—usually measured in inches of water—exerted by the air in a duct or fan at right angles to the direction of flow, or the pressure which is exerted in all directions in an enclosure independent of velocity pressure.

Static Friction or Resistance Head, or Friction Loss—is the static pressure necessary to overcome friction.

Selection therefore depends upon balancing the ideal objectives against budget limitations and other project requirements.

PIPED VERSUS DUCT DISTRIBUTION

THE first decision to be made is whether to employ a recirculating air distribution system employing ducts; a steam, vapor or hot water system employing pipes; or a combination system using both. The principal characteristics and limitations of these three broad types were developed in the preceding reference data (July 1934). In many cases, however, no final decision can be made as to which type or combination is best for a given project until actual layouts are developed and compared.

For example, space limitations may govern the choice. If pipes or ducts must be concealed, the type of system may be influenced by the relative size of distribution lines for a given amount of heat carried. The following are approximations of the number of heat units (Btu) that may be transmitted per square inch of pipe or duct per hour: summer cooling, 80; gravity warm air heating, 150; forced warm air heating, 400; gravity hot water heating, 20,000; low pressure steam, 60,000; and forced circulation hot water, 120,000. Obviously, the piped distribution systems require but a fraction of the space needed for the concealment of ducts; yet this advantage may be entirely offset by the floor space occupied in each room by free standing radiators or by separate humidifiers or air conditioning units if the piped system is to provide seasonal or all-year air-conditioning.

The remainder of this discussion is divided into two major sections, the first relating to piped distribution systems and the second to duct systems. Each is subdivided into two parts: (1) characteristics of equipment and (2) design of layouts. It is assumed that where combination systems are used the basic data here given will enable the reader to work out each element separately and to coordinate them without detailed rules of procedure.

Steam, Vapor and Hot Water Distribution Systems

CHARACTERISTICS of the five principal types of piped distribution systems must be considered relatively one to another because there is no absolute standard of comparison. To avoid tedious repetition, the simplest system is presented in detail. Others are discussed as developments of or deviations from it.

ONE-PIPE STEAM SYSTEMS

Elements of one-pipe steam systems are: a steam boiler, steam-type radiators or convectors in each room, one or more steam mains forming continuous loops pitched from a high point above the boiler outlet to a low point at the boiler return, and single branch pipes connecting each radiator or convector with one or another of the mains. The branches are pitched sharply from radiators to mains so that condensation will drain back to the loop *against* the steam flow. Each radiator must be equipped with an air vent valve which will permit the steam to drive out any air in the system without letting steam or water escape. See Fig. 1.

Steam mains may be located on ceiling of basement (up-feed system) with risers to radiators, or in a pipe loft or attic above the highest radiator (down-feed system) with risers dropping down past radiators and continuing to a return loop near the floor of the basement. Note that the down-feed system requires somewhat more pipe than the up-feed system, that steam and condensate flow in the *same direction* except directly at the radiator connection, that this system eliminates piping from the ceilings of basement space, and that risers may be of smaller size. Up-feed and down-feed systems may be combined, if desired. See Fig. 5.

Characteristics are: Lowest initial cost of all piped distribution systems because single runs of pipes carry both steam and condensate; radiator valves may be low-cost, angle type; air vent valves on radiators and high points of piping are inexpensive; and no thermostatic return traps or other accessories are employed. Simplicity of design and installation, coupled with the requirement that both design and installation be correct in every detail to assure reliable operation. Suited to zoned or combination systems only when constant heat delivery is maintained at boiler, and separate sections are dripped independently of each other. Usually intermittent in operation; individual radiators must be fully on or entirely off; humidifiers and other conditioners similarly intermittent in operation, as system is hot only when steam is being delivered and cools quickly when the supply stops. Air is vented into rooms, sometimes causing objectionable odors and noises.

Performance characteristics are: There is a lag in heating up while air vents are discharging air and a rapid cooling following cessation of steam delivery. Unless mains and branches are skillfully balanced to distribute the pressure drop correctly, radiators nearest to the boiler receive heat first and stay warm longest; those which are remote heat last and cool first.

In terms of the four design objectives, the performance of one-pipe team systems may be rated:

Uniformity, poor or difficult to achieve. *Convenience,* limited to on and off control of individual radiators or thermostatic control on boiler or firing mechanism. *Operating cost,* variable due to lack of precise control, but usually moderate because of low overhead and low maintenance. *Initial cost,* lowest of all piped distribution systems.

ONE-PIPE VAPOR SYSTEMS

Elements are identical with one-pipe steam systems, except that vacuum-type air vent valves are used on all radiators and at high points in the return lines. These valves permit air to be discharged by steam, but prevent or retard its re-entry into the system for several hours. This action develops a vacuum condition within the system, amounting to about 15 inches of mercury shortly after the fire is checked. Under this vacuum, generation of steam continues for a period, but at lower temperature than steam at or above atmospheric pressure. It is essential that the system be tight at all joints and connections and that radiator valves be of the packless type or else made air tight by very heavy packing. Piping may be up-feed or down-feed as in one-pipe steam systems. See Figs. 1 and 5.

Characteristics are: All the mechanical advantages of one-pipe steam systems. Limitations are the same as for one-pipe steam systems except that there is much greater uniformity in heating effect.

Performance characteristics are: radiators must be on or off, but intermittency of heating effect is far less than with one-pipe steam systems because radiators do not cool as rapidly. Rating is therefore:

Uniformity, fair. *Convenience,* limited by on or off control. *Operating cost,* lower than one-pipe steam. *Initial cost,* lower than any two-pipe systems; higher than one-pipe steam, because of higher cost of vacuum air valves.

TWO-PIPE VAPOR SYSTEMS

THIS is the modern type of two-pipe system often erroneously confused with ordinary two-pipe "steam" systems. Two-pipe air vented systems, similar to one-pipe systems previously described and also called two-pipe steam systems, are still sometimes used; they are not described here because they have largely been superseded by improved types.

Elements include boiler; hot water type radiation; a system of steam mains and branches serving radiators, a separate system of smaller dry returns (above water line of boiler) carrying air and condensate back to the boiler independently of supply lines; usually a set of wet returns for dripping the mains; radiator control valves of shut-off or modulating types at tops of radiators (preferably equipped with orifices); thermostatic traps on the return end of each radiator or convector that will pass condensate and air but close against steam; thermostatic air traps on the ends of mains. Air in dry returns is vented to atmosphere by automatic, non-return air trap near the boiler. Condensate from dry return is returned to boiler by an automatic trap or pump; system must be air tight throughout, hence packless radiator valves are generally used. See Fig. 2.

System operates at very low pressures ranging from 8 oz. steam pressure to 15 inches of vacuum; therefore a sensitive steam pressure control is required for operating dampers or automatic coal, gas or oil burners. Piping may be arranged for either up-feed or down-feed.

Characteristics include: a fair degree of simplicity; double the length of piping as compared to one-pipe systems; normal steam size radiation; thermostatic traps required on each radiator; control valves may be any type, including modulating, automatic, etc., as condensate does not flow against the steam. Air is usually vented from system in basement or out of doors rather than into rooms, as air is removed with the condensate; no radiator vents are needed.

This type of system operates mostly above atmospheric pressure in severe weather, but below atmospheric pressure for several hours at a time in milder weather. Pressures above atmosphere must be developed often enough to purge system of air.

Radiator valves may be partly closed, limiting the supply of steam and thus governing heat delivery.

Performance and responsiveness depend largely upon the degree of control exercised by automatic devices. Uniformity of distribution depends upon design and operation of the system. Ability to operate through a considerable range of steam and vapor temperatures enhances the responsiveness of the system to variation in outdoor conditions, particularly in periods of mild weather.

In small installations variations in pressure and temperature are usually controlled at the boiler only. Under this condition, secondary equipment, such as humidifiers, unit heaters and winter air conditioners, can only be operated at temperatures demanded by the average radiation load. Or, a constant head of steam may be carried on the boiler; in which case, humidifiers, unit heaters, unit ventilators or separate air conditioning units, used in combination systems, may be operated continuously where necessary; some rooms may receive more or less heat than others, individual thermostatic control may be used on radiators and in general much greater flexibility and adaptability is possible than with one-pipe systems. Rating, therefore, must be generalized according to equipment employed, as follows:

Uniformity: good if system is balanced and orificed; excellent if provided with local automatic controls; only fair if control is centered on operation of boiler in large installations. *Convenience:* wholly dependent upon controls employed plus simple manual adjustment of individual radiators as required. *Operating cost:* lower than for one-pipe steam; about equal to or slightly lower than one-pipe vapor systems according to nature of controls; and slightly higher than hot water systems. *Initial cost*: higher than one-pipe systems; less than hot water or two-pipe vacuum systems.

TWO-PIPE FREE VENTED SYSTEMS

HERE again, trade terminology is confused by lack of standard usage. Sometimes called "modulating," "partially filled" or "atmospheric" steam systems, the free vented system should not be confused with either vapor or the nearly obsolete two-pipe air vented systems.

Elements: Similar to two-pipe vapor systems except that dry returns are freely vented (without vent valves) to the atmosphere so that air may be expelled from or taken into system as the steam supply is varied. Radiators may be kept partly filled with steam and partly with air in any desired proportion, thereby varying the heat output in accordance with weather requirements. Return traps are optional on returns from radiators; if orifices are used to limit the steam supply to the maximum each radiator can condense, traps may be replaced with ordinary return ells. This system is adaptable to all kinds of local and zone control in large buildings. One particular advantage is that a continuous but controlled supply of steam can be maintained in the whole system or in any part to meet weather requirements without allowing radiators to get entirely cold at any time. Condensate is returned to boiler by automatic trap or return pump. Drips from mains under pressure are connected through float-type drip traps, or seals, into the same system of dry returns to which radiators are connected; hence only one set of returns is used. Venting of supply mains is through radiator connections directly into dry returns, but may be augmented by air vents equipped with thermostatic traps connected into dry returns. Supply and return piping may be located without reference to the water line of boiler but should drain by gravity to the receiver.

Characteristics are: Simplicity. Lower first cost than two-pipe vapor or vacuum systems, since orificing may replace return traps on radiators and no specialties are required at the boiler except an automatic return trap or pump and a sensitive steam pressure regulator. Has all advantages of vapor systems as to application of controls with greater

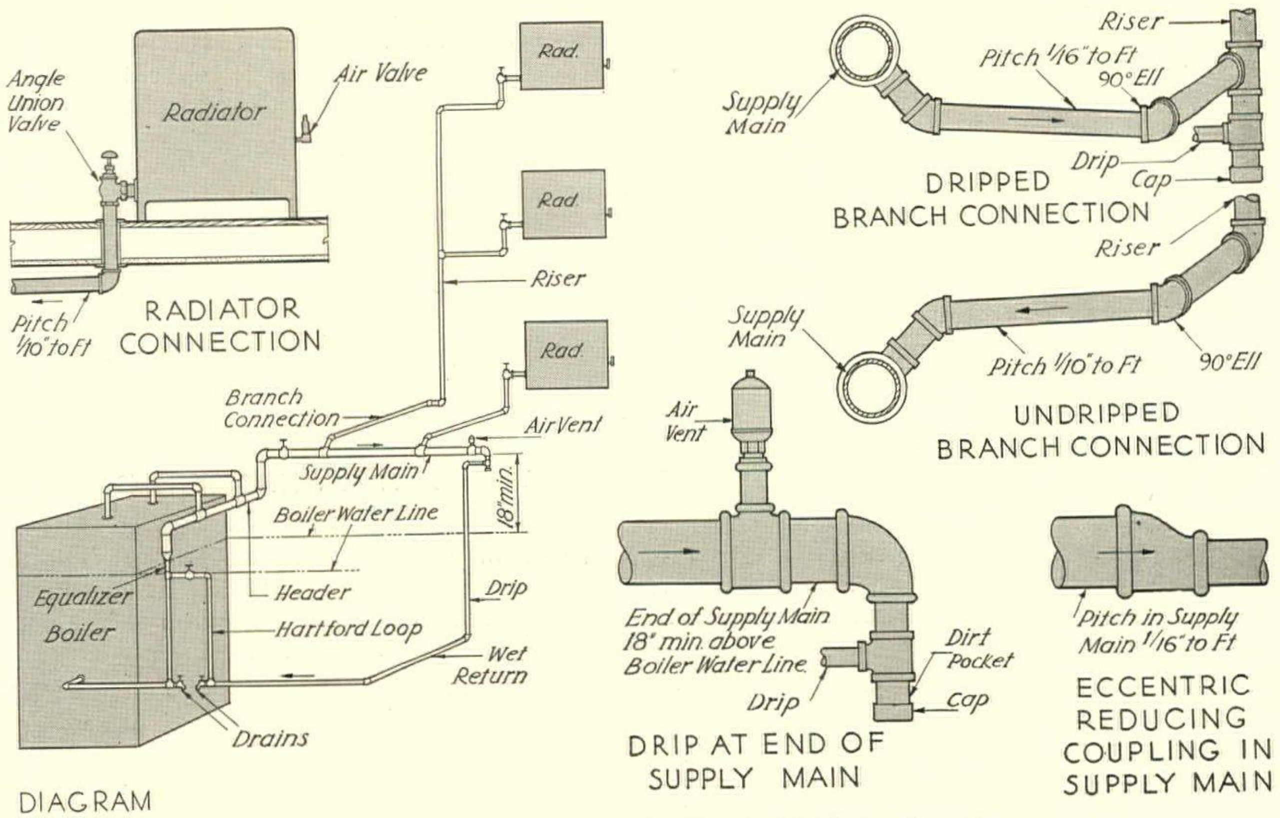


FIG. 1. DETAILS OF ONE-PIPE STEAM HEATING SYSTEMS

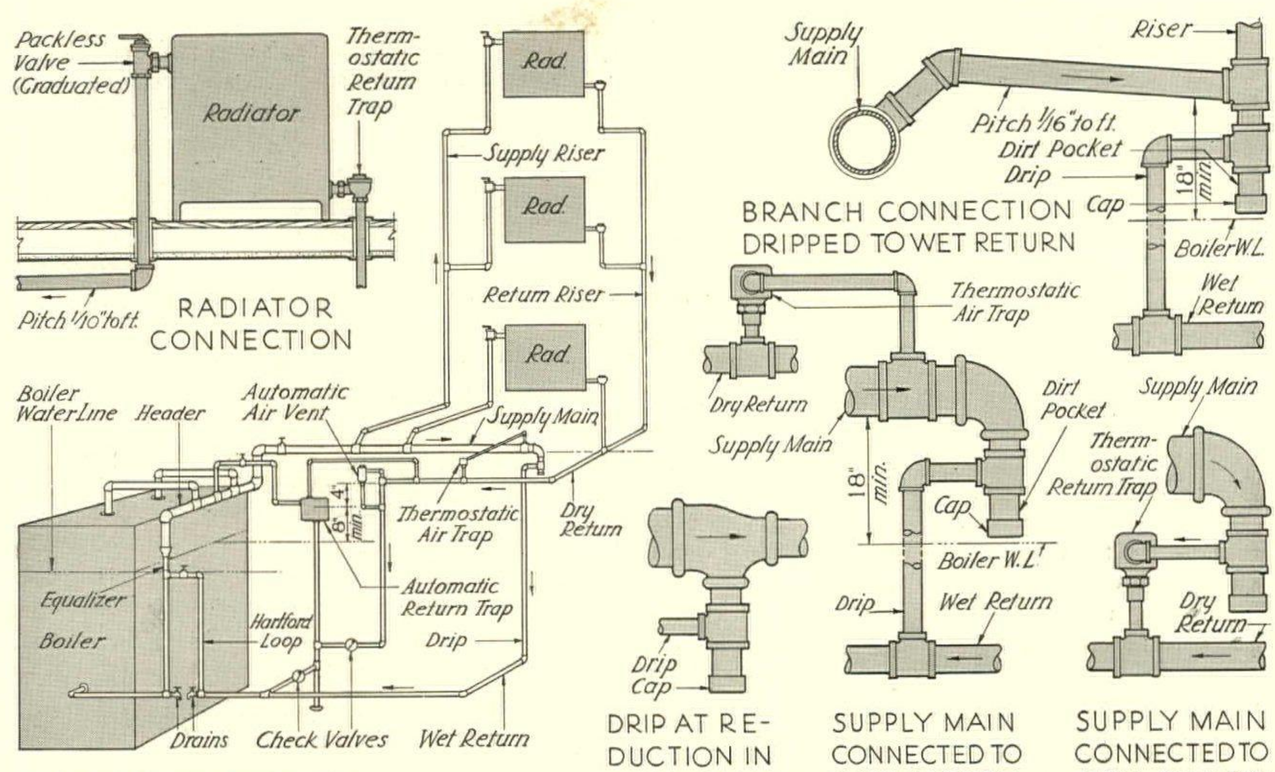


FIG. 2. DETAILS OF TWO-PIPE VAPOR HEATING SYSTEMS

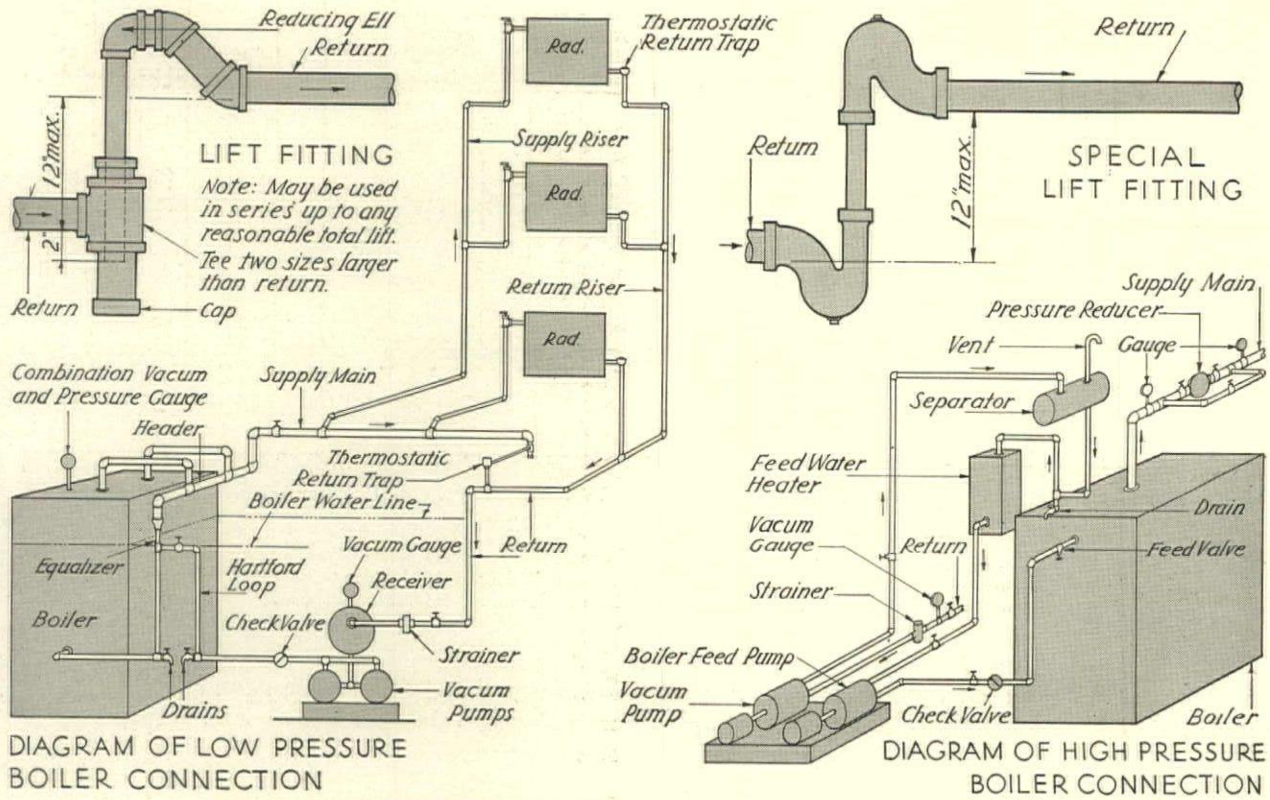


FIG. 3. DETAILS OF VACUUM HEATING SYSTEMS

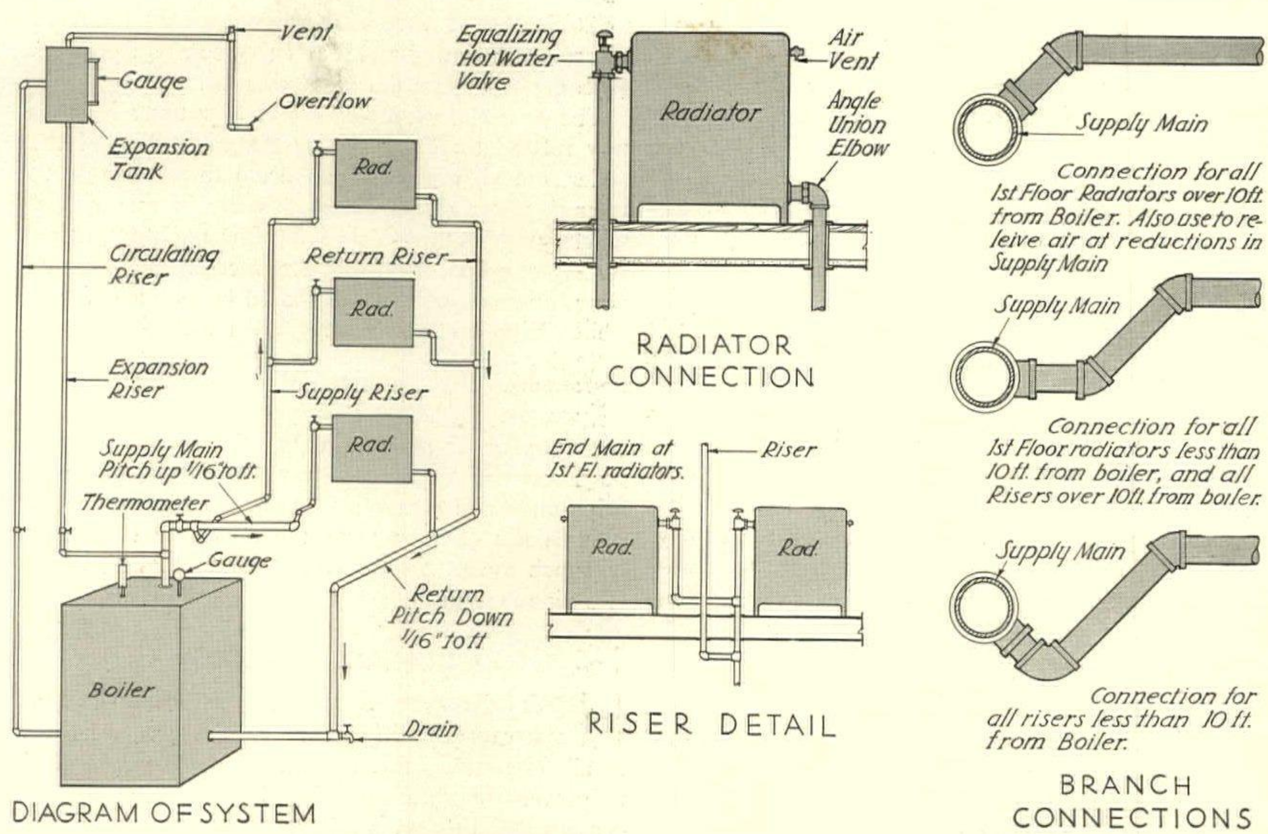


FIG. 4. DETAILS OF TWO-PIPE GRAVITY HOT WATER HEATING SYSTEMS

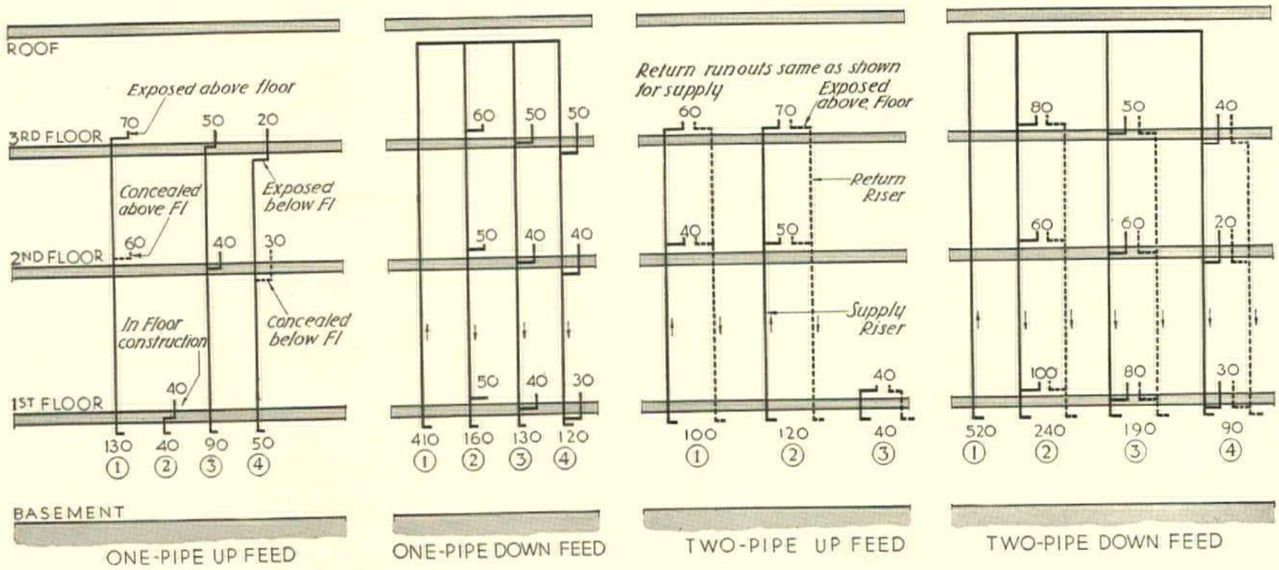


Fig. 5. Typical riser diagrams. Capacity of connected radiation is indicated by figures at radiator connections (in EDR). Total radiation connected by each riser is noted at foot of riser. Each riser should be numbered for reference purposes

range of heat output of individual radiators. Adaptable to all kinds of zone control systems. Heat output is controlled by partially filled radiation; hence any amount of variation is possible from zero to 100%. Constant steam pressure can be carried on boiler for operating auxiliary equipment.

Performance is similar to that of vapor systems except that a constant steam pressure may be maintained when desired and heat output regulated throughout a wide range. Rating must be generalized according to the equipment employed, as follows: *Uniformity:* excellent if system is balanced, zoned, orificed and/or subjected to local or regional automatic controls; only fair if control is centered on operation of boiler. *Convenience:* wholly dependent upon controls employed plus simple manual adjustment of individual radiators as required. *Operating cost:* lower than two-pipe vapor. *Initial cost:* usually less than other two-pipe systems.

TWO-PIPE VACUUM SYSTEMS

THIS term is used to denote installations in which condensate and air are continuously removed by a pump at pressures lower than those on the supply end. The pump may be required at times to maintain sub-atmospheric pressures as low as 26 inches of vacuum.

Elements are similar to two-pipe vapor systems except that condensate and air are handled by one return system back to a vacuum pump; all drips connect through thermostatic traps to this single return system; air is separated at pump or receiver and discharged to atmosphere; condensate is discharged directly to boiler by vacuum pump or to a feed water heater or receiver and thence to the boiler by a separate pump. Sensitive steam pressure control is required with low pressure boilers; a pressure reducing valve is required with high pressure boilers. See Fig. 3.

Characteristics are the same as those of vapor systems except air and condensate are handled under continuous vacuum. Entire system may be operated under any pressure above or below atmosphere down to 26 inches of vacuum. Adapted to all kinds of controls and zoning and may carry constant pressure on boiler for operation of auxiliaries.

The elevation of supply mains or returns is in no way related to or limited by the water line of the boiler, but all piping should drain to receiver or to vacuum pump direct. It is possible in this system to lift condensate and air from low radiators, drips, etc., into return mains and thence to the vacuum pump or receiver, but this should be avoided if possible. Lifts must be accomplished with lift fittings.

Performance may be rated thus. *Uniformity* and *convenience:* excellent in properly designed systems. *Operating cost:* may be higher than vapor systems on account of the added first cost, but when properly zoned and controlled either as sub-atmospheric or partially filled systems the operating costs may be much lower. *Initial cost:* usually highest of all two-pipe systems.

CONTROL METHODS

HEATING systems are designed to operate at full capacity only in the most severe weather: at all other times this operation must be controlled to prevent overheating. Two basic methods of accomplishing this are available; (1) by limiting the amount of steam or vapor delivered to radiators and (2) by governing the temperature of the heating medium. Both methods may be combined.

Control may be applied at the source (boiler or public utility supply); within the system of mains forming separate zones; at individual radiators, or by control at two or more points in any desired combination.

Furthermore, indoor temperatures may be governed by an outdoor thermostat which proportions the supply of heat according to outdoor conditions; by one or more thermostats indoors, or by a combination of both.

Thus there is an infinite number of combinations from which to select a control method suited to the conditions of a particular project. Only the more important basic methods are analyzed here.

The intermittent method employs the "on or off" principle of supplying heat only when demanded by a governing thermostat or at regular intervals of time established by a clock mechanism. The latter is in turn manually or automatically adjusted to outdoor weather conditions, reducing the interval of off periods in severe weather and increasing it on mild days. Thermostatic control of the central heat source is the method commonly used on small domestic installations. Obviously intermittent operation tends toward fluctuating indoor temperatures; hence these methods of control are best adapted to heating systems having some inherent stability.

The modified temperature method changes the temperature of the heating medium according to the demand for heat indoors or the prevailing conditions outdoors, or both. All hot water and some vacuum systems are controlled this way. Vapor systems operate on this principle most of the time except for periods when steam pressures are developed to purge pipes and radiators of air.

The controlled delivery method supplies some heat all of the time but controls the quantity according to indoor or outdoor temperatures, or both. The two-pipe free vented system operates on this principle, as do several trade-marked or patented systems, admitting only enough steam to each radiator to meet prevailing requirements, the rest of the radiator being filled with air.

The orifice principle, while not necessarily a control system in itself, should be considered here as it is an element in a number of trade-marked systems.

Orifices are usually discs (with small apertures) inserted in supply pipes at or near the radiator valve. The hole drilled in each disc is of such size that only as much steam as the radiator is able to condense can pass through under the maximum pressure normally maintained in the distribution system.

The underlying purpose of orifice controls is to increase the steam flow resistance of radiators until it exceeds that of the piping. Then steam will fill the entire piping system before it fills individual radiators and all are heated simultaneously.

ZONED SYSTEMS

WIND, sun and outside temperatures are constantly varying factors affecting the heating load on a building as a whole and its different parts according to their orientation and exposure. When the sun is shining it affects the east, south and west sides at different periods and the roof all day. At night and on cloudy days this effect is missing. The lower stories may be sheltered from wind and sun by adjacent buildings. Chimney effect is constantly robbing the lower floors of tall buildings, increasing infiltration; and the upper floors are receiving this rising heat which may cause exfiltration around windows.

These variations in load with changing outdoor conditions may be met by dividing the building into zones. Each zone should embrace rooms having substantially the same exposure and subject to approximately the same chimney effect. Zones may be horizontal according to orientation or vertical according to the number of stories, shelter of adjacent buildings, etc. Each zone may then be subject to a separate control of any desired type.

In addition to thermostatic control of each zone by either indoor or outdoor thermostats, some of the larger systems employ a central control board, manually supervised, where temperatures prevailing in each zone may be checked by indicating thermometers or signal lights and adjusted as required by means of remote-control automatic valves.

There are many developments and adaptations of standard distribution systems in which one or more of the foregoing principles of control are utilized to provide superior performance. The majority of them have meritorious features warranting careful consideration.

TWO-PIPE GRAVITY HOT WATER SYSTEMS

HOT water radiation systems are classed as open or closed systems. A system is open when the expansion tank is open to the atmosphere. It is closed when the expansion tank is closed and carries a head of air under pressure, or when in place of an expansion tank there is a pressure reducing valve connected between the water supply and the heating system and a relief valve taking care of expansion and contraction in such manner as to hold a constant pressure on the system.

Elements include a hot water boiler or a steam water heater; hot water type radiation; a system of supply mains and risers with branches to individual radiators; a system of return mains with risers and branches from each radiator; a supply valve on each radiator to control the flow of water; a key type air vent valve on each radiator to permit manual release of entrapped air when system is filled; and a means of keeping the system full of water while allowing for its expansion and contraction with variations in water temperature. See Fig. 4.

Characteristics are: Maximum water temperatures at the boiler range from 180 F with open systems to 240 F in closed systems; hence radiation must be about 50% larger with open systems than for steam temperatures. Closed systems may be designed for the same radiator output as steam systems, but on account of their sluggishness slightly more radiation is generally used. Domestic hot water supplied by an indirect heater in a hot water boiler may drop below the normal minimum of 140 F in periods of mild weather unless automatic valves are placed in the mains to check the circulation of hot water to radiators when the boiler water temperature is higher than that desired for heating purposes. Though difficult to design for correct balance in all parts, these systems are simple to operate and control; they are somewhat limited to use in buildings (or zones of a building) of not too great a height, on account of the static pressure of the water; and the water in the system is liable to freeze if left unattended in cold weather. They may cost more to install than two-pipe steam systems because the larger radiation and pipes may more than offset the cost of traps and other specialties used on steam and vapor systems.

Performance characteristics are: uniformity of heating effect coupled with (and due to) slow heating and slow cooling. This sluggishness is characteristic of gravity hot water systems; it is desirable for its steadiness and sometime undesirable for its slowness in response to rapidly changing conditions. Seasonal variations are met by changing the water temperature over a wide range. These systems are adaptable to local and zone control. Rating against standard requirements may therefore be expressed as: *Uniformity,* excellent but with slow response to changes; *Convenience,* excellent; *Operation cost,* minimum except as investment may increase overhead; *Initial cost* may be high.

FORCED CIRCULATION HOT WATER SYSTEMS—OPEN TYPE

Elements are the same as for gravity circulation except that a power driven circulating pump is used in the return line to stimulate or maintain circulation through the system. In some cases these pumps operate as a "booster" only when quick response is necessary. Gravity circulation is relied upon under normal conditions. In others, the pumps operate whenever there is a call for heat. In this case the pump may be provided with valves which prevent circulation except when the pumps are operating; then the combination serves as a summer-winter control device as well as a circulating device, permitting the development of high boiler temperatures for generating domestic hot water without heating the radiators.

Characteristics include: Quick response to call for heat due to rapid circulation. Pipe sizes may be 25% to 50% smaller than for gravity system, though increased frictional resistance of smaller pipes must be offset by greater power applied to the pump. Boiler temperature may be unrelated to heating load where pumps completely control circulation, so that a reserve of heat is ready for quick response.

Performance characteristics are: *Uniformity,* excellent; *responsiveness,* excellent. *Convenience,* maximum. *Operating costs;* low except for overhead and small power load. *Initial cost,* somewhat higher than gravity hot water systems. It should be noted that gravity systems may be converted and their performance improved by merely adding circulating pumps and valves as described.

FORCED CIRCULATION HOT WATER SYSTEMS—CLOSED TYPE

Elements are the same as for open forced circulation systems except that the expansion tanks are closed or replaced with water pressure control valves. The entire system is made tight and is operated under pressure with a pressure relief valve set for 10 to 15 lbs. maximum. Radiators may be sized as for steam.

Characteristics are: water in the system may be carried at any temperature to about 240 F without generating steam, as water will not boil under pressure at as low a temperature as in normal atmosphere. Hence a wide range of temperatures may be delivered at the radiators as in some vacuum systems.

Performance characteristics are: *Uniformity* and *responsiveness,* excellent. *Convenience,* maximum. *Operating costs,* low to moderate. *Initial cost,* lower than open systems due to steam-size radiation and small pipes and about equal to vapor systems.

CHARACTERISTICS OF RADIATORS AND CONVECTORS

Radiators require floor space (or its equivalent if suspended on walls). They heat partly by radiation and partly by convection, hence they do not induce as rapid air motion as convectors unless enclosed in cabinets of suitable design. Free standing high, short radiators produce minimum air circulation and maximum air stratification; low, long radiators produce maximum circulation and relatively low temperature differentials. Radiators are normally less expensive than convectors of equal capacity.

The rate of heat emission from radiators is affected by their height, width and length and for this reason they are now usually rated in terms of equivalent square feet of direct steam radiation (EDR = 240 Btu per hour) or in equivalent direct hot water radiation (150 Btu per hour) instead of, as formerly, in square feet of superficial surface. Short, low, narrow radiators emit more heat per square foot than long, high, wide ones of the same type. Pipe coils emit heat at different rates per square foot, depending upon pipe size, number of pipes high, horizontal or vertical position and location above floor. In selecting radiators or pipe

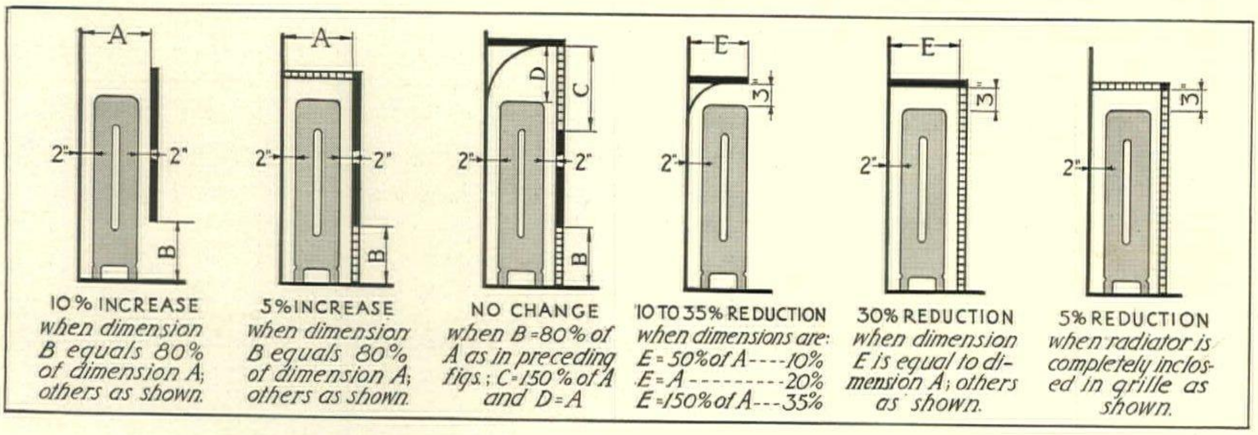


Fig. 6. Effect of radiator enclosures compared to heat emitted by a free standing radiator

coils the actual heat emission per square foot (or EDR rating) should be used.

Heat emission from radiators is also affected by the finished surface. If a given cast iron radiator, finished with a dull black paint is rated at 100% in heat emission, the same radiator would emit from 1% to 2% more heat if painted in light colors and nearly 10% less if finished with flake bronze or aluminum paints.

Radiators in enclosures may be slightly more efficient or much less efficient than open radiation according to the type of enclosure employed. See Fig. 6 for diagrammatic presentation of types commonly used and their effect on radiator performance.

Convectors have the following advantages. They are light in weight; are constructed so they may readily be concealed; they induce vigorous air circulation and thereby tend to keep the temperature differential per foot of height from floor to ceiling well below 0.75 F. They heat quickly but cool just as rapidly. Of the two principal types, the non-ferrous units are more responsive in both heating and cooling than those of cast iron. The performance of convectors is directly related to the amount of chimney effect produced by the enclosure or flue. Manufacturers' ratings are necessarily based upon definite recess or cabinet sizes. Outlet grilles may project air either vertically or horizontally; generally the latter produces lower temperature differentials within the room if the outlet is 2 to 4 feet from the floor. Intake openings should always be at the floor level.

Convector-radiators, usually consisting of a cast iron front or face which radiates heat directly and some form of flue which induces convection currents, combine the features of both radiators and convectors. They are usually wall hung or built in the wall, occupying little or no floor space. They produce somewhat less air circulation than true convectors, and hence, like radiators, should be long rather than short, but with as much vertical distance between floor inlet and warm air outlet as possible.

COMBINING RADIATORS AND CONVECTORS

CAST iron radiators should not be indiscriminately used with convectors (particularly those of non-ferrous construction) within a zone or building controlled by a single thermostat. Cast iron radiators heat and cool more slowly than convectors; hence if the heat source is intermittent, rooms in which quick acting convectors are used will be subject to wider fluctuations of temperature than rooms having free-standing radiation. Cast iron convectors and convector-radiators have more mass than copper or aluminum convectors; they are less subject to wide fluctuation than non-ferrous types and therefore combine better with direct radiation. In general it is good practise to use 60 to 80% of either direct radiators or convectors and to install the alternate type in rooms where greater or less heat can be tolerated than is called for by the governing thermostat.

Location of radiation is governed by the location of major heat losses; that is, radiation should be placed where it will counteract cold down drafts where they originate and prevent them spreading over the floor. Since windows usually cause the greatest heat losses, radiation should be placed beneath them wherever possible. Otherwise distribute the radiation along the exposed walls more or less in proportion as these walls contribute to the heating load. Large skylights should have enough radiation around their wells to offset their heat losses.

UNIT HEATERS AND VENTILATION UNITS

WHEN radiation is equipped with a power driven fan its characteristics change, and it falls into either of two classifications: unit heaters or ventilating units.

Unit heaters are made in both industrial and residential types. Industrial unit heaters are high capacity, very compact extended surface air heaters equipped with fans which recirculate the room air. They may be suspended from the ceiling, upper side wall or interior columns or be floor mounted. Their

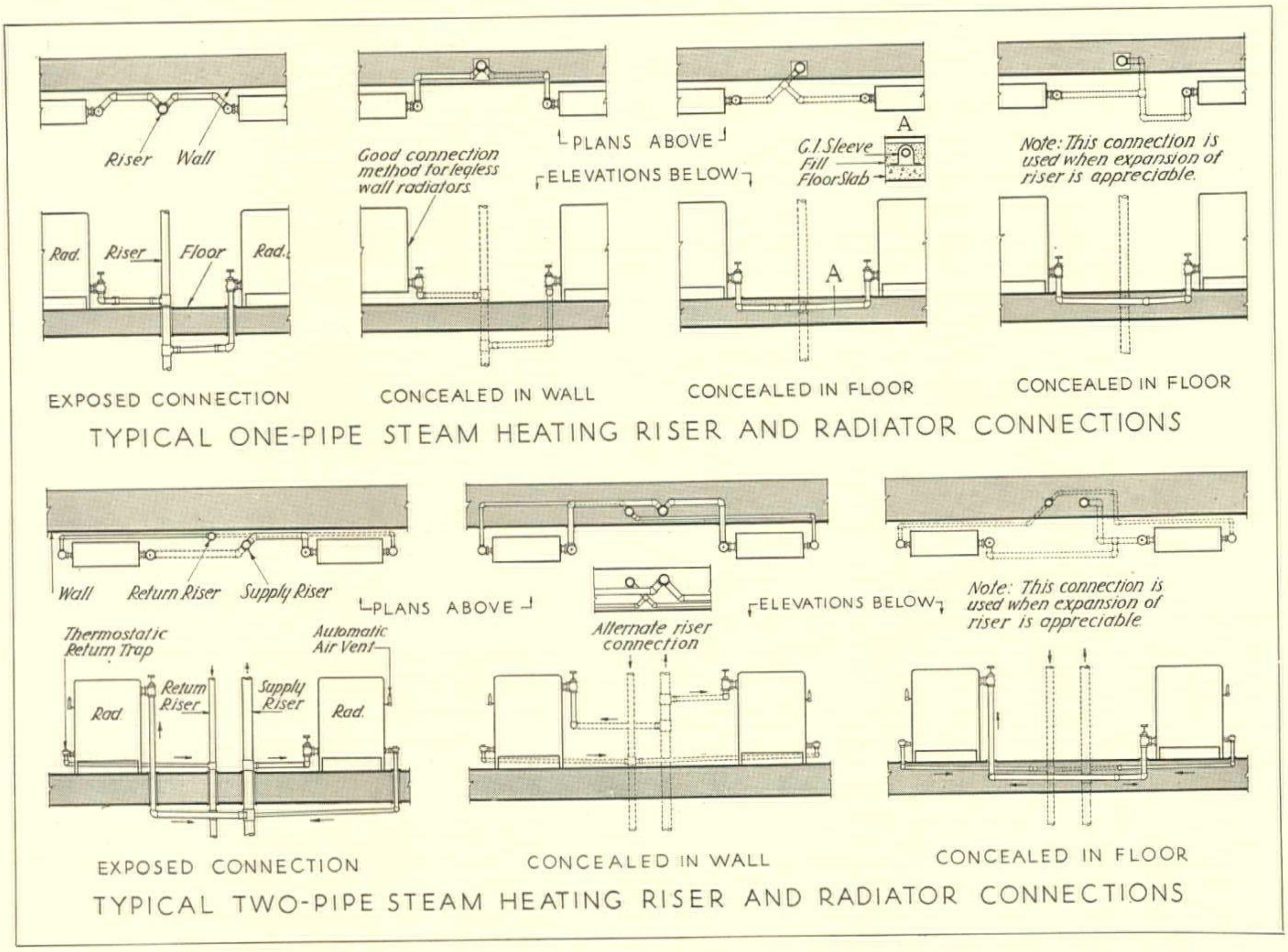


Fig. 7. Radiator connections must be designed with angle offsets to allow expansion and contraction of risers and runouts without disturbing radiation or stressing pipe or structural members

high velocities produce wide diffusion before reaching the breathing zone but most of the air is delivered against this zone to counteract the tendency of warm air to rise and blanket the ceiling. They are efficient low cost devices suitable for industrial, commercial and some auditorium or gymnasium applications where appearance and high velocity air currents are not factors. They may also be concealed behind grilles either near the floor or high up on the side walls of large rooms if served by recirculating ducts brought up within the wall from the floor level. Residential unit heaters resemble ventilating units except they do not introduce any outside air.

Ventilating units are so named because they are provided with intake openings from outside air. Dampers under manual or automatic control are usually provided to permit partial or complete recirculation as well as ventilation and to govern room temperature. They consist of a cabinet, suitable radiation of the convector type, one or more centrifugal fans and usually filters for cleaning either the outside air or both outside and recirculating air. The recirculating inlet is at the floor and the outside air inlet may be at any point in the back of the enclosure where it can be brought through the wall or beneath a window. The outlet grille is generally at the top, inclined to project the air upward and slightly outward so it will not strike occupants of the room before it has diffused widely against the ceiling.

Such units are effective in reducing temperature differentials to as low as 0.25 F per foot of height from floor to ceiling. They also have the merit of factory assembly and testing so their performance may be relied upon more fully than that of poorly constructed duct systems. Heat output is governed by varying the steam supply, by by-passing the air around the heater or by both. It is generally controlled automatically.

Unit coolers or air conditioning cabinets having heating as well as cooling coils may be treated as either convectors or ventilating units with respect to their location and performance.

PIPES, FITTINGS, VALVES AND TRAPS

STEAM heating supply pipes are seldom subject to any appreciable corrosive activity and therefore almost invariably may be made of wrought iron or steel. Steam heating returns may also be of the same materials, except for air vented systems or vacuum systems having air inleakage, where brass.

copper, cast iron, or at least extra strong iron or steel pipes should be used. For systems requiring much make up water or on street steam supply where the condensate is wasted, the returns should be of brass, copper or cast iron for long life.

Steel or wrought iron pipes are standard for heating work with some popular preference for genuine wrought iron where durability is a primary consideration. Alloys of iron and steel with copper, molybdenum, etc., are slightly more expensive, but their superior durability for this particular service is yet to be established. Black steel pipe is lowest in cost and is considered adequate for many types of commercial structures where changing land values indicate ultimate reconstruction.

Copper pipe has recently come into use for alteration work and for converting one-pipe systems into two-pipe systems because its relative flexibility simplifies installation and reduces the number of fittings.

Brass pipe is too costly for general heating use but finds application where water conditions harmful to other types of pipe prevail or where great durability is sought. Cold water supply piping should be of brass or copper since iron or steel piping in this service deteriorates rapidly from the inside on account of the corrosive activity of most raw water and on the outside on account of sweating. All raw hot water pipes should be of brass or copper as hot water is more corrosive than cold water.

Where the same water is recirculated over and over, as in hot water heating systems, the corrosive activity may be negligible provided there is no appreciable inleakage of air. In such work ordinary steel or iron pipe may be used.

Ammonia and some other refrigerants require steel or iron pipe, but most modern refrigerants may be piped with copper tubing.

Fittings on iron or steel steam heating piping should be steam pattern cast iron, screwed up to 6" and flanged 8" and above. On brass returns they should be heavy steam pattern screwed.

Fittings on brass tubing or iron weight brass pipe may be of the union or brazed joint type with adapters for attaching to iron size pipe where necessary. Fittings on ammonia and some other refrigerant piping are of special flanged type.

In all piping work fittings play an important part because the natural expansion and contraction of heating lines compel the use of offsets which will take up movement without leaking. Where combinations of elbows will not provide the necessary flexibility at connections between mains, risers and branch connections, and where mains are very long, slip-type expansion joints or large radius pipe bends must be introduced.

Pipe insulation is of utmost importance in reducing operating costs. All steam, vapor and hot water lines, including returns and all refrigerated water

TABLE 13. PER CENT OF HEAT LOSS STOPPED BY PIPE INSULATION ONE INCH THICK

Nominal Pipe Size (Inches)	Btu per Sq. Ft. of Bare Pipe	% OF HEAT LOSS STOPPED BY INSULATION 1" THICK: 85% Magnesia	Corrugated Asbestos 4 Plies	Corrugated Asbestos 8 Plies	Laminated Asbestos 30 to 40 Laminations	Laminated Asbestos Approx. 20 Laminations
1/2	2.982	74	67	71	78	68
3/4	2.84	75	68	72	79	69
1	2.77	77	70	75	80	71
1 1/4	2.722	78	72	76	82	73
1 1/2	2.68	79	74	77	82	74
2	2.632	80	75	78	83	75
2 1/2	2.572	81	75	78	84	76
3	2.509	81	76	79	84	76
3 1/2	2.469	81	76	79	84	77
4	2.439	81	76	79	84	77
5	2.399	82	77	80	85	78
6	2.373	82	77	80	85	78
8	2.335	83	78	81	85	79
9	2.336	83	78	81	86	79
12	2.298	83	79	81	86	79

Heat loss from horizontal iron pipe expressed in Btu per square foot per degree Fahrenheit difference in temperature between the pipe and surrounding air at 70 F. Per cent of heat loss stopped based on insulation 1" thick with steam at 5 lbs. pressure.

and other cooling lines, should be covered with suitable pipe insulation. See Table 13 for approximate heat emission of bare pipes of various common sizes and the per cent of heat loss stopped by insulations.

Valves commonly used in low pressure heating work may be classified as to application as follows: Radiator valves should be of angle type on all one-pipe installations, with no obstructions to the flow of condensate from radiators. Angle type valves are preferable but straight through globe valves may be used on all two-pipe systems. For economy, packed stem valves may be employed on all steam and hot water systems, but packless valves having a flexible diaphragm or bellows must be employed on vapor and vacuum installations to avoid constant trouble from air leakage.

In the use of valves, the gate type is always preferable to globe valves except where close regulation is to be accomplished through partial opening of the valve. Globe valves form a trap or water pocket and cannot be used where free drainage is required. Valves for 125 lb. working pressure are used up to and including 100 lb. and valves rated for 250 lb. are used above. Swing check valves are used where small pressures are required to open the valve, around boiler returns, etc.

Various patented heating systems have supply valves particularly adapted to their system, such as valves that drain and vent around the seat when closed, all kinds of graduated fractional distribution valves and orificed valves. Some of the latter are orificed when partly closed and are ordinary valves when open. Manufacturers should be consulted as to the use of these different kinds of valves.

Thermostatic traps used on return ends of radiators in vapor and vacuum systems are made in many styles. The principal features to consider in selection are (1) durability of the thermostatic element,

TABLE 14. STEAM PIPE CAPACITIES . . . CAPACITY EXPRESSED IN SQUARE FEET OF EQUIVALENT RADIATION

This table is based on pipe size data developed through the research investigations of the American Society of Heating and Ventilating Engineers.

PIPE SIZE INCHES	CAPACITIES OF STEAM MAINS AND RISERS — DIRECTION OF CONDENSATION FLOW IN PIPE LINE — WITH THE STEAM IN ONE-PIPE AND TWO-PIPE: 1/32 LB DROP	1/24 LB DROP	1/16 LB DROP	⅛ LB DROP	¼ LB DROP	½ LB DROP	AGAINST THE STEAM TWO-PIPE ONLY: VERTICAL	HORIZONTAL	SPECIAL CAPACITIES FOR ONE-PIPE SYSTEMS ONLY: SUPPLY RISERS UP-FEED	RADIATOR VALVES AND VERTICAL CONNECTIONS	RADIATOR AND RISER RUNOUTS
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*[a]	*I*[c]	*J*[b]	*K*	*L*[c]
¾	....	....	30	....	....	....	30	....	25	....	....
1	39	46	56	79	111	157	56	26	45	20	20
1¼	87	100	122	173	245	346	122	58	98	55	55
1½	134	155	190	269	380	538	190	95	152	81	81
2	273	315	386	546	771	1,091	386	195	288	165	165
2½	449	518	635	898	1,270	1,797	635	395	464	....	260
3	822	948	1,163	1,645	2,326	3,289	1,129	700	799	....	475
3½	1,228	1,419	1,737	2,457	3,474	4,913	1,548	1,150	1,144	....	745
4	1,738	2,011	2,457	3,475	4,914	6,950	2,042	1,700	1,520	....	1,110
5	3,214	3,712	4,546	6,929	9,092	12,858	....	3,150	....	....	2,180
6	5,276	6,094	7,642	10,553	14,924	21,105	....	....	....	....	....
8	10,983	12,682	15,533	21,967	31,066	43,934	....	....	....	....	....
10	20,043	23,144	28,345	40,085	56,689	80,171	....	....	....	....	....
12	32,168	37,145	45,492	64,336	90,985	128,672	....	....	....	....	....
16	60,506	69,671	84,849	121,012	169,879	240,245	....	....	....	....	....
	All Horizontal Mains and Down-Feed Risers						Up-Feed Risers	Mains and Undripped Runouts	Up-Feed Risers	Radiator Connections	Runouts Not Dripped

Note.—All drops shown are in pounds per 100 ft. of equivalent run—based on pipe properly reamed.

[a]Do not use Column *H* for drops of 1/24 or 1/32 lb; substitute Column *C* or Column *B* as required.

[b]Do not use Column *J* for drop 1/32 lb except on sizes 3 in. and over; below 3 in. substitute Column *B*.

[c]On radiator runouts over 8 ft. long increase one pipe size over that shown in this table.

(2) free opening for condensate and air, and (3) positive and rapid closing when steam or vapor reaches the trap. Traps should be rated for steam or vapor temperatures according to the type of system. In residence work they should be quiet in operation. They must be air tight under all conditions yet capable of disassembly for cleaning.

Air Vent Valves are available in many styles and in several grades. The cheaper lines have small air ports, small thermostatic elements and are of light construction. Their use is seldom desirable in place of the better grades which have greater durability, are quicker and more positive in operation and less subject to leakage or noisiness. Plain air vent valves are low in cost; the vacuum-type or non-return air vent valves are more expensive but their performance is far more critical in the success of the system, hence the best quality should be specified. They should operate freely when the slightest steam pressure exists in the system. They should close upon contact with steam and remain tightly closed regardless of temperature so long as sub-atmospheric pressures prevail in the radiator.

Design of Steam and Vapor Systems

THE following data are intended as a general guide to the layout of the principal types of steam, vapor and hot water systems. It is by no means exhaustive or complete. It is presented as an aid in estimating pipe sizes and in locating major elements for planning purposes only. The detailed design of these systems involves engineering procedure and requires experience that cannot be condensed here to profitable purpose. This work, except on systems of small size, should be entrusted to an experienced consulting engineer.

The importance of skilled design cannot be overestimated. The distribution system is the one part of complete installations designed and custom-built for a particular project, without the benefit of factory research, trial, development or supervision. It must be carefully laid out and checked, and its assembly must be carefully supervised, if it is not to vitiate the proper functioning of the entire plant.

However, it is entirely within the architect's province to develop layouts far enough to locate and size all radiation, risers, returns and mains with sufficient accuracy to make suitable provision for them in structural drawings of the project.

DISTRIBUTING RADIATION

IF the procedure detailed in "Heating, Cooling and Air Conditioning" (July 1934) has been followed in estimating heating loads, Forms 1 and 3 will show the apportionment of the total standing radiation be-

TABLE 15. RETURN PIPE CAPACITIES . . . CAPACITY EXPRESSED IN SQUARE FEET OF EQUIVALENT RADIATION

This table is based on pipe size data developed through the research investigations of the American Society of Heating and Ventilating Engineers.

CAPACITY OF RETURN MAINS AND RISERS

PIPE SIZE INCH	1/32 lb Drop per 100 Ft. Wet	Dry	Vac.	1/24 lb Drop per 100 Ft. Wet	Dry	Vac.	1/16 lb Drop per 100 Ft. Wet	Dry	Vac.	⅛ lb Drop per 100 Ft. Wet	Dry	Vac.	¼ lb Drop per 100 Ft. Wet	Dry	Vac.	½ lb Drop per 100 Ft. Wet	Dry	Vac.
M	*N*	*O*	*P*	*Q*	*R*	*S*	*T*	*U*	*V*	*W*	*X*	*Y*	*Z*	*AA*	*BB*	*CC*	*DD*	*EE*
MAINS																		
¾	....	....	...	....	....	326	....	....	400	....	....	568	....	....	800	....	....	1,130
1	500	248	...	580	285	570	700	320	700	1,000	412	994	1,400	460	1,400	....	....	1,977
1¼	850	520	...	990	595	976	1,200	670	1,200	1,700	868	1,704	2,400	962	2,400	....	....	3,390
1½	1,350	822	...	1,570	943	1,547	1,900	1,058	1,900	2,700	1,362	2,696	3,800	1,512	3,800	....	....	5,370
2	2,800	1,880	...	3,240	2,140	3,256	4,000	2,300	4,000	5,600	2,960	5,680	8,000	3,300	8,000	....	....	11,300
2½	4,700	3,040	...	5,300	3,470	5,453	6,700	3,800	6,700	9,400	4,900	9,510	13,400	5,450	13,400	....	....	18,925
3	7,500	5,840	...	8,500	6,250	8,710	10,700	7,000	10,700	15,000	9,000	15,190	21,400	10,000	21,400	....	....	30,230
3½	11,000	7,880	...	13,200	8,800	13,020	16,000	10,000	16,000	22,000	12,900	22,710	32,000	14,300	32,000	....	....	45,200
4	15,500	11,700	...	18,300	13,400	17,910	22,000	15,000	22,000	31,000	19,300	31,220	44,000	21,500	44,000	....	....	62,180
5	....	....	...	....	....	31,500	....	....	38,700	....	....	54,920	....	....	77,400	....	....	109,300
6	....	....	...	....	....	50,450	....	....	62,000	....	....	88,000	....	....	124,000	....	....	175,100
RISERS																		
¾	....	190	...	....	190	570	....	190	700	....	190	994	....	190	1,400	....	....	1,977
1	....	450	...	....	450	976	....	450	1,200	....	450	1,704	....	450	2,400	....	....	3,390
1¼	....	990	...	....	990	1,547	....	990	1,900	....	990	2,696	....	990	3,800	....	....	5,370
1½	....	1,500	...	....	1,500	3,256	....	1,500	4,000	....	1,500	5,680	....	1,500	8,000	....	....	11,300
2	....	3,000	...	....	3,000	5,453	....	3,000	6,700	....	3,000	9,510	....	3,000	13,400	....	....	18,925
2½	....	....	...	....	....	8,710	....	....	10,700	....	....	15,910	....	....	21,400	....	....	30,230
3	....	....	...	....	....	13,020	....	....	16,000	....	....	22,710	....	....	32,000	....	....	45,200
3½	....	....	...	....	....	17,910	....	....	22,000	....	....	31,220	....	....	44,000	....	....	62,180
4	....	....	...	....	....	31,500	....	....	38,700	....	....	54,920	....	....	77,400	....	....	109,300
5	....	....	...	....	....	50,450	....	....	62,000	....	....	88,000	....	....	124,000	....	....	175,100

tween the several rooms of the building. Form 6, published herewith, provides a convenient means of scheduling radiation.

RULE 19 . . . To locate radiation and risers:

(1) Where total radiation for the room does not require more than one radiator or convector, locate it beneath a window on the coldest side of the room. Study heat load data on Form 1 to find which exposed wall or window introduces the maximum loss.

(2) Where total radiation for the room must be divided among two or more radiators, distribute them along the sides having the greatest exposure or heat loss in approximate proportion to the amount each wall contributes to the total load. Enter selected radiators or convectors on Form 6 as noted thereon.

(3) By placing one floor plan (in tracing form) above the other, adjust these tentative locations to minimize the number of risers needed to serve all radiation. Horizontal branches from risers should seldom exceed 5 to 8 feet and then only when there is adequate pitch from radiator to riser.

(4) Check space requirements for branch connections and fittings by comparison with accompanying diagrams for the system under consideration to determine how lines may be concealed or how they may affect construction. Also follow risers down through structure to find any possible interference with structural members and either adjust location of riser, provide space for offsets and fittings or modify construction details as required.

LOCATION OF SUPPLY AND RETURN MAINS

WHILE the arrangement of supply mains and wet or dry returns (or both) will vary according to the system employed, the following procedure will suffice for a study of pipe locations and clearances, ceiling heights and other similar planning problems.

RULE 20 . . . To locate boilers:

(1) Tentatively select a location in basement which places boiler as near equi-distant as possible from the bottom of all risers.

(2) Adjust this location to bring boiler as close as possible to the chimney. A minimum distance of two feet is usually required for access back of the boiler and for flue connection, but otherwise this should be as short and as direct as possible and it should not pass through partitions of any type except solid masonry.

RULE 21 . . . To locate steam and vapor supply and return mains:

(1) Make tentative layouts for one or more supply mains pitched from a high point above the boiler and connecting the bottom ends of all supply risers, until an arrangement has been found that places risers serving the rooms requiring heat first (such as bathrooms and dining rooms and those of such importance as living rooms in residences) among the first group connected to the mains from the boiler. Risers serving rooms of minor importance and those

having the least exposure may be taken off near the ends of the mains. At the same time strive for minimum length of mains and freedom from interference with other uses of basement (or attic space if system is of down-feed type).

(2) From the ends of supply mains (where last risers are connected) lay out wet or dry return lines (or both) according to the needs of the system, connecting to all return risers and terminating at the boiler. Wet returns may be below floor grade if in well drained trenches covered with removable slabs for access to piping. If it is desired to help balance the system by making the length of circuit through all radiators practically equal, pitch the returns so that radiators are connected in the reverse order to which they are taken off the supply.

(3) Check tentative layouts of both supply and return mains for interference with structural members, basement windows or doors, plumbing lines, headroom and for appearance in areas that may be used for recreational purposes. Headroom may be checked by figuring pitch of mains as follows: all supplies pitched against the steam flow 1/10 inch per foot; all supplies pitched with the steam flow, and all returns, 1/16 inch per foot. Minimum height of low point in dry returns and ends of supply mains above boiler water level 18 in. to 2 ft.; above level of receiver 12 in. minimum, with water level of receiver at least 8 in. above boiler water line. Greater heights are advantageous wherever available.

Methods of handling radiator connections to risers are shown in Fig. 7. Provision of angle offsets to allow for expansion and contraction of piping is essential and must be considered in selecting riser locations.

APPROXIMATE SIZING OF PIPES

THE detailed determination of exact pipe sizes to secure satisfactory operation, minimum line losses and low cost is beyond the scope of this article. Approximations adequate for determining space requirements in floors, walls and partitions and headroom in basement can be estimated as follows.

RULE 22 . . . To determine approximate size of steam supply mains and risers:

(1) Prepare a riser diagram similar to Figure 5 to scale vertically but without horizontal scale, and indicate the EDR of each radiator in square feet and the total carried by the riser.

(2) Assume for the present that the "equivalent" length of pipe in each run is *double* the actual length in feet, and find the number of hundreds of feet of equivalent length from boiler to farthest radiator.

(3) Assume a *total* drop in pressure for the system from the following data:

	Small, Compact Systems		Large or Extended Systems
All vapor and gravity systems	1/8 lb.	to	1/4 lb.
Two-pipe vacuum systems.	1/4 lb.	to	1 lb.

Note that the lower the pressure drop for which the system is designed, the better the system, but the larger the pipes required.

(4) Divide the assumed total pressure drop by the number of hundreds of feet of equivalent length of the longest run (as in Par. 2 above) to find the pressure drop per 100 feet. Use this pressure drop for all parts of system.

(5) Refer to Tables 14 and 15 and to your riser diagram and begin sizing the pipes tentatively, starting with the radiator branches and run-outs at the most remote radiators and proceeding back toward the boiler. For sizing the supplies use data in the various lettered columns of Table 14 thus: Where columns B to G inclusive are used select column for the pressure drop per 100 feet nearest to that found by Pars. 3 and 4 above. Otherwise use columns as indicated in the table headings.

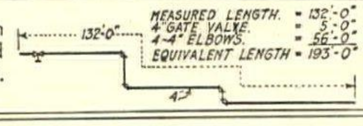
Size the returns from data in Table 15, using the same total drops and equivalent lengths of runs as for supplies. Use figures in the column corresponding to the kind of return being sized, i.e., wet, dry or vacuum.

(6) Having tentatively determined the probable pipe sizes, the process is repeated after finding the "equivalent" length of runs more accurately from Table 16. Each elbow, tee and valve introduces resistance greater than an equal length of pipe. Hence to the actual length of a riser or run in feet there must be added an allowance for each fitting as given in this table and in the example accompanying it. Where the actual equivalent length is greater or less than the estimated equivalent length (Par. 2, above) refer again to Tables 14 and 15 and correct the pipe sizes tentatively chosen. However, one-pipe system mains should not be less than 2″ and two-pipe system mains less than 1½″ at any point. In small systems supply mains are frequently made of one size to avoid reducers.

TABLE 16. EQUIVALENT LENGTH OF PIPE
Showing the length in feet of pipe to be added to actual length of run, owing to fittings.

SIZE OF PIPE INCHES	ST'D. ELBOW	SIDE OUTLET TEE	GATE VALVE	GLOBE VALVE	ANGLE VALVE
	LENGTH IN FEET TO BE ADDED IN RUN				
2	5	16	2	18	9
2½	7	20	3	25	12
3	10	26	3	33	16
3½	12	31	4	39	19
4	14	35	5	45	22
5	18	44	7	57	28
6	22	50	9	70	32
7	26	55	10	82	37
8	31	63	12	94	42
9	35	69	13	105	47
10	39	76	15	118	52
12	47	90	18	140	63
14	53	105	20	160	72

Example of length in feet of pipe to be added to actual length of run.



From A.S.H.V.E. Guide, 1934, page 446.

Design of Hot Water Radiation Heating Systems

THE general principles of radiator, riser and main locations indicated in Rules 19, 20 and 21 apply to hot water radiation heating systems, with slight modifications as indicated below.

The sizing of pipes for hot water systems is wholly different from steam or vapor practice and is far more complex, unless rule-of-thumb methods are adopted. This is due to the fact that in hot water systems relying upon gravity circulation, friction losses must be exactly balanced to bring the proper quantity of water to each radiator. In small work such as residences and stores where the system is compact, the short cut method of sizing pipes may be used with reasonable satisfaction. But with larger systems it is almost essential to good results to entrust the design to a consulting engineer experienced in this work.

Loads are designated in square feet equivalent hot water radiation at 150 Btu per hour instead of equivalent direct radiation (EDR).

In contrast to steam and vapor systems, hot water flow and return pipes are of the same size. While the pipes of a gravity hot water system might be considerably larger in size than for a comparable low pressure steam system, the absence of return traps on radiators and traps or pumps at the hot water boiler may approximately balance their costs. In large forced hot water systems the flow and return pipes may be less than one half the area of comparable low pressure steam flow pipes.

Mains and risers may be disposed with somewhat more freedom than with steam. While piping arrangements for hot water are not standardized, the diagram shown in Fig. 4 indicates a common layout.

In addition to careful sizing of pipes it is necessary to use different kinds of connections of branches to mains to assist in balancing flow between outlying and nearby radiators. Several such connections are shown in Fig. 4. Orifices are also used for this purpose in large installations.

Two-pipe forced circulation systems, whether open or closed, are far less susceptible to unbalancing than gravity systems as the motive force supplied by circulators or pumps is several pounds per square inch while in gravity systems it is generally but a fraction of an inch of water.

SHORT CUT METHOD OF SIZING HOT WATER RADIATION PIPING

THE methods given in Rules 23 and 24 are suitable for use only with small compact systems or for roughly estimating pipe sizes for general planning and clearance purposes in large systems.

RULE 23 . . . to estimate pipe sizes for small two-pipe gravity open hot water systems:

(1) Find in Table 17 the pipe sizes for all radiator connections and risers, using actual pipe lengths instead of equivalent lengths.

(2) Find in Table 18 the factors for each size of pipe selected for radiator connections and risers for each branch from any main. Add these factors.

(3) Use the pipe size for mains which corresponds to the factor in Table 18 nearest to the sum of the branch factors.

RULE 24 . . . to estimate pipe sizes for two-pipe gravity closed hot water systems:

(1) Proceed as in Rule 23 except use Table 19 instead of Table 17 for pipe sizes and factors from Table 18 as before. This change allows for the fact that closed systems may operate at any predetermined pressure and temperature up to 240 F.

There is no corresponding short-cut rule for estimating pipe sizes in forced circulation hot water systems. The object in exactly sizing pipes in such installations is to arrive at an economic balance between pipe size, pipe losses, the cost of the circulating equipments and operating costs. These considerations fall within the province of experienced engineering counsel. It is usually sufficient for design purposes to know that on small systems forced circulation will permit reduction of pipe sizes 20% to 35% and on large installations up to 50% of the sizes used for gravity work.

TABLE 17. OPEN GRAVITY HOT WATER SYSTEMS

Square feet of hot water radiation (equivalent to 150 Btu per hour) allowable on risers up to 100 ft. in height.

NOMINAL PIPE SIZE INCHES	DISTANCE CENTER OF RADIATOR ABOVE CENTER OF THE BOILER IN FEET									
	10	20	30	40	50	60	70	80	90	100
¾	40	50	60	70	80	90	100	110	120	130
1	70	80	90	100	110	120	130	140	150	160
1¼	110	120	135	150	160	175	185	200	210	225
1½	180	185	210	230	250	265	285	300	315	330
2	300	350	400	500	575	625	700	775	825	900

TABLE 18. FACTORS FOR VARIOUS SIZES OF PIPE IN GRAVITY HOT WATER HEATING

	NOMINAL SIZE OF PIPE INCHES										
	¾	1	1¼	1½	2	2½	3	3½	4	5	6
Factor	5	10	20	30	60	110	175	260	380	650	1050

TABLE 19. CLOSED GRAVITY HOT WATER SYSTEMS

Square feet of hot water radiation (equivalent to 150 Btu per hour) allowable on risers.

PIPE SIZE INCHES	FIRST FLOOR	SECOND FLOOR	THIRD FLOOR	FOURTH FLOOR
½	30	40	50	60
¾	60	75	90	110
1	110	120	135	150
1¼	165	180	200	225
1½	270	290	315	350
2	450	525	600	750

The table of factors at left is used for determining the sizes of mains after risers and radiator connection sizes have been obtained from Tables 17 or 19

Air Circulating Systems for Heating and Cooling

As noted in the preceding article "Heating, Cooling and Air Conditioning" (July 1934) practically all warm air heating and ventilating systems are directly adaptable to all-year air conditioning. Even when they are initially intended for heating or winter air conditioning only, they should be designed with thought to their ultimate adaptation to summer air conditioning as well. Hence in this section the design of distribution systems employing ducts for the distribution and recirculation of treated air will be considered with relation to both heating and cooling.

No distinction will be made here between systems employing a warm air furnace for heating air and those employing indirect heating coils in an air conditioning unit of any type. The design principles presented may be applied to combination systems or to the so-called unit conditioners serving a single room, as well as to central systems.

Nor will consideration be given to pipeless and duct-type gravity warm air systems, the design of which is adequately covered in standard works and is familiar to most readers. Duct sizes required for gravity circulation of air are larger than those used in forced circulation systems, hence the former may usually be adapted to the latter with few changes.

CHARACTERISTICS OF MAJOR ELEMENTS

Registers and grilles are of two basic types; those which function primarily to decorate and partly to conceal the discharge or intake ends of ducts, and those which are designed to control direction, velocity, or other characteristics of the air stream.

Decorative or plain register faces are measured by their overall size multiplied by the percentage of their face area which is devoted to clear openings. Thus a grille or register face 2′ x 4′ has a superficial area of 8 square feet. If the pattern provides 50% clear opening the net free area is 4 square feet; if 65% it is 5.2 sq. ft., etc. Since duct velocities are usually greater than is desired at outlets, the duct connection is usually enlarged and a grille face chosen that has a free area corresponding to the desired velocity.

Directional control is often advantageous as it may permit the use of outlet locations other than those theoretically ideal. The air is then caused to flow or diffuse into the desired zone by the shape of the vanes forming the grille face. See Fig. 8.

In general the shape of a register is governed by the flue size and construction limitations. But if a choice of shape can be made, place the longest dimension of outlet faces horizontally to secure wide diffusion, and keep the shape of return air faces approximately the same as that of the ducts they serve. Outlet registers should not have a length over four times their width.

Ducts may be round or rectangular. For a given sectional area a round duct will carry more air than a rectangular duct. In no case should a rectangular duct have a width over four times its depth. Plenums, or air passages formed by construction surfaces, are seldom used as their resistances cannot be determined accurately or their behavior anticipated. Ducts are usually made of 22 to 24 gauge (heavier in large work) galvanized iron or copper-bearing alloys. There are also types made of moulded materials such as asbestos cement for special applications where iron would corrode rapidly.

Heat losses from ducts may be reduced: (1) by the use of permanently bright surfaces having low emissivity, and (2) by considerable thicknesses of duct insulation of hair felt, cellular asbestos, mineral wool, etc. Inflammable materials must not be used on heating ducts and moisture-proof covering should be used on cooling ducts. A single thickness of asbestos paper applied over a metal duct increases its losses above those of the bright metal surface alone.

Duct fittings increase the resistance to the flow of air more than straight runs, hence their number should be kept to a minimum and all elbows or bends should be of the largest radius space limitations will permit. The radius to the center of the duct should not be less than one to one and one-half times the duct diameter. Special fittings are available to minimize loss of head at bends. These may be of the venturi or streamlined type or may be angle bends fitted with curved vanes or dividers as shown in Fig. 8. See manufacturers' data for their use.

A damper should be placed in each main duct and branch to assist in balancing the system. Branches should be taken off main ducts with easy bends and should be fitted with adjustable deflectors for final adjustment of air flow.

Types of duct systems include: (1) Individual mains from the furnace or conditioner bonnet to each room or to each outlet, with individual return ducts. This is the simplest system to design and balance. (2) Main ducts with branches, the main ducts being reduced in size at each branch to balance the flow of air proportionately throughout the system. Recirculating ducts or returns are similar. This is the system used on large work; it requires better design and should be entrusted to a competent engineer.

LOCATION OF REGISTERS

Most important in the design of a satisfactory forced air heating or cooling system is the proper location of supply registers and return air intakes in each room. The objective is to force the warm or cooled air to be widely diffused throughout the room without creating drafts before it is drawn into the return face for recirculation.

Because it is desirable to keep the length of supply ducts at a minimum and to group them as closely as possible to the furnace or tempering cabinet, it is customary to place supply risers in partitions and to avoid locating them on cold outside walls. To effect adequate diffusion and circulation the return air faces are usually placed as far across the room as possible and ordinarily beneath windows or where there is a maximum amount of cold air.

Warm Air Supply Registers may be located in the baseboard. They may also be located beneath window sills or in cabinets forming window sills if their operation at this height in the wall cannot be blocked by the placement of furniture against the register. They may also be placed high in side walls or in ceilings if return air faces are positioned to assure prompt removal of cold air at the floor.

Cold Air Supply Registers should be located high in the side walls and air should move through them with enough velocity to distribute it over the room but not in such a manner as to come in contact with the occupants before it has widely diffused. It is also possible to place cold air supplies in the ceiling with diffusing plates under them for directing the air horizontally over the entire ceiling.

Cooling requirements introduce limitations in the use of a common supply duct system for both summer cooling and winter heating. Cold air tends to fall rapidly to the floor forming a cold blanket that causes discomfort while warm air tends to rise and form a warm blanket at the ceiling. Furthermore, cold air must be projected at higher velocities than warm air to secure thorough diffusion but causes perceptible drafts which may not be felt with warm air at the same velocity. It is, therefore, seldom good practice to use a baseboard or low, warm air register inlet with horizontal discharge for cooling.

All-Year Air Conditioning may nevertheless utilize a common system of supply ducts and a common system of returns for both heating and cooling.

In rooms having ceiling heights ten feet or less, both heating and cooling supplies may enter through common ceiling registers, properly located and equipped with diffusing plates.

Supply registers may be placed high in side walls for both heating and cooling.

Common supply registers may be placed in cabinets or window sills where air may be projected toward the ceiling without striking occupants.

Where the volume of air needed in summer varies widely from that wanted in winter in a given room, a separate duct may be brought from the furnace or conditioner to supplement the all-year duct. In this case the auxiliary duct must be shut off at the furnace or conditioner when not in operation. Usually summer and winter air volumes can be balanced by designing for suitable temperatures as in Rule 26.

Design of Duct Systems

THE following procedure may be used to design small residential air circulating systems for heating and cooling and to approximately determine the required sizes of ducts, registers and return intakes for larger installations. The simplified rules used here do not consider the variation in air volume due to temperature for the reason that its effect upon the operation of small systems is less than the effect of the variations in some of the assumptions which must be made in any such problem.

A clear understanding of the following relationships and terms will assist in using this procedure:

The area in square inches of any duct or register opening is found by dividing the volume in cubic feet per minute (cfm) by velocity in feet per minute (fpm) and multiplying the quotient by 144 (to convert square feet to square inches). If any two of these three factors, cfm, fpm or area are known the other can be found by transposing this rule.

In order to assure adequate air movement in the room to prevent stratification it is desirable to move enough air to effect from four to eight complete circulations per hour. See Table 3 in preceding article (July, 1934) for data on recommended air circulation in different types of space. This places a certain minimum limit upon the volume of air to be circulated per minute. The latter may be found by multiplying the volume of the room in cubic feet by the desired number of air circulations per hour and dividing the product by 60. This should not be confused with air changes due to infiltration or ventilation which refer to the number of times the indoor air is renewed with air from out of doors.

Obviously there is frictional resistance to be overcome in ducts, filters, air washers, furnace casings and other parts of the system. It is necessary to determine this resistance for two reasons: (1) The total static resistance of the entire system including ducts and all central elements determines the static pressure which must be developed by the fan in order to move the desired volume of air. (2) The static resistance of the various ducts must be balanced to assure uniform distribution.

Two factors contribute to the static resistance of ducts: (1) Velocity head, which is a pressure (expressed in inches of water) needed to maintain a given velocity of air through a duct without considering the effect of friction. (2) Friction head, which is a pressure (also expressed in inches of water) needed to overcome the friction caused by air in contact with the duct. Both of these factors are embraced in the rules which follow.

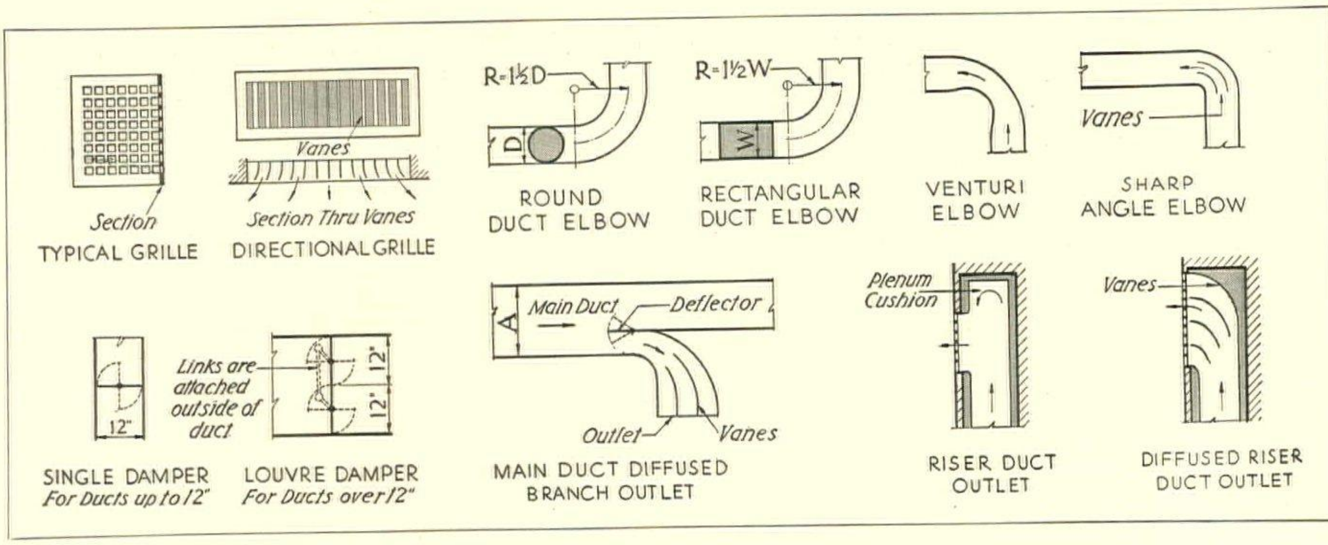


Fig. 8. Details of warm air heating and air conditioning ducts and outlets

WORK FORMS

REFERENCE is now made to the data developed in "Heating, Cooling and Air Conditioning" July 1934 and to the four work sheets (Forms 1 to 4 inclusive) upon which project data have presumably been entered. The work sheet, Form No. 5 presented here is recommended as a convenient form for entering calculations of air circulation and duct and register sizes.

AIR CIRCULATIONS

TRANSFER from Form 1 to Form 5 the number and name and the volume of each room in cubic feet, entering these items in Cols. I and II. From Form 3 take the cubic feet of air to be circulated per minute through each room and enter on Form 5, Col. III. For winter heating this cfm is found in Col. V of Form 3; for summer cooling use the cfm from Col. XI.

Where the duct system is to be used for both heating and cooling two sets of calculations should be made, each on a separate sheet. Balancing the system will be done after discrepancies are developed in these parallel calculations.

RULE 25 . . . to secure the desired number of air circulations in each room to prevent stratification, etc.:

(1) Divide the cubic feet per minute entered in Form 5, Col. III, by the volume of the room in Col. II. This will give the number of air circulations per minute. Multiply by 60 and enter the product in Col. IV as the number of air circulations per hour.

(2) If the air circulations per hour thus found are within 10% or so of the desired air circulations as recommended in Table 3 (July 1934), the assumed register temperature used in Form 3, Col. III for winter or Col. IX for summer may be considered substantially correct. But if the number of air circulations is higher or lower than is required *in the principal rooms* proceed as follows:

(3) If the air circulations in winter are greater than is desired, revert to Form 3 and tentatively select a higher register temperature and its corresponding factor in Table 9 (July 1934) and compute the air volume to be circulated as indicated on Form 3, Col. V. It will be found that the cfm is reduced by the higher register temperature. If the air circulations are insufficient select a lower register temperature and proceed as above.

(4) If the air circulations in summer are less than is necessary select a higher register temperature (Form 3, Col. IX) and its factor as above and proceed as in (3). To decrease the circulated volume choose a lower minimum register temperature, but do not drop below the outlet temperatures recommended in Table 4 (a) (July 1934). It is better in summer to have excessive circulation than abnormally low register temperatures.

Note that the register temperature for the entire system served by a single heater or cooler must remain the same. Hence the important rooms should govern the design, permitting minor rooms to have more or fewer air circulations than is desired.

RULE 26 . . . to balance air circulation for both summer and winter use of the same ducts:

(1) After summer and winter air circulations have been adjusted as in Rule 25 compare the volume of air to be moved for heating and cooling. It is desirable to have them the same, or to have summer volumes in the principal rooms uniformly higher than winter volumes. If the latter is done the fan speed can be increased in summer to provide the necessary increase in volume and velocity: if both requirements are the same, no change is necessary. If one or two rooms require abnormally large differences in summer and winter volumes and the rest of the system is fairly well balanced, an auxiliary duct and register can be provided for each of these rooms, to be used only during the cooling season.

(2) Restudy the air volumes (cfm) and regis-

ter temperatures to find means of adjusting the volume of air for heating to a definite ratio with the volume needed for cooling. This ratio should be within the adjustment range of the fan speed. In most projects such compromises can be made without departing from recommended practices. Use these adjusted figures for the remaining calculations, entering them in Form 5, Col. III (for cfm).

DUCT AND REGISTER SIZES

RULE 27 . . . to find the area in square inches of any supply or return duct:

(1) Select velocities in ducts from the following recommended practices: main supply and return ducts 600 to 800 fpm; risers, 400 to 500 fpm; runouts (or connections) to grilles, 300 to 400 fpm. These velocities are conservative and may be increased by 50% on large work, but construction must be good and ducts built in or covered to eliminate air noise if velocities are thus increased.

(2) Divide the volume of air to be circulated (cfm) entered in Form 5, Col. III by the desired velocity in the duct in feet per minute (fpm) and multiply the quotient by 144 to reduce to square inches. Enter in Form 5, Col. V the area of supply ducts and in Col. VIII the area of return ducts (these being the same under this method of calculation). In Cols. VI and IX enter the selected dimensions as diameter of round pipe or width and depth of rectangular ducts. The two sets of columns are provided for cases where one return, as in a central hallway, handles the air brought in by more than one supply.

RULE 28 . . . to find the free area in square inches of any register or inlet grille:

(1) Select the desired velocity through the register face from the following data: [It may be noted that the Mechanical Warm Air Heating Code permits higher velocities (and consequently smaller registers and greater danger from drafts) than are here recommended for warm air inlets above head height and those discharging horizontally in the breathing zone. The Code allowances are 500 and 300 fpm respectively for the first two conditions.]

WARM AIR INLETS

(1)	above head height	250 to 350 fpm
(2)	discharging horizontally in breathing zone	100 to 200 fpm
(3)	discharging vertically along walls or in front of windows	500 to 800 fpm
(4)	in ceilings over 15 ft. above floor	400 to 600 fpm

COLD AIR INLETS

(5)	in breathing zone	100 to 150 fpm
(6)	above breathing zone	200 to 300 fpm
(7)	in ceilings under 15 ft. with deflectors beneath	300 to 400 fpm
(8)	in ceilings over 15 ft. high with deflectors beneath	400 to 600 fpm

RETURN AIR OUTLETS

(9)	above breathing zone	300 to 400 fpm
(10)	in walls at floor (baseboard)	150 to 350 fpm
(11)	in floor	100 to 200 fpm

(2) Divide the volume of air to be circulated (Form 5, Column III) by the selected velocity through the register in feet per minute and multiply the quotient by 144. This will give the free area in square inches desired in the supply register or return intake grille. Enter in Form 5, Column XI, for supply registers and Column XIII for return air intakes.

(3) Select register sizes which will provide the required free area and enter the selected dimensions for supply registers in Column XII. Do likewise for return intake grilles and record dimensions in Column XIV.

MAIN DUCT SIZES

IF a system comprising main ducts and branches is to be used instead of individual ducts from basement to each register the following rule-of-thumb method may be used for approximately determining the size of trunk line ducts. It applies to both supply mains and return mains. It is not sufficiently accurate for large work but will suffice for general planning purposes.

RULE 29 . . . to find the size of main trunk ducts between furnace or air conditioner and branches:

(1) Determine size of branches or risers as in Rule 27.

(2) Starting at the extreme end of the duct and working back toward the furnace or conditioner, add the areas in square inches of the two or more branches which leave the end of the trunk and deduct 10% of this area to find the required area of the trunk duct at this junction.

(3) At the next junction of one or more branches with the trunk, add the area of these branches to the area of the preceding trunk section and again deduct 10% to find the area in square inches of the trunk ahead of this second junction point. Proceed in this way until all branches have been taken off.

(4) In no case, however, shall the area of the main duct at the heating or conditioning unit be less than 70% of the sum of all the branches from the main duct.

STATIC RESISTANCE IN DUCTS

IN the following procedure, the length of ducts is measured in terms of diameter in the case of round ducts and in terms of the short dimension of rectangular ducts.* Where round ducts are used refer to any table showing areas of circles to find diameters corresponding to the duct areas entered in Form 5, Columns V and VIII.

The actual length of ducts must be increased by an allowance for each ell or bend. Add to the measured length for each ell or bend a length equivalent to ten diameters of round ells or eight times the short dimension (or the more accurate equivalent diameter as explained below*) of rectangular ells.

*A more accurate method of sizing rectangular ducts uses an "equivalent diameter"; which is the diameter of a round pipe having the same frictional resistance as a given rectangular duct. These equivalents are published in the Mechanical Warm Air Heating Code and in A.S.H.V.E. Guide, 1934, pages 264-5.

The friction drops in ducts are determined on the following assumptions:

(1) It is assumed that each length equal to 40 diameters of round ducts or 40 times the short dimension (or equivalent diameter) of rectangular ducts will produce a "velocity head" of friction. It is also assumed that an air velocity of 4,005 feet per minute is equivalent to a velocity head of one inch of water and that the velocity head is proportionate to the square of the velocity. These assumptions are explained for the purpose of checking this procedure against other methods in common use. But the following rules may be used without a more detailed understanding of their origin.

RULE 30 . . . to find static resistance (friction drop) in ducts:

(1) Find in Table 20 the velocity head which corresponds to the velocity selected for the duct under consideration. If the desired velocity is not included in this table, divide the velocity in feet per minute by 4,005 and square the quotient. The result is the velocity head for that velocity in inches of water.

(2) Find the length of the duct in diameters by dividing the actual length in feet by the diameter of round pipe in inches or by the short dimension (or equivalent diameter) of rectangular duct in inches and multiply by 12. Add to this net length in diameters an allowance of 10 for each round, and 8 for each rectangular ell or bend. This will give the equivalent length in diameters.

(3) Multiply the equivalent length of the duct in diameters by the velocity head in inches of water as found in paragraph one above and divide the product by 40. This will give the total friction loss for the duct in inches of water.

Example: Assume a round duct 8″ in diameter, 100 feet long with two bends or ells; the length in diameters is $\frac{100}{8} \times 12 = 150$ diameters. The equivalent length (allowing for bends) is $150 + 10 + 10 = 170$ diameters. If the velocity is 400 feet per minute the velocity head is .01″ of water (as found in Table 20). Therefore, the friction loss is

$$\frac{150 \times .01}{40} = .0375'' \text{ of water.}$$

(4) Enter the friction loss for each supply duct in Form 5, Col. VII, and for each return duct in Col. X.

BALANCING THE STATIC RESISTANCE IN DUCTS

IF one duct offers more resistance to the flow of air than other ducts in the system, the one showing high resistance would not carry its proportionate share of the air moved by the fan. It is, therefore, necessary to balance the static resistance so there will be the same friction drop in each circuit leading out from the apparatus.

RULE 31 . . . to balance the static resistance for various ducts in a given system:

TABLE 20. VELOCITY HEADS FOR NORMAL DUCT VELOCITIES
For Dry Air at 70 F

Velocity in Duct Feet per Minute	Velocity Head Inches of Water
300	.0056
400	.0100
500	.0156
600	.0224
700	.0305
800	.0399
900	.0505
1000	.0623
1200	.0898

(1) If the static resistance or friction loss of a given duct, as found in Rule 30, needs to be decreased to balance it with the friction loss in the majority of the other ducts, tentatively select a lower velocity and correspondingly larger size of duct and repeat the computations in Rule 30 until a static resistance is found which will balance with the majority of circuits. An alternative is to study the relocation of the duct to reduce the number of bends and thereby reduce its equivalent length.

(2) If any duct shows an abnormally low friction loss in comparison to the majority of circuits, refigure using a higher velocity and a correspondingly smaller duct size.

(3) Friction loss through the several ducts comprising the system as shown in Cols. VII and X of Form 5 should not vary one from another more than 10% above or below the average.

STATIC RESISTANCE OF SYSTEM

TO the friction losses of the duct system must be added friction loss from apparatus to find the total static resistance which must be overcome by the fan in order that it may move the required volume of air.

RULE 32 . . . to find the total static resistance of the entire system including ducts and apparatus:

(1) The friction loss of the duct system is not the sum of the friction losses through each duct, but is the greatest friction loss of any circuit.

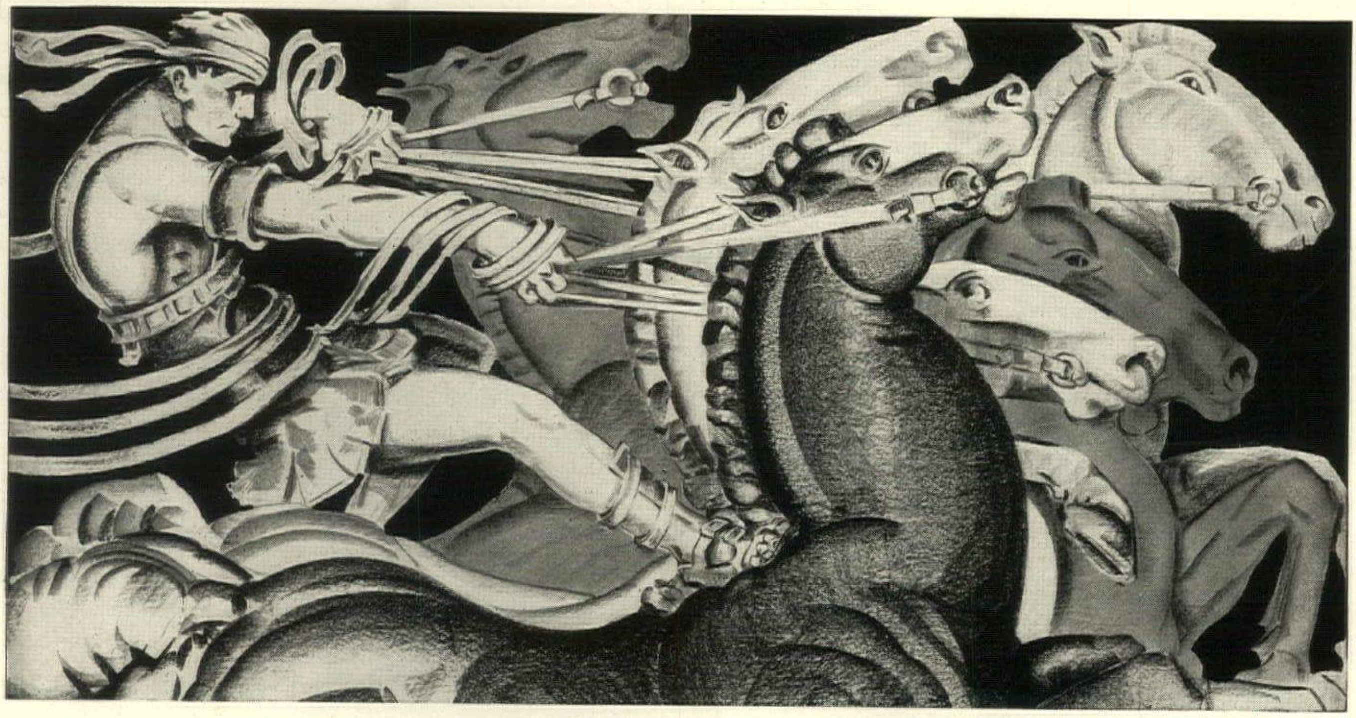
(2) Obtain from the manufacturer's data on the particular apparatus to be used the friction loss through apparatus, or in lieu of actual data, assume the following average losses: Filters, ⅛″ to ¼″; Air Washers, 1/10″; Steam Heating Coils and Cooling Coils, ⅛″ to ¼″; Furnaces, ⅛″.

(3) Add the apparatus resistances to the resistance of the duct system. If the total indicates a pressure or static resistance above the usual standard pressure rating of the selected fan, adopt either of these alternatives: (a) increase the speed of the fan, if to do so will not introduce undesirable noise or; (b) redesign the system to reduce its friction loss. In the latter case, ducts are made larger, velocities are decreased, the number of ells or bends may be reduced, or apparatus with less friction selected.

This article has been prepared by the Technical Editor in consultation with Perry West, M.E., consulting engineer, Newark, N. J.

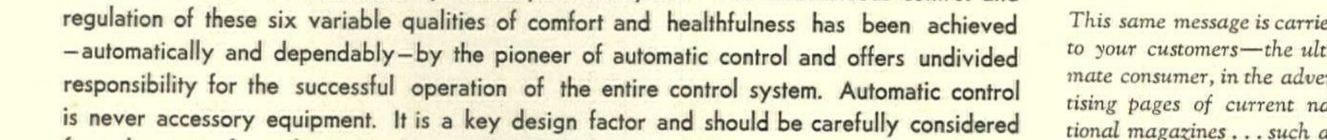
Controlled

. . . IN ONE HARNESS . . .
EVERY "COMFORT FACTOR"
IN HEATING AND COOLING



Like spirited animals reined to a single hand, the six climate factors of true air conditioning are subdued to perfect teamwork by Minneapolis-Honeywell. This simultaneous control and regulation of these six variable qualities of comfort and healthfulness has been achieved —automatically and dependably—by the pioneer of automatic control and offers undivided responsibility for the successful operation of the entire control system. Automatic control is never accessory equipment. It is a key design factor and should be carefully considered from the start of any heating or air conditioning project in either new or existing buildings.

This same message is carried to your customers—the ultimate consumer, in the advertising pages of current national magazines . . . such as Colliers, Time, Fortune, etc.



MINNEAPOLIS-HONEYWELL

AUTOMATIC CONTROL SYSTEMS

HOW THE Modutrol System . . .

TO provide the comfort for which heating and cooling plants are designed, controls must be applied that will maintain uniform conditions indoors regardless of the varying moods of Nature or the changing influences of man's activities.

Individual rooms, zones or whole buildings are kept at the desired temperature by Minneapolis-Honeywell thermostats of which there are many types (to meet every known need). Most advanced are the Chronotherm, a master, time-governed control; and the Proportioning Thermostat that reflects minute variations in temperature . . .

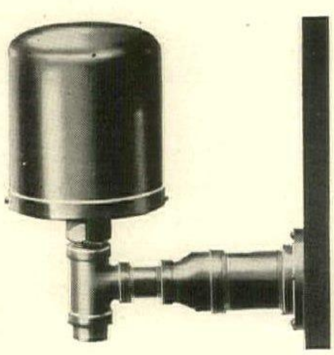
THE MODUTROL SYSTEM automatically and instantly responds to more than a dozen varying influences, balancing and coordinating them more swiftly and surely than human supervision could accomplish. It governs, according to need, the operation of every element in any heating, cooling or air conditioning installation.

OUTDOOR TEMPERATURE is the greatest variable any control system must counteract. In mild weather the controls must completely shut off both heating and cooling equipment, though perhaps maintaining air circulation through washers or filters. In severe weather they must respond through a temperature range often exceeding 100° F.

SUN EFFECT modifies the apparent outdoor temperature on one or two sides of a building at any time.

WIND EFFECT tends to lower indoor temperature on the exposed sides.

THE WEATHERSTAT . . . an exclusive feature of the Modutrol System, is the only practical device that reflects and responds to all four of these outdoor variables, air temperature, wind direction, wind velocity and solar radiation. Placed outside the building exposed to the same forces that affect the zone or structure it controls, the Weatherstat is like a miniature house in itself. As sun, wind, and air temperature combine to affect its internal temperature, so this sturdy device governs the operation of heating equipment indoors . . . By means of Weatherstat control, just enough heat is delivered to each zone to balance the losses from the building. No waste heat is generated; fuel bills are reduced.



The ingenious and exclusive Weatherstat, placed outside the building, responds to wind and sun effects as well as air temperature and governs the supply of heat indoors accordingly.

INDOOR VARIABLES exceed in number those for which Nature is responsible. They change from room to room and zone to zone. If left uncontrolled, the AVERAGE indoor temperature may be 70° F yet no single occupant may be comfortable. To assure uniform comfort indoors the Modutrol System controls each area according to its own needs.

REQUIREMENTS OF OCCUPANCY are reflected in the necessity of different temperature levels in different rooms or zones of a building. An office, for example, requires a higher temperature than a shipping room; a nursery a different temperature than a garage. The Modutrol System readily provides for and maintains temperature levels to meet the occupancy requirements.

ADDITIONAL HEAT SOURCES, such as lights, motors and body heat generated by activity or by increasing the number of occupants often change the demands on the heating plant itself. With the Modutrol System, the heating or cooling system is automatically adjusted in proportion to these extra heating effects.

THE SIX WEATHER VARIABLES, CHANGING HOURLY AND DAILY, ARE MASTERED BY THE MODUTROL SYSTEM

WARMING SUNSHINE — COOL SHADE — COOLING WINDS — MILD WEATHER (SPRING-FALL) — WINTER BLIZZARDS — SUMMER HEAT

MINNEAPOLIS-HONEYWELL

AUTOMATIC CONTROL SYSTEMS

MASTERS THE VAGARIES OF MAN AND NATURE

Individual radiators may be controlled by the Modustat or by a motorized radiator valve which automatically deliver only as much heat as the room requires. Yet if the occupant desires, he can instantly change the temperature level (or shut off the radiator entirely) by a twist of the Modustat handle or by a simple movement of the room thermostat.

NIGHT, WEEK-END AND HOLIDAY SHUT-DOWNS represent periods of changed occupancy. The Modutrol System, controlled by a program clock, automatically reduces heat delivery during these periods, saving an average of 15% or more in fuel consumption over constant temperature systems. Yet individual areas may be heated to normal during these periodic shut-downs.

BALANCED CONTROL within individual rooms, in each zone and throughout the whole structure is the outstanding characteristic of the Modutrol System. It is adapted to residences as well as to skyscrapers. Electric wires, easily concealed, make its installation simple and inexpensive. Sturdy, time-tested control devices, often combining in one unit the functions of several old-style mechanisms, assure simplicity and economy of operation and maintenance.

INDIVIDUAL ROOMS are governed by Modustats (self-contained thermostatic valves) on each radiator, or by a room thermostat governing motorized valves on each of several radiators. Manual changes can be made in each room without affecting the master automatic controls.

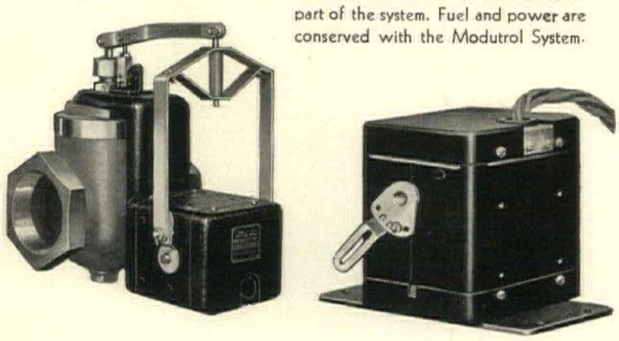
ZONES are controlled by one or more zone thermostats or Weatherstats governing motor-operated valves on steam lines or Modutrol Motors that move dampers or louvres in duct systems.

HEATING, COOLING AND AIR CONDITIONING APPARATUS of all types is governed by these sensitive controls. They send their commands to Minneapolis-Honeywell safety and operating devices on the boiler or furnace, humidifier, fans, cooling equipment and air washers, according to the nature of the installation. Here the needs of the building are translated into action; more or less heat is generated or more or less refrigerating effect produced. If desired, each zone and each unit of equipment may be governed from a central supervisory control board. Steam and power are conserved—operating costs are reduced; yet there is no deviation from desired comfort conditions.

MODUTROL SYSTEMS ARE BUILT FOR YOUR PARTICULAR PROJECT. While each system is a simple arrangement of thermostatic controls, pressure controls and motor operated devices, variations in building requirements have required the development of many models of the basic units.

A LARGE STAFF OF EXPERIENCED TECHNICAL ENGINEERS is maintained to assist you or your engineer in developing a Modutrol System for your particular building. This service is free. Minneapolis-Honeywell always seeks the opportunity to check every installation and make recommendations because we want every job to function as it should. Obtain our recommendation early. The Modutrol System can save you money, not only in the control equipment itself, but in operating expense and often in the selection of other apparatus as well. Minneapolis-Honeywell Regulator Company, 2738 Fourth Avenue South, Minneapolis, Minnesota. Branch and distributing offices in all principal cities.

Slender electric wires, easily installed and completely concealed, carry the commands of each controller to sturdy motor operated dampers or louvres or to motor operated valves that control conditioning and the exact delivery of heated or cooled air to each zone or part of the system. Fuel and power are conserved with the Modutrol System.



THE SIX FACTORS RESULTING FROM MAN'S CHANGING ACTIVITIES ARE CONTROLLED BY THE MODUTROL SYSTEM

PHYSICAL ACTIVITY — OCCUPANCY — PERSONAL WHIMS — CHANGING EXPOSURES — CLOSED PERIODS — LIGHTS AND MACHINERY

MINNEAPOLIS-HONEYWELL

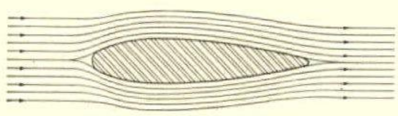
AUTOMATIC CONTROL SYSTEMS

Direction AND *Volume* OF AIR FLOW

CONTROLLED AT THE REGISTER

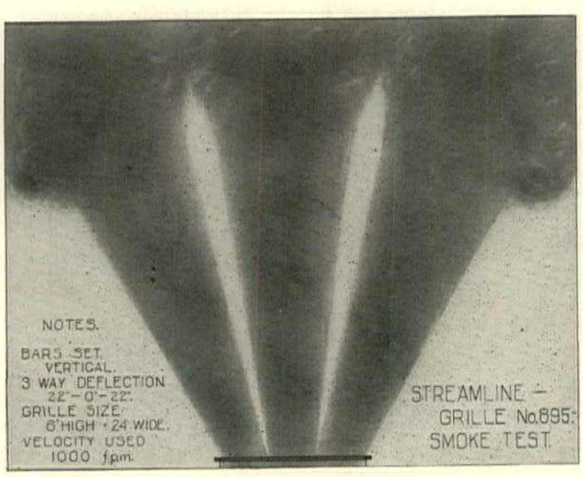
WITH NEW TUTTLE & BAILEY PRODUCTS

THE NEW STREAMLINE GRILLE Newest in the Tuttle & Bailey group of air conditioning products is the Streamline Grille No. 895 which provides a highly efficient method of controlling the direction of air flow at the outlet. From one to five air streams may be directed from a single face at angles of 0°, 18°, 22°, and 45° deflections from normal; these deflections being provided with either a vertical or horizontal setting of the bars.

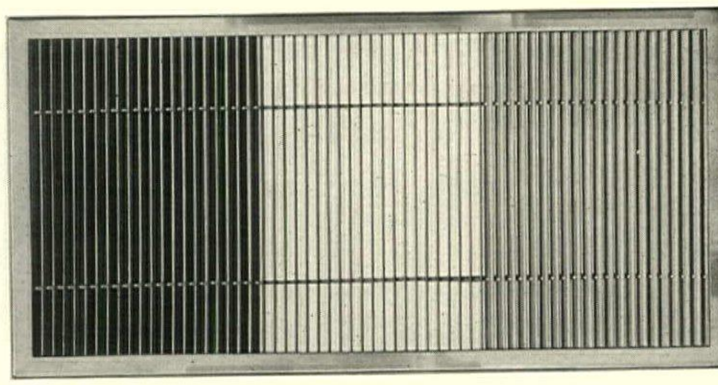


Cross Section of Streamline Bar

The Streamline Grille No. 895 is made of special streamline-shaped bars having correct dynamic properties to minimize friction losses. This new grille is neat and attractive in appearance, is extremely sanitary, and of very sturdy construction.



Deflection combinations provide aspiration and quick infusion of room air with incoming air.



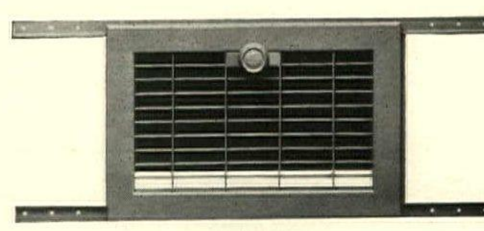
Neat and sturdy in appearance, the Streamline Grille No. 895 offers directional control in from one to five different directions.

McKNIGHT VOLUME CONTROL Volume control at the register is provided in the popular McKnight Register No. 1000 which may be effectively combined with the Streamline Grille to give either straight or directional flow. The McKnight Register eliminates the need for expensive diffusers, splitter or branch dampers in the duct work, offering an extremely flexible system which is easily adjusted *at the register face.*

The ordinary single valve control may also be furnished with the Streamline Grille, the valve being either knob or key operated. Multiples of the single valve construction can be furnished in a single Streamline face.

RESIDENCE REGISTERS For normal sidewall and baseboard installations in dwellings the Ferrogrid Register is recommended. Cold air intakes of the same design are also available. Special features of this register are the attractive knob operator and the ingenious locking device to guarantee a definite setting of the valve.

The popular Ferrogrid sidewall or baseboard register for residences.



SEND for catalogues of Tuttle & Bailey products for heating, cooling and air conditioning systems, including Cast Metal Grilles, Stamped Metal Grilles, Streamline Grilles and Registers, McKnight Volume Control Registers, etc.

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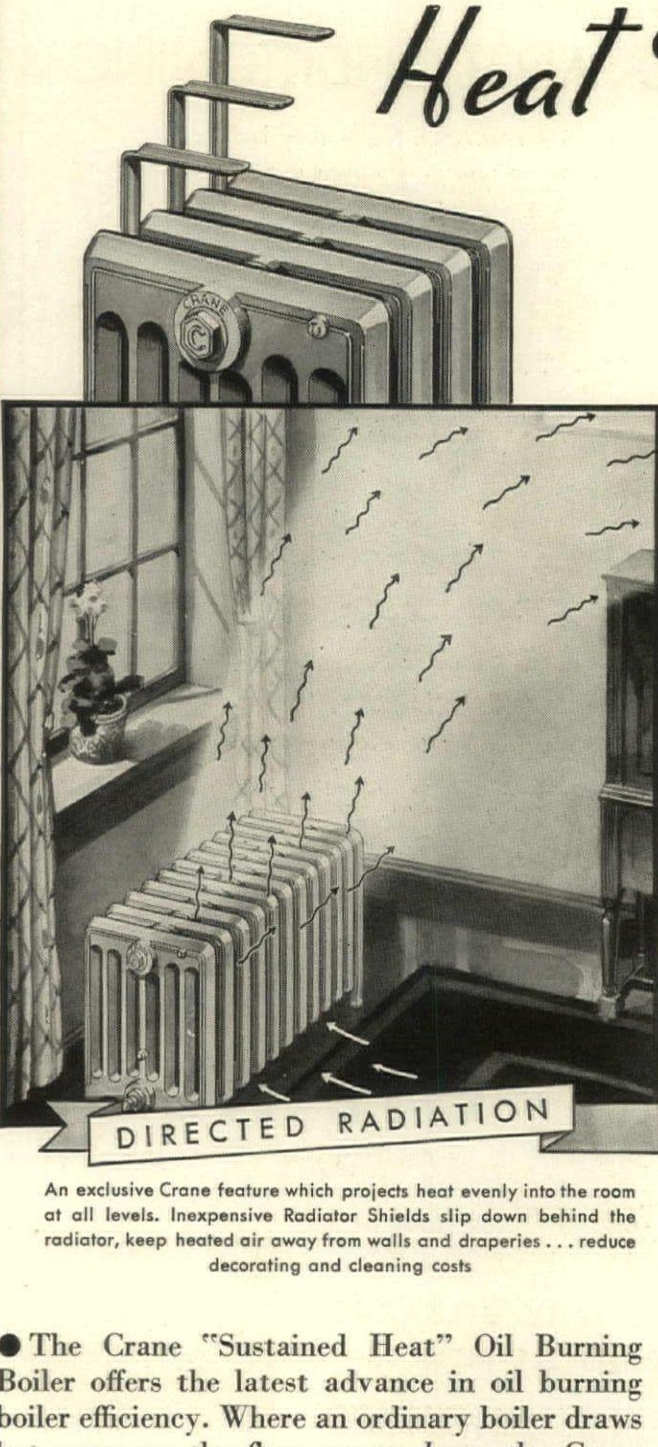
NEW BRITAIN, CONN.

FOR BETTER
Heat Distribution



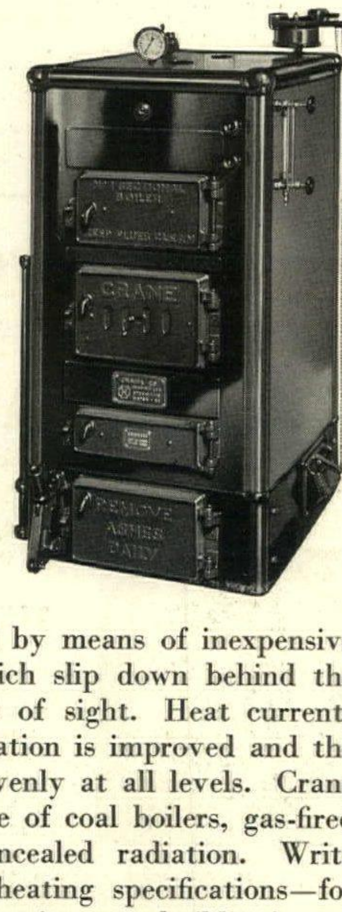
An exclusive Crane feature which projects heat evenly into the room at all levels. Inexpensive Radiator Shields slip down behind the radiator, keep heated air away from walls and draperies . . . reduce decorating and cleaning costs

CRANE "SUSTAINED HEAT" OIL BURNING BOILER

Water circulation in this boiler is controlled and speeded by a water baffle which directs cold water to the hottest part of the boiler. A patented smoke-hood absorbs additional heat. Boiler is insulated top, sides and bottom

CRANE COAL FIRED BOILER

Improved flue design in this famous Crane boiler eliminates fuel waste by absorbing more heat from flue gases. Many superior features not included in the average coal boiler are found in this well-insulated, fuel saving boiler



● The Crane "Sustained Heat" Oil Burning Boiler offers the latest advance in oil burning boiler efficiency. Where an ordinary boiler draws hot gases up the flue—*wastes heat*—the Crane "Sustained Heat" Oil Burning Boiler *retains these heated gases* within the boiler until the heat is extracted. This boiler goes on absorbing heat even after the burner shuts off . . . absorbing more heat per gallon of oil. Temperatures are more evenly maintained throughout the building. That's why it is called the "Sustained Heat" Boiler!

Crane likewise offers the exclusive feature of Directed Radiation—a method of projecting heat *out into the room*, away from walls and draperies. This is accomplished by means of inexpensive Radiator Shields which slip down behind the Crane Radiator, out of sight. Heat currents flow *outward*. Circulation is improved and the room heated more evenly at all levels. Crane offers a complete line of coal boilers, gas-fired boilers, open or concealed radiation. Write "Crane" into your heating specifications—for better heat distribution in every building!

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Practical easy-to-use information about the design and selection of equipment for heating, cooling and air conditioning installations is contained in a series of three AMERICAN ARCHITECT Reference Data articles, now available in limited quantities in reprint form. These articles offer practical rules which can be followed without engineering experience, yet are based on standard engineering practice.

The Time-Saver Work Sheets, which appeared with these articles, are invaluable aids in any architectural office. Their uses are:

(1) For making your own computations of loads and capacities as a basis for selecting equipment.

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

(3) As job records and to check performance against specifications.

WORK SHEETS AVAILABLE (unlimited quantities)

Form 1. **Individual Room Data—Winter Conditions.** For heating, humidification and winter air conditioning. Space for 4 rooms per sheet.

Form 2. **Individual Room Data—Summer Conditions.** For cooling, dehumidification and summer air conditioning. Space for 3 rooms per sheet.

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

Form 4. **Economic Chart for Comparing Equipment.** Provides space for listing desired performance of equipment and for direct comparison of competitive units against these requirements.

Form 5. **Duct and Register Sizes.** Space for determining dimensions of supply and return ducts, supply registers and return air faces for 24 rooms, including balancing of pressure drops in ducts and adjusting air circulations, etc. Reverse side cross-section ruled for diagrammatic layouts.

Form 6. **Schedule of Steam and Hot Water Radiation.** Space for selecting and listing radiators, convectors, unit heaters, etc., for 27 rooms. Reverse side cross-section ruled for riser diagrams.

REPRINTS AVAILABLE (while they last)

Number 11. **Thermal Insulation of Buildings** (May 1934)—contains original Time-Saver Table showing "Per Cent of Heat Transfer Stopped by Building Insulations" and all other data required to select suitable insulation, weatherstripping and multiple glazing methods on the basis of the savings they produce.

Number 12. **Heating, Cooling and Air Conditioning** (July 1934)—contains complete data, including 12 reference tables, 18 rules of procedure and four Time-Saver Work Sheets (Forms 1 to 4 inclusive) needed to determine heating, cooling and air conditioning loads for any building and to select appropriate equipment.

Number 13. **Distribution Equipment for Heating, Cooling and Air Conditioning** (September 1934)—contains complete instructions for estimating sizes of pipes, ducts, radiators, convectors, registers, etc. for general planning purposes; including 8 reference tables, 14 rules of procedure and two Time-Saver Work Sheets (Forms 5 and 6). Use with preceding article (No. 12).

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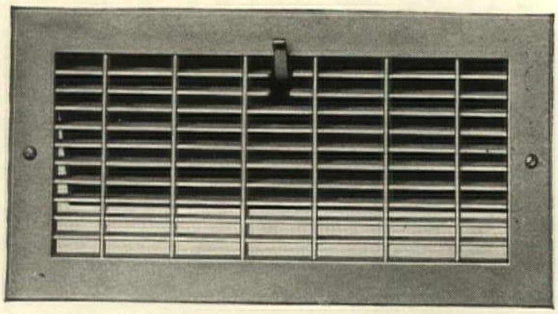
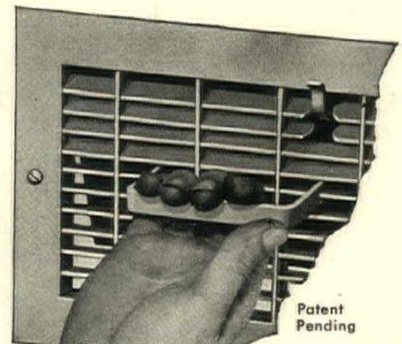


Registers and Grilles with grille bars made adjustable so that air flow can be directed upward or downward, or to the right or left, to any angle desired to 45 degrees.



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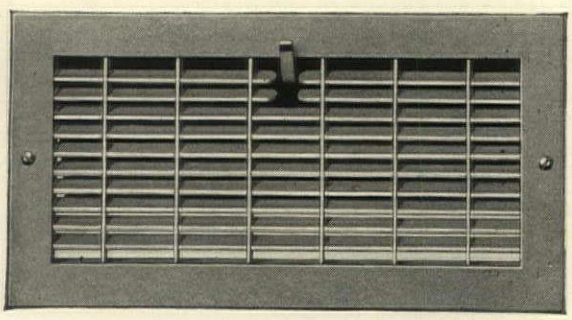
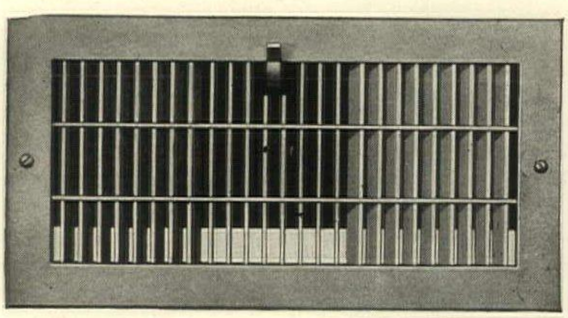
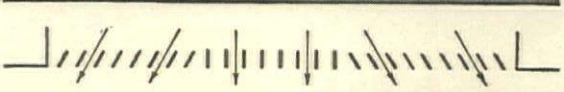
DIRECTED AIR FLOW REGISTERS AND GRILLES For Forced Air Installations



No. 311-A HORIZONTAL GRILLE BARS

This shows grille bars adjusted for downward deflection of air. They may be pitched from straight to any angle within 45 degrees, either down or up, wholly or in part, as conditions require.





No. 321-A VERTICAL GRILLE BARS

Here the grille bars have been turned to direct the air outward at the ends and straight out at the center. This illustrates one of the many combinations of adjustments which can be made to secure any desired direction of air flow. Grille bars are inserted firmly but the tension is such that they can easily be changed from one angle to another with the tool which accompanies each shipment, and any desired directed air flow attained.

HERE are the perfected registers and grilles that heating engineers have needed and have been waiting for. They give complete latitude for controlling direction of air flow, and make it possible to direct air flows with exactness never before attainable.

Any register or grille may be set to deflect air all in one direction, or air may be directed in several directions from the same register or grille.

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The Readers Have a Word to Say

• REVISE BUILDING CODE

Editor, AMERICAN ARCHITECT:

WE note your comment in the July issue of AMERICAN ARCHITECT pertaining to building codes. Our Society has been instrumental in having a new building code written for the city of Elizabeth. This code was adopted last December, after 3½ years work by two of our members and the Superintendent of Buildings of the City Building Department.

Building codes formerly contained certain minimum requirements arbitrarily set by those writing them. This made building expensive. The requirements of modern codes are based upon conditions effecting materials by the design of the building. This reduces the cost of construction but it requires that the design be established by those technically trained and experienced.

U. S. Department of Commerce BH9 report of Building Code Committee reads as follows:

"The committee's recommendations represent in nearly all cases relaxations from the prevailing limitations imposed by building codes. To this extent they should effect economies in building construction. In order to be structurally safe, on the other hand, buildings utilizing these increased stresses must be planned and constructed by those technically trained and experienced; and both materials and workmanship must be uniform, dependable grades."

We would suggest that all plans be prepared by registered architects and submit the phraseology of the new Elizabeth Building Code, which reads in part as follows:

"All plans for which a building permit is issued, shall be prepared by and bear the seal of a Registered Architect, licensed to practice architecture in the State of New Jersey, except that drawings pertaining to engineering features shall have the engineering features prepared by such an Architect or a licensed Professional Engineer holding an authentic State License for the particular field of engineering represented by the features prepared by him."

May we again quote the following from the Department of Commerce:

"Discussions of this report in tentative form disclosed a prevailing opinion that safety is not so much influenced by stress limits as by the competency of those employing them. Relatively few building codes at present provide any machinery for controlling the class of men responsible for building design and construction. City inspection departments do not and should not assume the full responsibility for safe construction. There undoubtedly is a strong trend toward the employment of more competent talent to design and supervise the construction of buildings. The registration of architects and engineers in several states provides at least partial foundation for control, and is utilized to that end in some cities. Nevertheless there is, in general, no method, except the hurried and necessarily casual check by building officials, of insuring that building design or construction will not be attempted by those utterly inexperienced or incompetent."—*Lauren V. Pohlman, Secretary, Union County Society of Architects, Inc., Elizabeth, N. J.*

• PLANS FOR NEW BUSINESS

Editor, AMERICAN ARCHITECT:

OUR community, known as the University District of the City of Seattle, is contemplating a statistical survey campaign and is desirous of obtaining any information possible to help make it a success.

We have been following your articles relative to the National Housing Act, and feel that you have knowledge and information that could be valuable to us.

Our plan is to make a thorough investigation of each piece of property in the district. A complete report filed according to address would be made on blanks supplied for the purpose. A study of these reports would immediately show which piece of property was eligible for action under terms of the National Housing Act, and which owner might be interested in developing it.

It is our thought to employ a group of unemployed draftsman or advanced University students to make this survey. These men would be carefully selected and would operate under direct supervision. If students were employed they, of course, would be chosen from the school of architecture.

A pamphlet of information containing the following, would be given to each property owner: 1st. Method of procedure outlined. 2nd. Selling factors carefully presented to encourage procedure. 3rd. Proof of why such procedure should be followed.

Owners who were qualified and wanted to proceed would sign the information blank accordingly. If a modernizing project, the survey man making the original contact would measure the existing building and prepare sketches showing the finished product. When approved, competitive figures would be taken from local contractors supporting the campaign. To this would be added the architectural fee. Finally the owner would be presented with a complete program showing the financial set up and including an outline of all necessary details. Other details enter the picture. However, this brief outline may convey enough information to show what available data might be advantageous to us.

Will you kindly forward a copy of "When You Build" and details of how it may be obtained in large quantities.—*Smith & Carroll, Seattle, Washington.*

• BOOKLET IDEA GOOD

Editor, AMERICAN ARCHITECT:

I AM very much interested in your article on page 71 of the July issue of AMERICAN ARCHITECT entitled "A National Campaign for the Architect that will, etc.," and particularly your reference to a booklet, entitled "When You Build."

I am of the opinion that if these booklets could be distributed by local architects in various sections, it would have a considerable influence on the prospective home builder. In order to encourage the use of this booklet, I believe the architect who distributes it should be allowed to have his name and address printed on the back cover, or at some place that would not destroy the identity of the author.

I would be pleased to receive a copy of the booklet when they are available. —*Edw. H. Helms, Ridgewood, N. J.*

BOOKS

THE MODERN HOUSE

By F. R. S. Yorke, A.R.I.B.A. Published by The Architectural Press, 9 Queen Anne's Gate, S.W.1, London, England. Illustrated; partially indexed; 199 pages; size 8x10; price 21 shillings.

ALTHOUGH it contains about 500 illustrations including many plans and construction details, this book is not primarily a picture volume dealing with the modern house. About half the pages contain text outlining the requirements to be met in the type of individual dwellings commonly called "modern." Discussed at length are materials to be employed, the various structural portions of the house and types of plans best suited to the development of the characteristically "modern" design. The author says little about design philosophy; and the volume should be widely useful as a practical exposition of planning and new construction possibilities.

FIRST AID TO THE AILING HOUSE

By Roger B. Whitman. Published by Whittlesey House, New York, N. Y. Illustrated; indexed; 320 pages; size $5\frac{1}{2}$ x $8\frac{1}{4}$; price $2.00.

THE author for some time has conducted a column in the *New York Sun* designed to give helpful hints to home owners about their houses. Based upon the information compiled to answer innumerable questions regarding economical ways to keep a house in good condition, the book is undoubtedly a helpful compendium for the layman. It has been written for him. In spite of this and the non-technical, rather wordy explanations, the volume contains much that is of interest and value to the architect as well. It should be in the library, if only to tell the architect what to do when his own house needs first aid.

DWELLINGS FOR LOWEST INCOME

By International Congress of New Building, Zurich. Published by Julius Hoffmann, Stuttgart, Germany. Illustrated; 207 pages; size 7 3/16 x $9\frac{1}{2}$; price Reichmarks 6.80.

COMPILED in clear fashion are those exhibits which formed the basis for the Second International Congress for New Building at Zurich held in 1929-1930. Though much of the material has been published before, the present edition contains a summary of the significant reports in English, French and German; and each plan is shown with English, French and German captions which are helpful in clarifying plan types and in quickly recognizing their significant features. The great variety of plans shown should prove helpful to those architects who are concerned in the development of American housing plans for the lower income group.

THE EVOLVING HOUSE

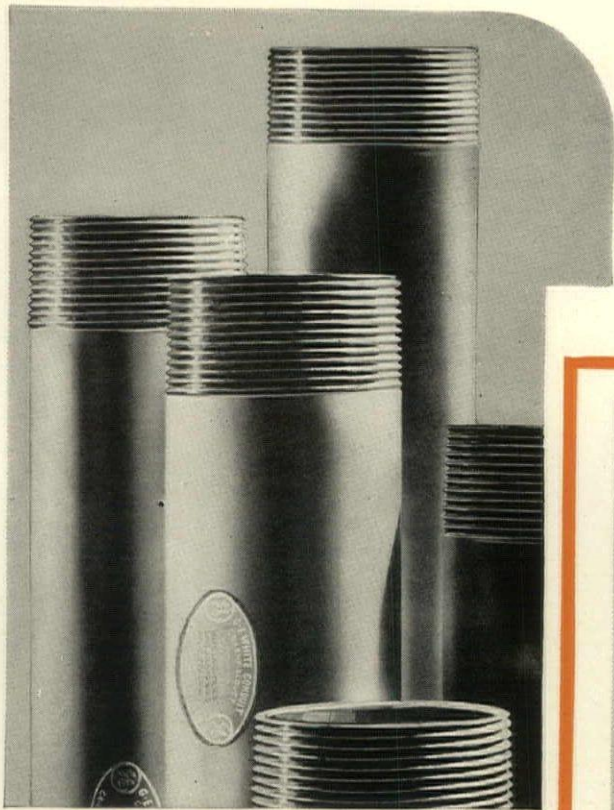
Volume II, The Economics of Shelter by Albert Farwell Bemis. Published by Massachusetts Institute of Technology Press, Cambridge, Mass. Illustrated; indexed; 605 pages; size $6\frac{1}{2}$ x $9\frac{1}{2}$; price $4.00.

AS the second of three volumes on the American housing problem, this book deals with the costs of shelter in America. Probably everyone realizes they are too high; and architects particularly have had innumerable experiences that have driven this realization keenly home. But, like Mark Twain's weather, nobody has done anything about lowering them until recently. The work of Mr. Bemis—largely concerned with an attack on housing costs—has undoubtedly taught him that the economics of shelter is an involved subject that must be thoroughly analyzed before any solution can be developed for the innumerable problems involved. Consequently, in this volume of The Evolving House, Mr. Bemis evaluates the importance of housing as an economic factor of American life before he appraises methods of lowering housing costs. Thus developed the book contains an amazingly exhaustive mass of information. Innumerable charts and tables are included. The Economics of Shelter is not light reading. But undoubtedly it is important reading. Whether or not the reader agrees with all the conclusions of Mr. Bemis, he cannot fail to gain much from the challenging mass of facts upon which they are based.

AIR CONDITIONING FOR HEATING CONTRACTORS

Edited by S. Lewis Land. Published by Heating, Piping and Air Conditioning Contractors National Association, New York. Three volumes; size $4\frac{1}{4}$ x $7\frac{1}{4}$; 194 pages (total); price for non-members $5.00 per set, including a three-ring flexible imitation leather binder.

IN three handbooks written as a series of ten lessons for heating contractors, architects will find a clear picture of present air conditioning practice in relation to homes and commercial or industrial buildings of moderate size. The lessons embrace an introduction to problems; analysis of temperature and humidity; discussions of equipment and their uses; the designing of air conditioning systems; the selection of apparatus and equipment; and two sections primarily for the contractor on selling air conditioning, and operating and servicing these installations.



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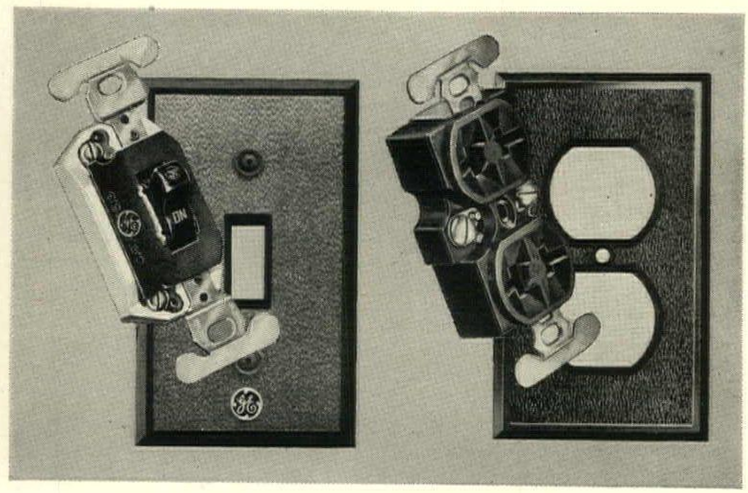

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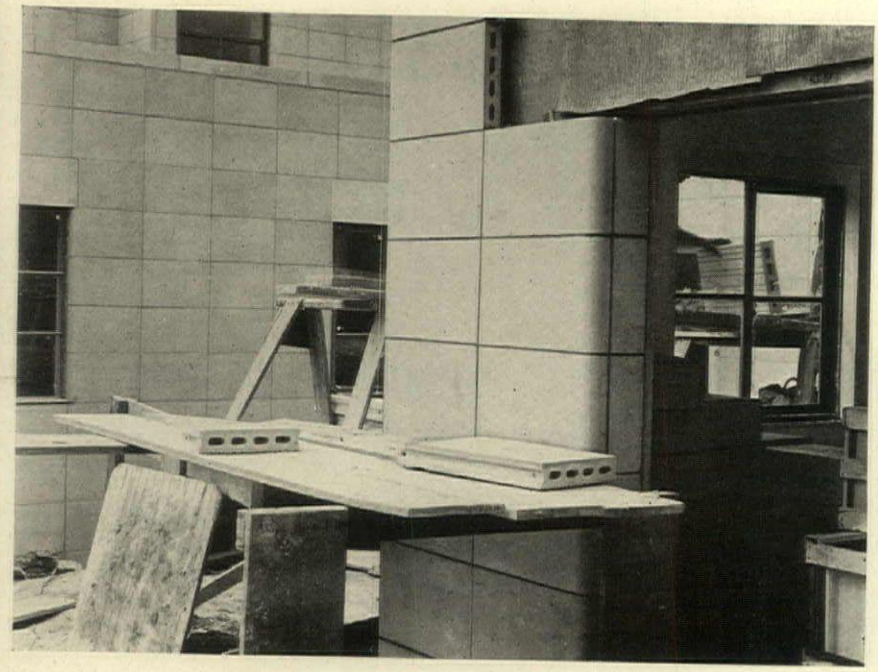


Terra Cotta Wall Units

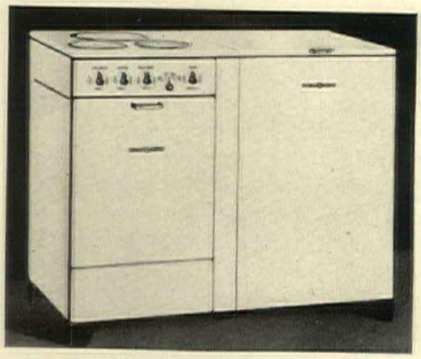
328M Atlantic Terra Cotta Company, New York, announces that its Atlantic Wall Units can now be had in any standard size of structural unit from 5x8" to 18x36" and from 1" to 8" in thickness. The development of large-sized units is the result of perfecting extruding machines and also of a process known as "de-airing" which eliminates from the clay all air cells, making the terra cotta body very dense, strong and not subject to warping in the drying and firing procedures.

Freon Condensing Units

329M The line of air conditioning and commercial refrigerating equipment manufactured by York Ice Machinery Corporation, York, Pa., has been supplemented by two new Freon condensing units. These consist of a 3 h.p. triple-cylinder compressor with water-cooled condenser, and a 7½ h.p. double-cylinder compressor. The new units are small and light in weight.

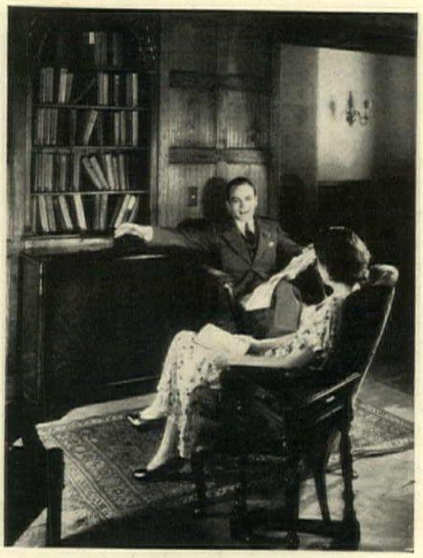
Chemical Fire Protection

330M A new automatic chemical sprinkler device for fire protection has been developed by Firetox System, Inc., Attleboro, Mass. It consists of one or more self-contained aluminum units suspended from the ceiling. When fire occurs, excessive heat develops a pressure within the unit and melts the solder of its sprinkler head. This releases a chemical spray forming a non-poisonous gas blanket which settles down on the blazing area and extinguishes the fire. No piping is necessary.



G-E Electric Refrigerator and Range

331M Development of a new low-cost electric refrigerator and an electric range has been announced by General Electric Company, Nela Park, Cleveland. The refrigerator is of the lift-top type, with all steel cabinet and hermetically sealed unit located at the bottom. The range has automatic precision temperature control, porcelain enamel cooking surface, blue porcelain enamel broiler pan with rack, single oven unit for baking and broiling, and other features of more costly electric ranges. It is 18 in. wide and 24 in. deep. Both refrigerator and range are 36 in. high. These units may be obtained singly or in combination.



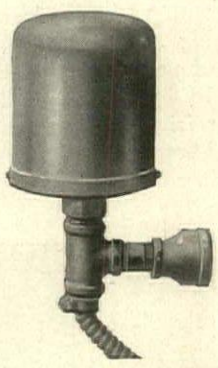
"AirTemp" Conditioning Units

332M A low cost air conditioning and heating unit has been developed by the Amplex Manufacturing Company, a division of Chrysler Motors, and is being marketed by The Temperature Corporation, New York. This new unit cleans the air, dehumidifies it in summer and humidifies it in winter. The air is forced through the top of the unit at the rate of 600 cfm. The unit has a common heating and cooling coil, using steam or hot water for heating and any type of refrigerant or direct expansion for cooling. Ordinary plumbing connections can be used. It is of a size built to replace the average steam radiator.

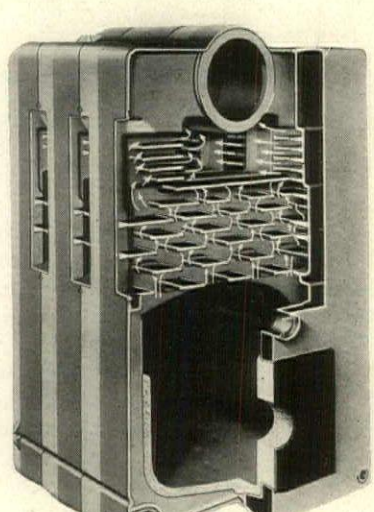
Delco-Heat Conditionair

333M The Delco-Heat Conditionair, which combines the service of an oil-fired warm air heater and an air conditioner within the same unit, has been announced by Delco Appliance Corporation, Rochester, New York. This unit purifies the air; humidifies; automatically heats; circulates air and changes it completely every ten to fifteen minutes. Features of construction include streamline heat transfer unit of "teardrop" design; three-pass heat transfer surfaces; large heating area; burner mechanism outside heating zone; no exposed mechanism; furniture-steel cabinet in two tones of green with chromium trim; automatic controls.

The Weatherstat



334M A new outside mounted temperature control, known as the Weatherstat, which responds to all four weather factors—temperature, wind direction, wind velocity and solar radiation — has been developed by Minneapolis-Honeywell Regulator Company, Minneapolis. The unit consists of a mass of iron containing a thermostatic element and an electrical heating element. In proportion that more or less heat is required to offset the wind, sun and air effect on the unit, the building or zone supply is modified. It is mounted in a waterproof housing and placed in a location subject to the same weather conditions as the zone or building it controls.



Oil Burning Boiler

335M A cast iron, square, oil burning boiler, designed for horizontally fired burners, has been introduced by United States Radiator Company, Detroit. Heat is absorbed through a new method of fire travel; flue gases rise upward between each section. These gases, traveling through passages formed by ribs placed on the face of each section, are thrown against each succeeding row of cast iron ribs. The boiler is built with a wet base and is encased in a jacket of black and green.

Tub-Shower-Lavatory Combination

336M A combination bathroom fixture, which can be installed in a 5'x7' bathroom, has been developed by Lavashower Corporation, Philadelphia. This unit, termed "The Lavashower," is 7 ft. in length and consists of a shower compartment, a 5' built-in-tub, a dressing table lavatory with wide flat surfaces on both sides of bowl, and a cabinet with two shelves. The Lavashower, made of porcelain-enameled cast iron, is available in white and standard colors for right or left hand recessed installation, or with lavatory-end finished for corner installation.

Three-Circuit Socket

337M For applications requiring two or three intensities from the same lighting unit, Westinghouse Electric & Mfg. Company, East Pittsburgh, has developed a three-circuit lamp socket for use with three-light lamps. Though quite similar in appearance to a mogul porcelain socket, the interior has been redesigned to provide a floating center contact, for the high wattage lead, supported by a coil steel spring. Surrounding this contact is a ring contact for the low wattage lead and the standard shell provides the common lead. The supporting screw spacings are standard.

Air Circulator

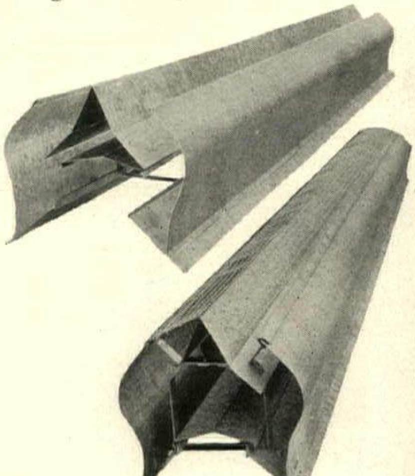
338M An air circulator, for use in reducing indoor summer temperatures, has been introduced by General Electric Company, New York. Designed primarily for installation in attics, this unit circulates air through the attic in daytime, to reduce sun effect on the roof and draws relatively cool outside air through the dwelling in the evening. The G-E Type HV-1 air circulator has a rubber-cushioned mounted motor directly driving an 18-inch, three-blade propeller fan at 860 r.p.m., delivering 2050 to 2600 cfm.

New Klieglight

339M Kliegl Bros., New York, have developed a spot-and-flood light projector which permits the shape of the light beam to be instantly adjusted to any desired pattern of innumerable dimensions, and from pinpoint to full lens opening, by arrangement of iris and framing shutters. It can be used at any distance up to 250 ft. for interior or exterior spotlighting or floodlighting. The unit is flexibly mounted on a telescopic pedestal, uses biplane filament incandescent lamps and operates on A.C. or D.C. circuits.

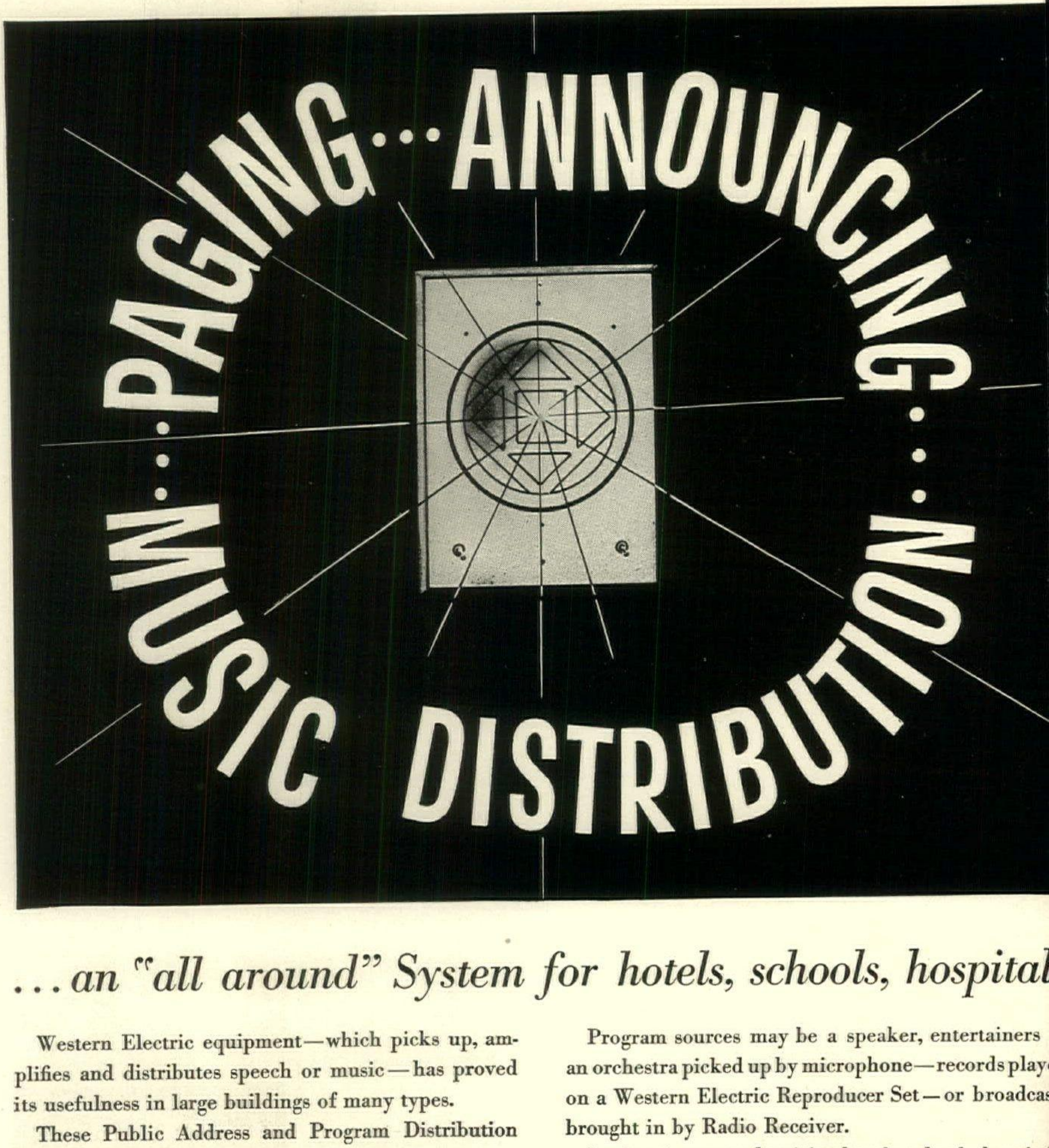
Steam Operated Cooler

340M The Elliott Steam Operated Cooler, a new development of the Elliott Company, Pittsburgh, produces cooled water for air coolers or air conditioning cabinets and cooled drinking water for buildings by means of flash or instantaneous evaporation under vacuum. This steam cooler is fully contained within a single tank, compact in size. The ordinary steam heating system will furnish enough steam for the operation of this unit. Available in three sizes, up to 15 tons refrigeration capacity.



Dexter Heat Valve

341M A new device, known as the Dexter Heat Valve, which releases heated air from building interiors and induces circulation of cool air from outside without mechanical apparatus, is announced by The Swartwout Company, Cleveland. The Heat Valve is inconspicuous and is installed along the ridge of a pitched roof, where it provides an adequate weatherproof opening along the full length of the building at its highest point. A damper is provided for opening or closing the device at will.



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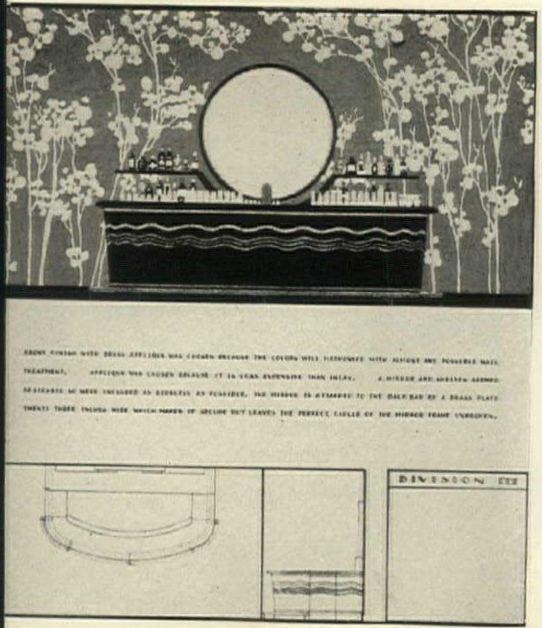
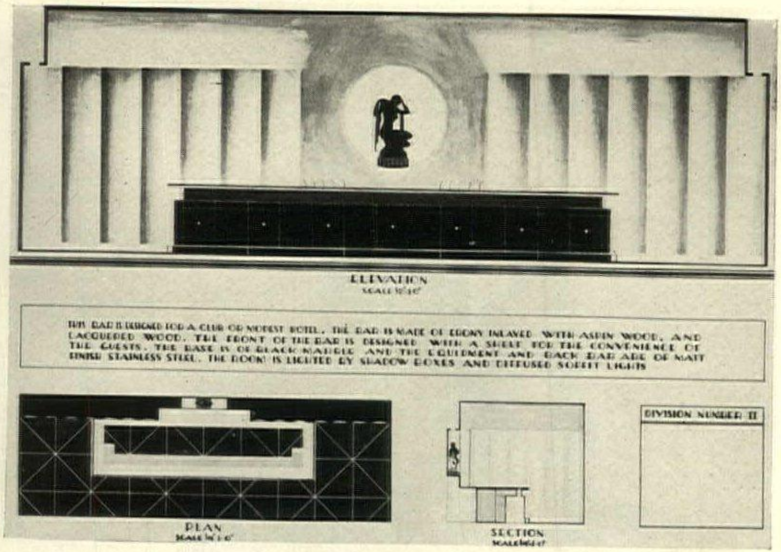




RIZE-WINNING BAR DESIGNS

irst prize winners in the recent competition for new bar esigns sponsored by the Brunswick-Balke-Collender Co. ere: Donald M. Douglas of Georgetown, Conn., for a ervice bar (above); M. Righton Swicegood of New ork for a commercial bar (above, right); and Maxfield . Gluckman of New York for design of a de luxe bar. udges of the competition were, left to right, Harvey Viley Corbett, Benjamin Marshall, John Holabird, Ernest yfield, Karl Eitel, Ralph T. Walker and Robert F. Beninger, president of the Brunswick-Balke-Collender Company

Trends and Topics of the Times

(*Continued from page* 64)

powder, destroys metal objects in a shower of sparks and makes a heavy copper wire disappear in a vapor.

• W. M. Kiplinger writing on business conditions in the *Nation's Business* said with respect to housing, "Figure on a moderate improvement this fall and winter on all the things which go into home repairs and renovation. But no boom. Figure on a slight improvement in new home building. Count on a spurt in new home construction next spring and summer, but not much before. It will take until then to make the effects of the new law (The National Housing Act) trickle down through the various layers of mortgage lenders.

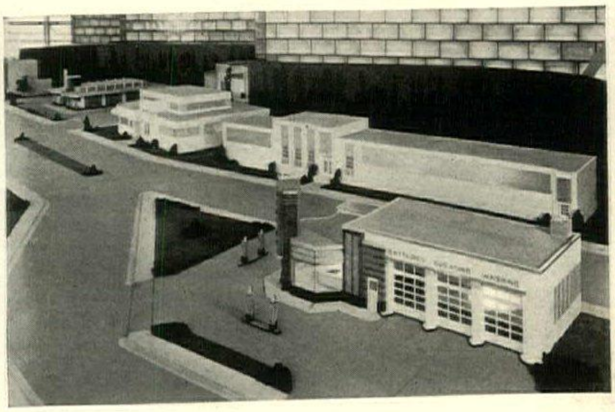
"Costs of housing must be reduced before people will buy new housing as freely as they buy new automobiles, for example. Government is now tackling the financing phase, but this is only one of several cost items. Material costs must be reduced. This is primarily a problem of better organization of the various industries which supply building materials; and they are very backward in organization, in imagination, in vision for the future."

Mr. Kiplinger believes that the way toward reduced building costs will not be through reductions in wages but by fabricated construction and technical efficiency.

• Encouragement to building interests from a recent issue of *Millar's Housing Letter:* "New deal psychologists have an answer ready for the doubters. If private capital refuses to be enticed into the home-building picture, they are not a bit worried that the whole housing program will stop then and there. They say that if business will not cooperate, the government will have to go the whole hog."

• Best information for architects who expect to participate in activity under any one of the five titles of the National Housing Act is contained in a government publication. This reports, in 22 pages, the complete scope of the Act. It is entitled "Public—No. 479—73rd Congress"; and copies may be obtained at 5 cents each from the Superintendent of Documents, the Government Printing Office, Washington, D. C.

• The Architects' Code is still alive—rumor to the contrary. A conference held this summer ironed



Realistic models of glass block buildings in the exhibit of the Owens-Illinois Glass Co. at A Century of Progress. They visualize possibilities of glass block construction, the blocks used in them being accurate miniatures of the regular blocks in both sizes and colors

out certain features so that a basis was reached for forwarding the code to the Administrator. No changes were made in any essential clauses of the code as it was formerly published.

• Subflooring, often blamed as a source of residence moisture, cannot always be blamed when the finish floors warp and once tight joints begin to widen. Tests made by the Forest Products Laboratory on a Wisconsin residence indicate that under all ordinary circumstances, finish flooring picks up moisture independently from that in the subfloor itself. The villain in the piece is probably relative humidity, though often a specific source is impossible to determine.

• The Real Property Inventory indicates that a huge remodeling market exists. In 43 cities—a sort of representative list in 33 states—652,440 structures were surveyed. 121,732 of them—almost 20 per cent—were in need of major repairs, some of them being unfit for use. If this condition applies with equal force to all cities in America, the remodeling clauses of the National Housing Act should be extended indefinitely instead of only for a maximum of five years.

PERSONALS

• Charles Morgan, A. I. A., of Chicago, Ill., will become associate professor of architecture at Kansas State Agricultural College, Manhattan, Kansas. Mr. Morgan has been for some time associated with Frank Lloyd Wright at Taliesin, Wisconsin. This year he was decorated by the Italian Government for his work on the Italian Pavilion at A Century of Progress.

• Nat O. Matson announces removal of his offices to 151 East Post Road, White Plains, N. Y.

• Walter Earle Bort, architect, of 730 South Twelfth Street, Clinton, Iowa, would like manufacturers' literature to bring his office files up to date.

• Charles L. Borden announces removal of his offices from 85 Summit Avenue to 360 Springfield Avenue, Summit, New Jersey.

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The Mezzanine of the Brown Hotel—Louisville, Ky.—Keystone Wilton Carpet

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Long an honored name in the art of weaving carpets and rugs, the Cochrane Company enables you to have entire freedom in planning floor effects, yet assures you of a complete selection of patterns and colors most adapted to your installation.

If you have specifications to submit or a plan involving carpeting, call the Cochrane office nearest you.

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Offices and Showrooms in All Principal Cities

• Lawrence E. Hovik of Minneapolis, Minn., won the award of the Carnegie Research Fellowship in city planning given by the Department of Architecture of the Massachusetts Institute of Technology.

• The first prize in the competition conducted by the quarry tile industry was awarded Vernon F. Duckett and Henry S. See of Washington, D. C. for the design of a box office lobby. The second prize was won by Thomas Stathes and the third prize by Harry F. Cunningham, both of Washington, D. C.

• Allen G. Siple, architect has removed his office to 450 North Beverly Drive, Beverly Hills, Calif.

• The Architects' Exhibit, Inc., 333 North Pennsylvania Street, Indianapolis, Ind., wants to establish a complete catalog file and will appreciate receipt of all types of manufacturers' literature.

• Rollin L. Wolf of Allentown, Pa., was awarded the annual graduate scholarship prize in architecture by the College of Fine Arts of New York University.

• Ernest Thornell Brown announces removal of his office to 201 East Fifth Street, Plainfield, N. J.

Poster design has been adopted by at least one architect as a practical challenge to "the depression." This one, by LeRoy E. Kiefer of Detroit won a prize over thousands of others in a national poster contest

• Randolph Frantz and John M. Thompson announce formation of a partnership for the general practice of architecture. Offices will be in the Boxley Building, Roanoke, Virginia.

• Lewis P. Hobart announces removal of his office from the Croker Building to Room 502, 525 Market Street, San Francisco, California.

• Leslie S. Deglow has removed his office from 9 West Fourth Street, Cincinnati, Ohio, to 14 Princeton Avenue, Sunnymede, South Fort Mitchell, Ky.

• Sir Raymond Unwin, English housing authority, is in this country as one of three foreign experts who will make a tour of inspection of 36 cities preliminary to formulation of a long-range housing program to aid Federal and municipal housing officials. Henry Wright, New York city planner, will accompany the party on the tour.

Plenty of Building Work Ahead

DURING the past six months the Government has been collecting factual data through the National Survey of Potential Product Capacity. The purpose of the survey is essentially a quantitative inventory of the Nation's capacities, resources, and so forth. According to an article in the August issue of the *New Outlook* by Robert R. Doane, the survey is not yet completed. Figures in hand, however, show an interesting picture of our major fields of activity. Commenting on shelter as the second ranking human necessity, Mr. Doane said: "The findings indicate a present accumulated shortage in excess of six million dwellings. On the basis of sanitary and living comfort standards it will take the American people fifteen years at an annual outlay of ten billion dollars to bring our housing facilities up to a reasonable level. It has been conservatively estimated that on the basis of normal population increase plus losses from obsolescence and disaster there is a current minimum need for the construction of 500,000 dwelling units per year."

Preliminary reports of the Department of Commerce's Real Property survey bear out the contention that modernization, repairs and replacement needed in the dwelling field present a large potential market of building activity for many years to come. A little prosperity in other fields would soon produce the confidence needed by owners to start the wheels of the building industry turning with increasing rapidity.

Beginning with this issue American Archite

will be published EVERY MONTH

Increasing activity in the building field makes monthly publication necessary in the interest of our subscribers.

The present editorial policy, largely responsible for the increasing popularity of American Architect during the last two years, will be continued. Balanced coverage of the architects' many interests: inspiration, design, construction, finance, materials, equipment, business, etc.; will not be changed.

Reference Data articles for the balance of 1934 will cover the following subjects:

Modern Interior Lighting - - - November

Residence Lighting - - - - - December

These valuable Reference Data sections will be continued in at least six issues during 1935.

The Nebraska State Capitol

This final monumental work of Bertram Grosvenor Goodhue is regarded as one of the most significant architectural contributions of the last fifty years.

American Architect is devoting its entire OCTOBER ISSUE to this one great project. Seven months ago, in consultation with the Bertram Grosvenor Goodhue Associates, plans were laid for publishing the first and only complete story of the Capitol from inception to dedication.

Samuel Gottscho, has made a full photographic record of this great building. Over one hundred and fifty new and unusual photographs were taken, covering every important feature and detail of the Capitol.

There will be forty or more pages of hitherto unpublished plates—some in color, and an equal number of pages devoted to text.

Subscription Price Now $3.00 Per Year

The single-copy price of all future issues will be $1.00 per copy—or $12.00 for a year's copies if they are bought one at a time.
The new subscription rates are: One Year $3; Two Years $5; Three Years $6.
It is to your advantage to subscribe rather than buy the magazine at the single-copy price. However, regardless of price, AMERICAN ARCHITECT will continue to publish the most valuable magazine in the architectural field.

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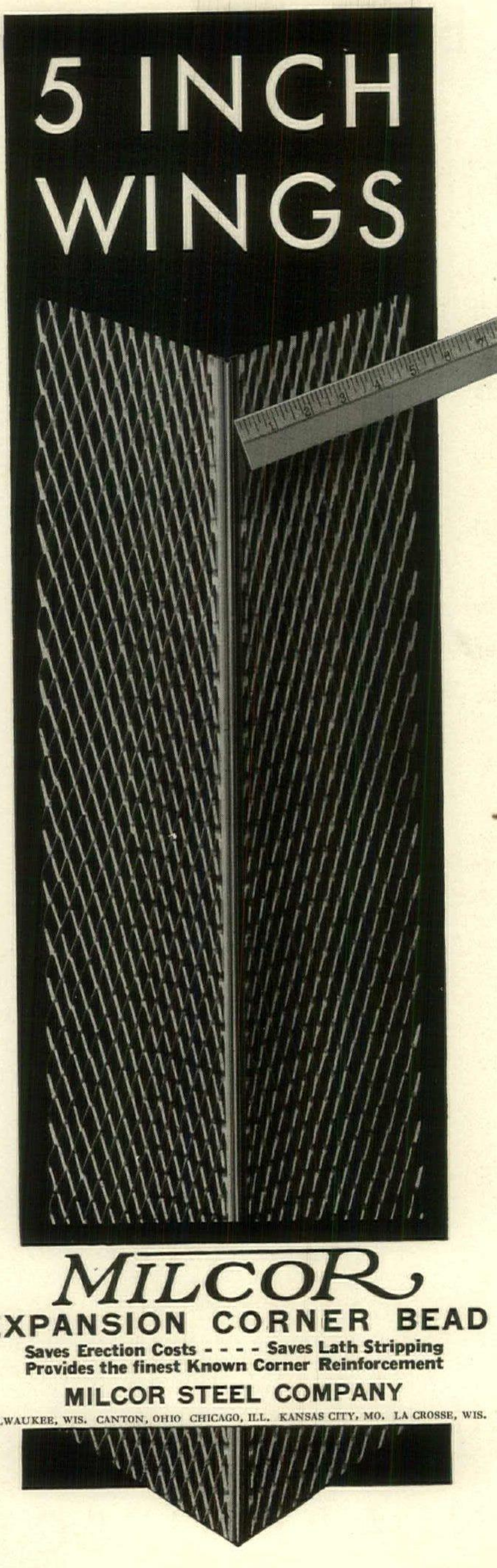
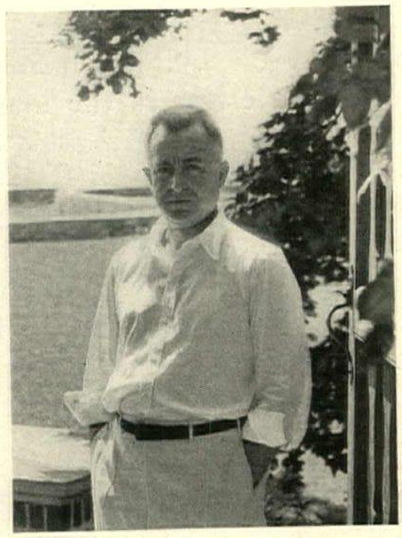


DEATHS

RAYMOND M. HOOD, F.A.I.A., member of the firm of Hood & Fouilioux, New York City, died at Southfield Point, Stamford, Conn., on August 14. Mrs. Hood, two sons and a daughter survive. He was born at Pawtucket, R. I., March 29, 1881. He left Brown University to enter the architectural school at Massachusetts Institute of Technology, graduating in 1903. From 1904 to 1911 he studied in Paris at the Beaux Arts. As a draftsman he was employed in the offices of Cram, Goodhue & Ferguson and Palmer, Hornbostel & Jones. In 1914 he established his own office in New York City. The firm of Hood & Fouilioux was formed in 1924.

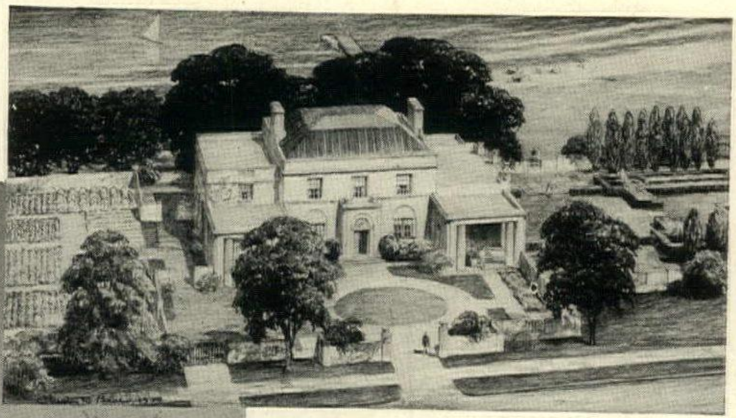


As designer of the Chicago Tribune Tower, American Radiator Building, Daily News Building and McGraw-Hill Building in New York, and as one of the architects for the Century of Progress in Chicago, and Rockefeller Center in New York, Raymond Hood was well known to the architectural profession as well as the general public. In 1926 he received the Medal of Honor of the Architectural League of New York. From 1929 to 1931 he served as president of the league. He became a member of the American Institute of Architects in 1923 and was elected a Fellow in 1934. He was a member of the international jury of the Columbus Memorial competition, a trustee of the Beaux Arts Institute of Design in New York, and a Chevalier of the Order of the Crown of Belgium. He was a member of the Groupe Americain des Architectes Diplomes and a member of the Tavern Club, Chicago, and the Players' and Uptown Clubs, New York.

• Howard Peare died in New Rochelle July 5th. Mr. Peare, who was 41 years old, studied architecture at Columbia University and also at L'Ecole des Beaux Arts in Paris. Mr. Peare had been three times President of the Westchester County Architects Society, a Vice-President of the Council of Architects in New York, and a member of the Architects Emergency Relief Commission.

• John Torrey Windrim died in Philadelphia, June 27th at the age of sixty-eight. He was the son of James H. Windrim, for some time Supervising Architect of the United States Treasury Department. Mr. Windrim was a member of the Architectural League of New York, and a Fellow of the American Institute of Architects.

The one-story living-room wing at the right of the entrance of the house illustrated has been erected as the Pavilion below, and is exhibited in the Good Housekeeping Garden at A Century of Progress



The Classic Modern House

The trend of modern domestic architecture is prophesied by Helen Koues, Director of Good Housekeeping Studio of Architecture in her article describing this classic modern house in September Good Housekeeping. Dwight James Baum, F.A.I.A., was the architect.

Good Housekeeping

Everywoman's Magazine

HOUSE IN BEAUMONT, TEX. *Architects, B. E. Irby and H. R. Woodside, Beaumont. Walls painted with Cabot's* DOUBLE-WHITE, *blinds with Cabot's Green Gloss Collopakes.*

INDEX TO ADVERTISERS

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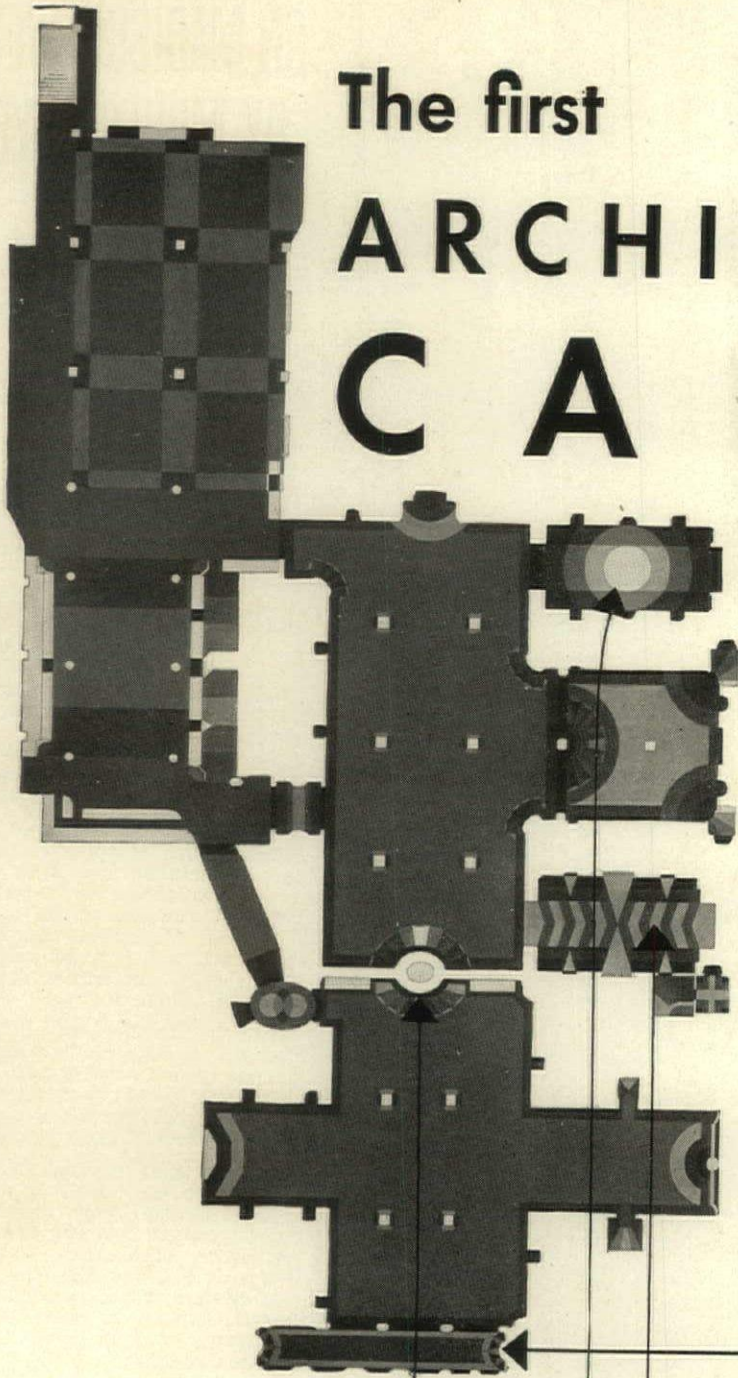
The first ARCHITECTURAL CARPET



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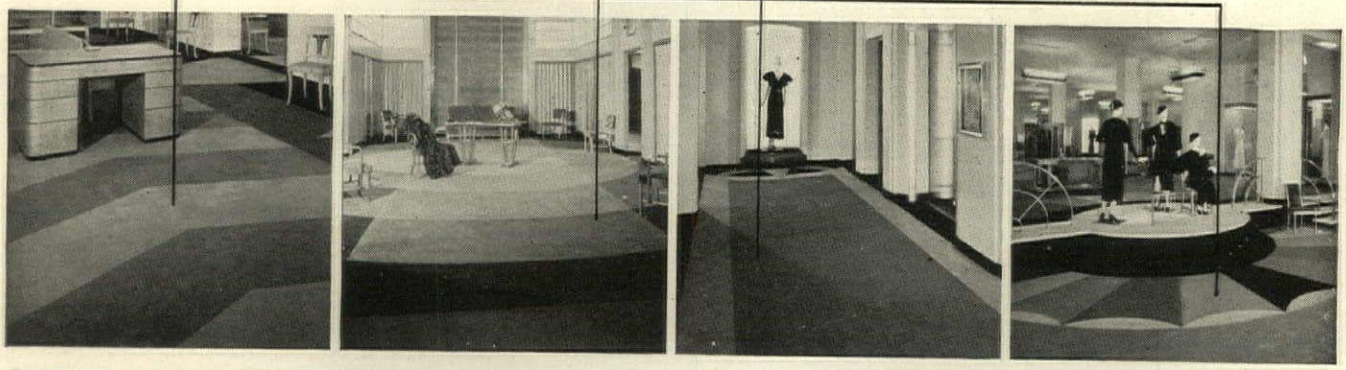
Architects and contractors all over the country see it as a new, practical and economical media for expressing floor design in old and new buildings. Have *you* seen it?

Plan of Joseph Evans Sperry, Architect, for Seamloc carpet installation in Hutzler Brothers Store, Baltimore, Md. Seventeen shades were used to get individual designs in the various salons.



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UNDERHEATING ELIMINAT

Owners Expect to Recove Modernization Cost in Fou Heating Seasons

SAVINGS EXCEED ESTIMA

New York—Just how long years may be in the progress of heating science has been dem strated to the satisfaction of a vi president of a leading New Y building management company.

"When the 183 Madison Ave Building was completed ten ye ago, it included the best dev then known to the heating indus Yet, in the season of 1933-34, un a Webster Modernized System, steam bill was reduced more t 20 per cent. per degree day," executive declared.

Built in the shape of an "L", Madison Avenue has an enorm amount of exposure. It is 17 sto high and is heated by metered ste obtained from the street mains the New York Steam Corporatio

Seeking some method of cutt steam costs while heating all p of the building evenly, the mana ment company followed the rec mendation of Warren Webster Company and installed the Mo ator System which had made s stantial savings in scores of bu ings, some of them newer than Madison Avenue.

Before modernization, accor to this official, the south wing g erally was underheated due to ficulties in circulation. This is corrected by Webster Metering fices. The heating of the 756 r ators is uninterrupted during mal operation, but the rate of livery of steam is varied auton ically with changes in outdoor t perature.

The following table gives fig on the number of degree days the heating season, as well pounds of steam consumed:

BEFORE

29-30..10,813,000 lbs...5,067 d.
30-31..10,590,000 lbs...5,078 d.
31-32.. 9,489,000 lbs...4,414 d.

AFTER

32-33.. 7,144,000 lbs...3,957 d.
33-34.. 8,745,000 lbs...5,017 d.

Campbell & Smiley, Inc., mod ization heating contractors, firmed these figures, pointing that "the resulting economy operation has exceeded the sav estimated and the owner is recei a generous return on his investme

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If you are interested in (1) i proved heating service and (2) lo heating cost in your building, addr

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