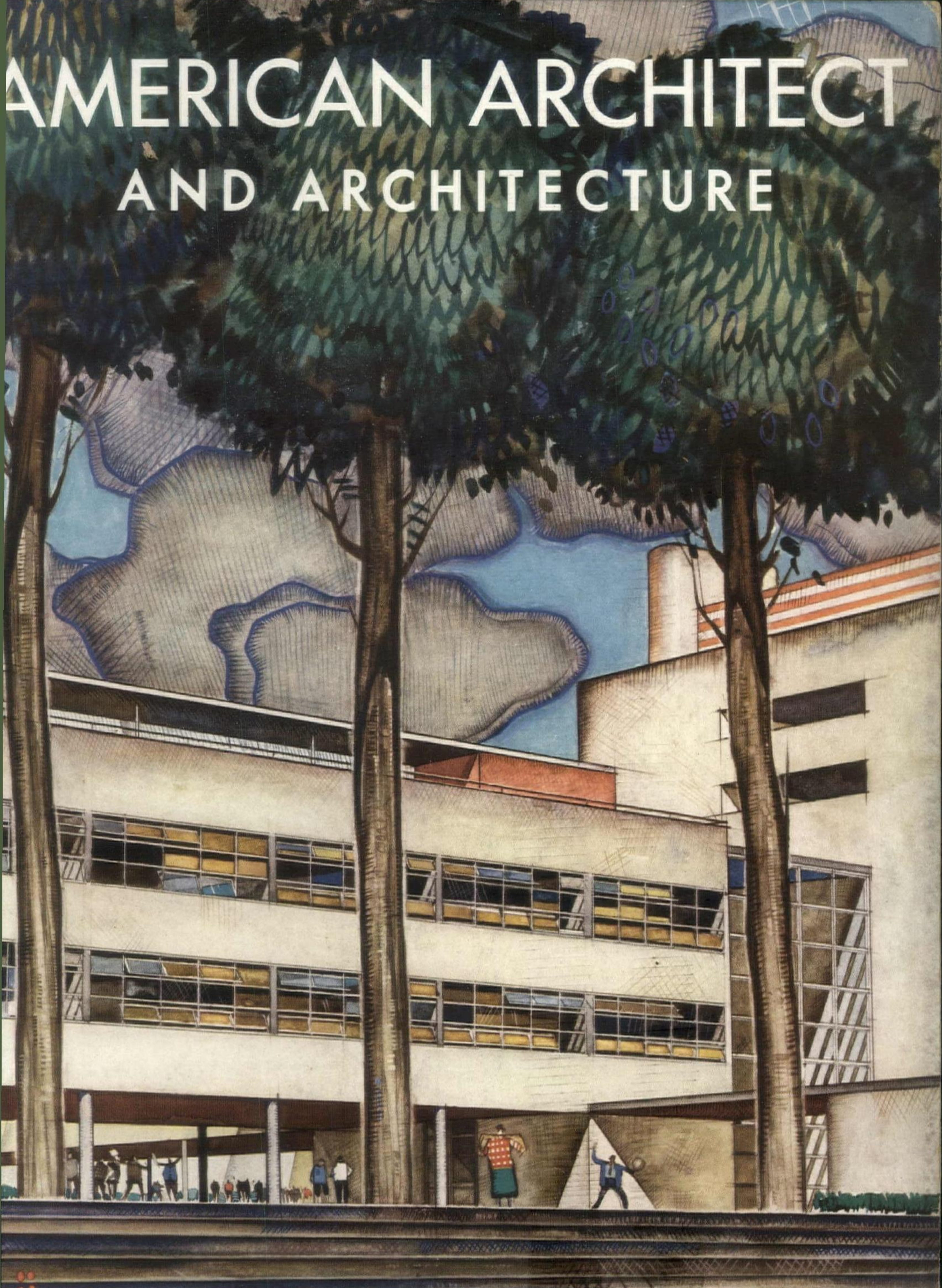
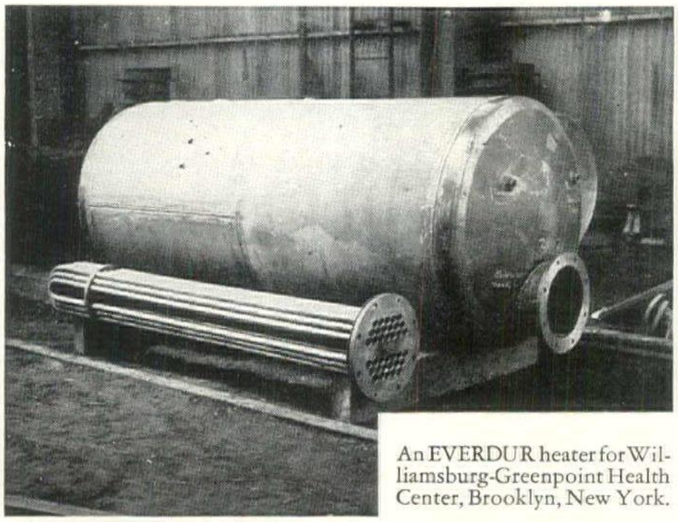
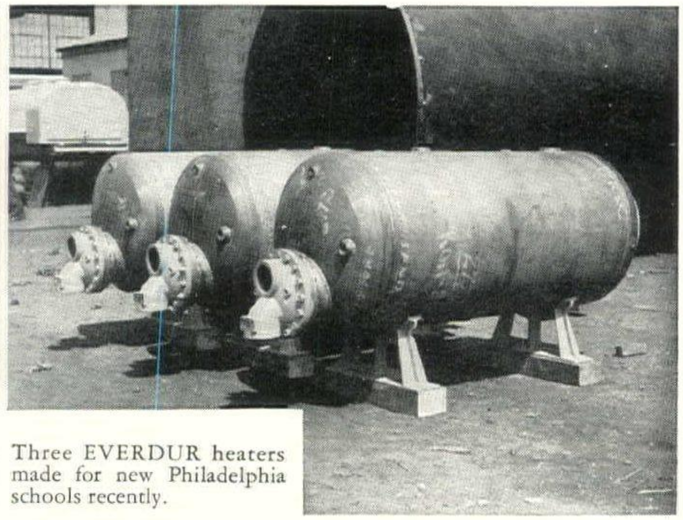
AMERICAN ARCHITECT AND ARCHITECTURE



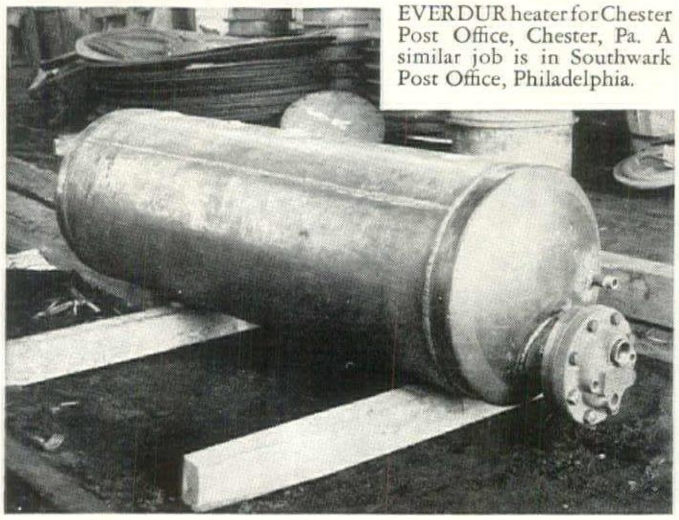
APRIL 1937 • THE SCHOOL OF TOMORROW



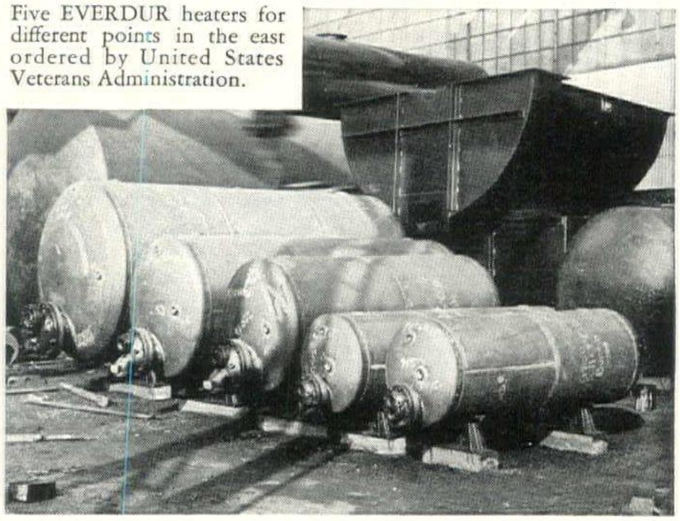
An EVERDUR heater for Williamsburg-Greenpoint Health Center, Brooklyn, New York.



Three EVERDUR heaters made for new Philadelphia schools recently.



EVERDUR heater for Chester Post Office, Chester, Pa. A similar job is in Southwark Post Office, Philadelphia.



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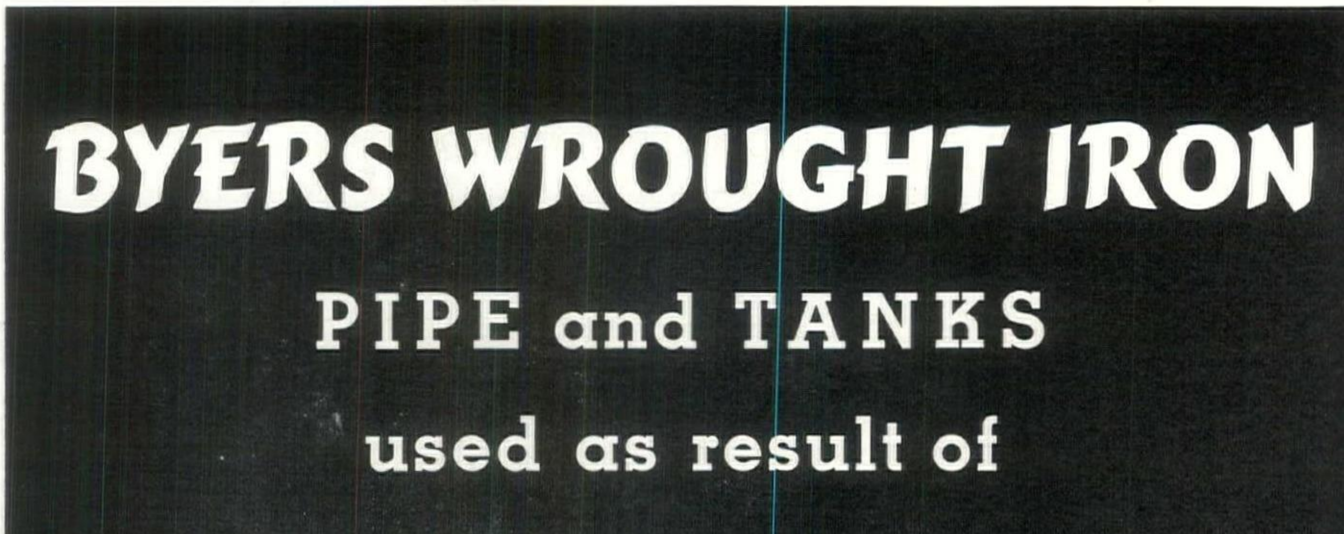
American Architect and Architecture, published monthly by Hearst Magazines Inc., 572 Madison Avenue, New York, N. Y. $3.00 per year; Canada, $4.00; Foreign, $5.00. Entered as second class matter April 5th, 1926, at the Post Office at New York, N. Y., under the act of March 3rd, 1879. Issue 2656, dated April, 1937.



● Much actual service data is available to back up the selection of Byers Wrought Iron for the corrosive conditions to which it will be subjected in the new buildings at the Allegheny County Home at Woodville, Pennsylvania. Additional evidence is also available in this instance because Byers Wrought Iron had been in use for years in the older buildings.

In the new buildings in this group, designed by J. Lawrence Hopp, drinking water reservoir tanks were made of Byers Wrought Iron plates, sheets and angles. The pipe services where Byers Wrought Iron was used are drinking water lines, steam supply and return lines, fire and sprinkler lines, gas lines, rain leaders, drains, vents and waste lines.

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AMERICAN ARCHITECT
AND ARCHITECTURE

CONTENTS

APRIL 1937

Vol. CL No. 2656

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NEWS • EVENTS • FACTS • FACES TRENDS IDEAS • OPINIONS • COMMENTS

SMALL HOUSE COMPETITION

The Structural Clay Products Institute, Inc., announces, on behalf of the burned clay products industry of this country, an extremely interesting and unusual small house competition. Architects, operative builders, realtors and contractors may submit entries for the award of prizes totaling $5,000. The competition is open from now until September 20, 1937. Following is a digest of the program. (A copy of the full program and requirements of this small house competition will be sent immediately on application to Structural Clay Products, Institute, Inc., 1427 Eye Street, N. W. Washington, D. C. See postcard on page 131.)

COMPETITION IN THREE SIMULTANEOUS STAGES

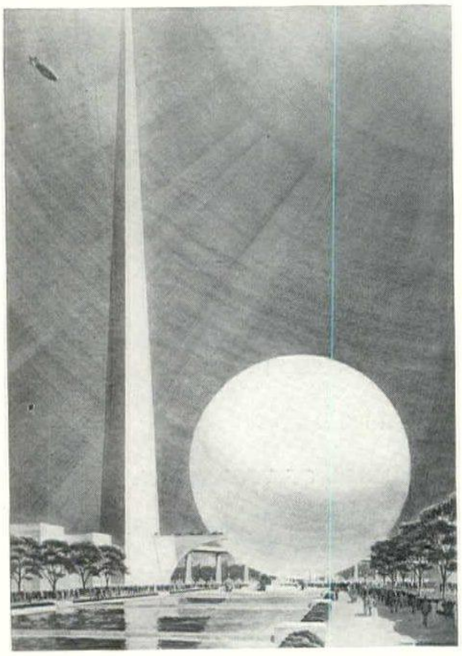
The announcement indicates that the first two stages of this competition call for designs or photographs of brick or brick and clay tile houses ranging in size from 3 to 7 rooms and one or two baths. The third stage calls for architectural (decorative) and structural details built of clay masonry for any type of building or ground improvements.

STAGE 1

This stage of the competition is open to all architects and draftsmen and calls for sketches, floor plans, elevation and sections of 1, 1½ and 2-story houses built of structural clay masonry, brick or clay tile and their combinations. Class A calls for houses up to but not exceeding 5 rooms and 1 bath, not exceeding 18,000 cu. ft. in volume. Class B calls for the design of larger houses, 5 to 7 rooms and 1 or 2 baths but not exceeding 24,000 cu. ft. in volume. First prize in each of the above classes is $500; second prize, $250; third prize, $100, and ten honorable mention awards at $50.

STAGE 2

This stage of the competition is open to architects, operative builders and realtors and calls for photographs and plans of 1, 1½ and 2-story brick or brick and clay tile houses built since 1928. The requirements for Class A and Class B with regard to size of houses to be submitted are similiar to those called for in Class A and B of Stage 1. First prize in both classes is $250; second prize, $100; third prize, $50, and twelve honorable mention awards at $25.



Working on the basis that simple geometrical forms such as the Pyramids have a universal appeal, Architects Harrison and Fouilhoux have used a sphere and trilon for their World's Fair Theme Tower

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Our Highest Praise For

Messrs. WALLACE K. HARRISON and J. ANDRE FOUILHOUX

Because of their strikingly original design for the New York World's Fair "Theme Center."

Because their bold enthusiasm for design has not swerved them, architecturally, from an underlying integrity of purpose — in this case, display.

Because their conception is appropriate to that spirit of modern life which the Fair endeavors to express.

Because the effective grace of their design—and its inevitable influence on the structures that will follow—will help to lift this fair to a unique position.

Because their work reveals clear, direct thinking, free from restrictive prejudice or habit.

Because, finally, it adds to our saga a timely and inspiring indication that American Architecture can—in its own right—set an example for world architecture.

STAGE 3

This stage of the competition is open to architects, engineers, contractors and realtors, and calls for sketches or photographs of decorative or structural details built of clay masonry. Class A calls for architectural (decorative) details such as fireplaces, doorways, wall fountains, etc. Class B calls for structural details such as methods of firestopping, floor constructions, etc. First prize in each of the above classes is $200; second prize $100; third prize, $50, and ten honorable mention awards at $10 each.

SPECIAL PUBLICATION AWARDS

The Structural Clay Products Institute is constantly in need of good small house plans for publication in its literature—particularly photographs, floor plans and four elevations of brick or brick and tile houses built since 1928 at a cost of $9000 or less.

For each house submitted by an architect, builder or contractor, and selected for publication in its literature, the Institute will pay $25. For brick or clay tile details (drawings or photographs) showing ingenious uses of clay masonry for decorative or structural details in any type of building, the Institute will pay $10 each on selection for publication in its literature. This offer is open during and after the duration of this competition.

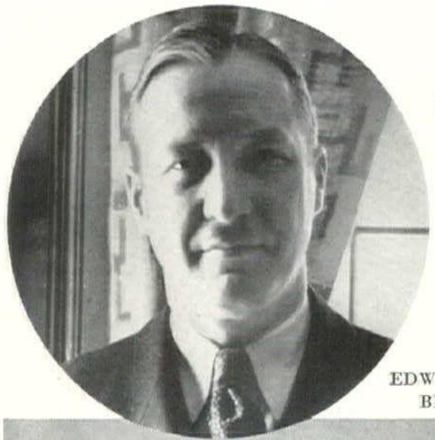
All entries in this competition will be opened immediately upon receipt. For those which are judged acceptable for immediate publication, the Institute will promptly send its check at the rates of $25 for each house and $10 for each detail.

Acceptance for publication (and payment therefor) of entries received before the closing date of this competition does not bar the entry from the competition. Such entry will be submitted to the jury in the same manner as all entries. Thus any entry is eligible for (a) selection for publication with payment therefor, and (b) for any prize or honorable mention award in this competition.

THE SPONSORS

The Structural Clay Products Institute is an associated group of America's leading manufacturers of brick, structural clay tile and other burned clay products used in building and land and highway improvements. It has been formed to carry on the research and promotional work started years ago by manufacturers' associations in the burned clay industry. These associations were formerly well and favorably known to the architectural profession and have merged for the common good of all. This competition is the first step in an extensive promotional program to be carried out by the Institute on behalf of its industry.

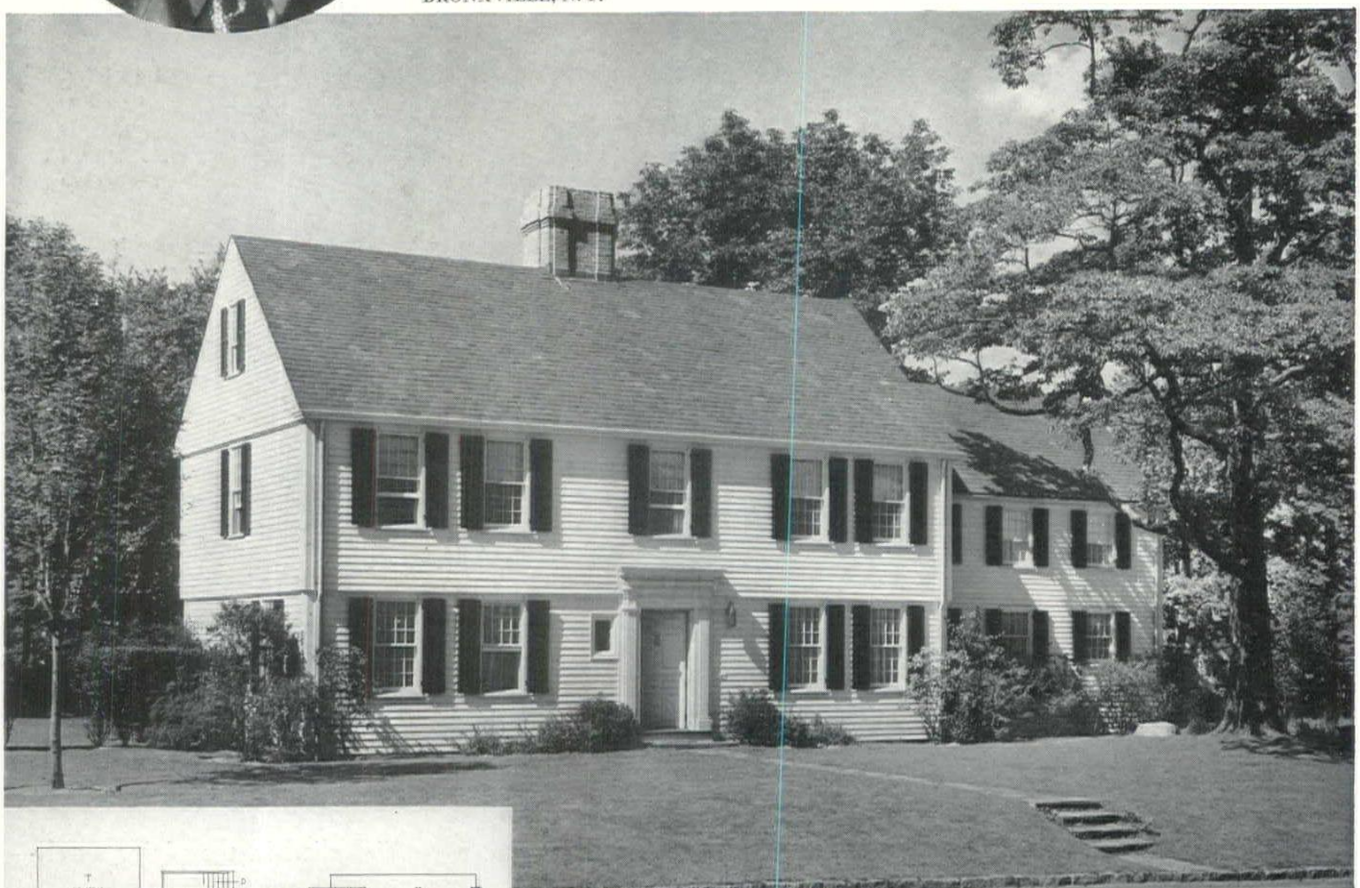
A copy of the four-page program containing full details and requirements of the competition will be mailed immediately on application to Structural Clay Products Institute, Inc., 1427 Eye Street, N. W., Washington, D. C.



"...HEAT THAT NEVER VARIES MORE THAN A FRACTION OF A DEGREE..."

SAYS Edwin M. Loye

EDWIN M. LOYE, *Architect*
BRONXVILLE, N. Y.



Residence of Raymond A. McDonald, Scarsdale, N. Y.

FIRST FLOOR

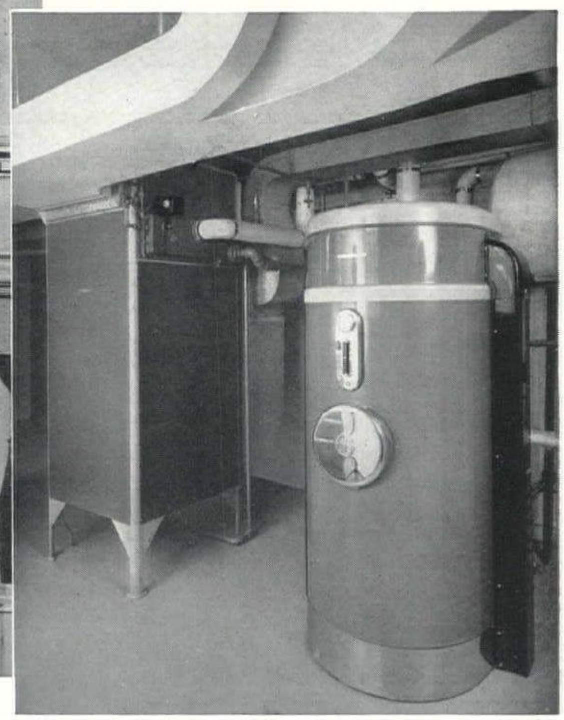
SECOND FLOOR

"THIS house was designed for a New England family of four who were as enthusiastic as the Architect about this simple, early type of Connecticut architecture with its narrow 4½" clapboards, the slight overhang projections at second floor and at gables and moulded backhand corner boards. The typical enrichment of the entrance is in contrast to the studied simplicity elsewhere.

In the study, to provide an ample and safe place for owner's private correspondence and papers, a four drawer steel letter file is housed in a space built into the chimney, between the study and living room fireplaces. It is concealed by a secret door in the pine paneling. The owner's typewriter, when not in use, disappears inside a panel cupboard beneath the bookcases in the study.

The General Electric winter air conditioning system was chosen for its compact, efficient design, of boiler burner integral unit which with the air conditioner combines flexible steam and humidified forced air heat, and also provides ample domestic hot water supply. Even though this was an Owner built house, the potential real estate value of the General Electric name was a factor in the selection of the heating plant. Regardless of outside conditions the house is kept at an even temperature. The heat never varies more than a fraction of a degree from the thermostat reading."

Notice how compact these units are and how well they fit into the decorative scheme. The finish is gray enamel with gleaming chromium trim.



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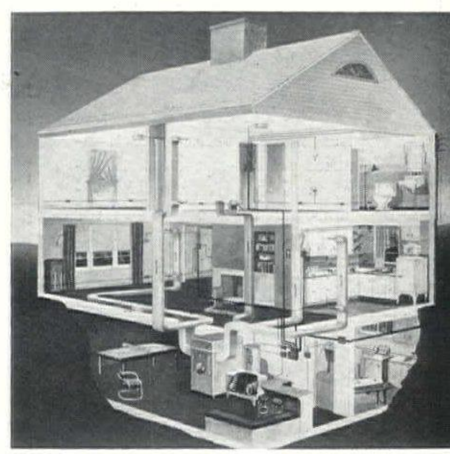

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●

Kentfield Residence, San Anselmo, California
William Wilson Wurster, Architect.

L O F

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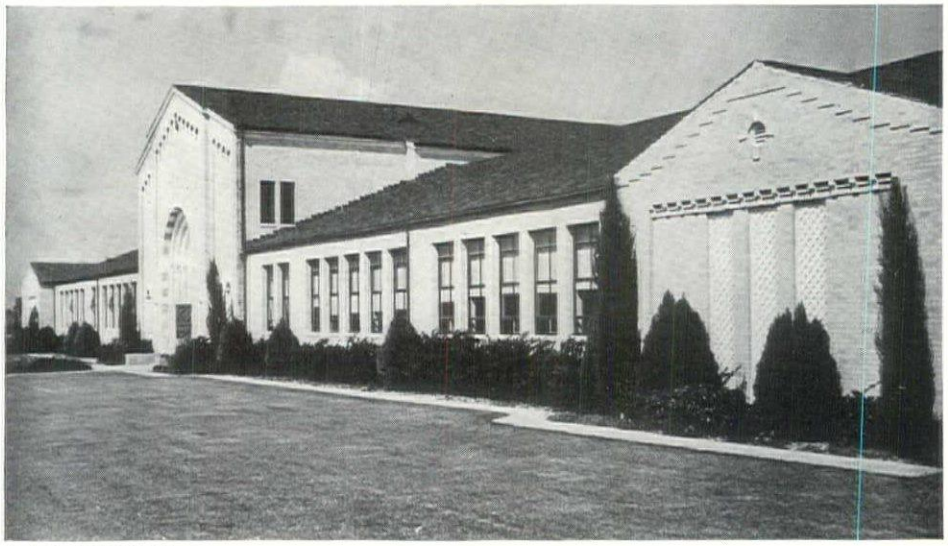


PHOTO: WIDE WORLD

455 small broken bodies and a totally wrecked building were the result of leaking gas and a spark in the New London, Texas, schoolhouse shown above

LEGISLATION

IT WAS TO BE EXPECTED that the Wagner-Steagall Bill would precipitate a storm of comment, pro and con. And, as the vigor of a baby's crying is supposed to indicate his health, it was also to be expected that the resultant criticism would provide a beneficial indication of the soundness of this "baby." So it has proven.

Some of the most pertinent comments have been offered by General Hugh S. Johnson, now one of the country's active columnists. He praised the Bill in its purpose; as an expert piece of drafting; and in its ingenious financing plan—making possible a billion dollars worth of housing at a cost of less than 2 per cent. The catch came, however, when provisions for management were mentioned. To quote the General, "The bill sets up a housing authority which gathers the government's scattered and conflicting housing activities under one roof. That is fine, but each member of the trio that runs it gets $10,000 a year to conduct a billion and a half dollar business. What kind of management will that buy?"

"The bill decentralizes all operations and, except for power to build a few demonstration projects, it is a lending agency. Local, public and private agencies do the work. Is that sufficient safeguard for a billion and a half dollar federal obligation?"

From near and far, other comments indicate that one of the chief deficiencies of the bill is the failure to include a clause to insure low construction costs. So far as can be determined, the only restrictions are those assuring low rentals for such housing as may be built; and limiting the incomes of families using the quarters provided.

While opinions run strife throughout the country, the battle rages at home, too. Henry Morgenthau, Jr., Secretary of the Treasury, recently implied that passage of the Wagner Bill might mean new and additional taxation. In answer to a direct question, however, he took refuge from further explanation by referring to that part of President Roosevelt's budget message which said that new government activity would mean new taxation.

On top of that, it seems that Senator Wagner and Mr. Morgenthau cannot agree on the financing of the proposed Federal grants. Secretary Morgenthau believes that the government subsidies should be given in the form of direct grants of funds raised annually by taxation. Quite naturally, he does not want the housing grants to interfere with the Administration's budget balancing plans. Senator Wagner prefers staggering the grants over a period of years, chiefly so that the annual outlay may be kept down.

The situation had reached something of a deadlock when President Roosevelt stepped in, and told them to come to an agreement and report to him.

Within convenient range of these controversies, Paul E. Stark, President of the National Association of Real Estate Boards, exploded the one shot calculated to cap the climax. Speaking before the newly formed New York Chapter of the association, he called the whole Wagner-Steagall Bill "premature!" While recognizing the need for government aid in ridding the country of slum sections, Mr. Stark never-the-less believes that under present circumstances the release of $1,000,000,000 in credit for housing purposes would probably result in a money-grabbing contest. Instead, he suggested that the central agency in Washington might properly concern itself with a national survey to determine the proportionate needs of each section of the country, and to map out a sound course of action. "If 500 housing authorities," Mr. Stark said, "were informed that their localities must furnish perhaps half of the money for the projects, much of the money-grabbing would be eliminated."

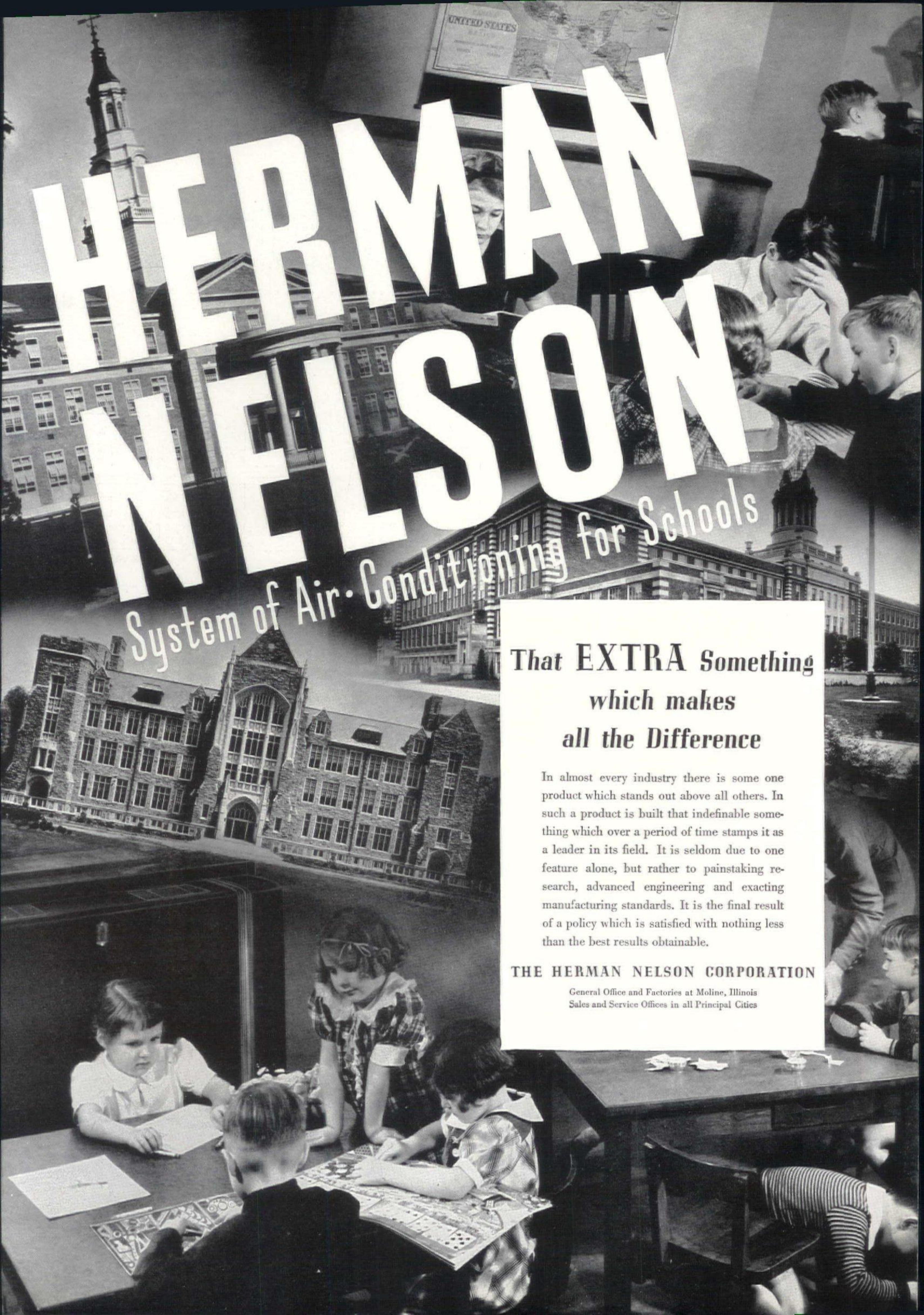
SOMEWHERE IN NEW JERSEY is a town —called Arlington by some, Kearny by others. This fall, when a new mayor is elected, the citizens will decide which name they prefer. Former Councilman Thomas H. Branch will stump his pleas to the citizens of Kearny; Arthur H. Jones will run for re-election as Mayor of Arlington.

The bus company which serves the 48,000 inhabitants of the multi y-clept municipality does not care for either name. It calls the town Harrison, N. J.

IT IS PROBABLE THAT THE PROPORTION of large to small loans for housing purposes, during the next ten or fifteen years, will be greater than ever before. It is to meet this looming competition that the savings banks of New York State are now working out a plan for a mortgage bank. The opening wedge into this field, which is so closely related to that of the savings banks, will be provided by the Joseph Bill. According to present plans, these "savings bank mortgage banks" would be permitted to make larger loans than any one savings bank would normally choose to make—merely another way of saying that these banks would make only relatively large loans. Although no definite steps have been taken, August Ihlefeld, Jr., executive vice-president of the Savings Banks Trust Company of New York, has just completed a study which clearly indicates that it would be to the advantage of the savings banks to form such an organization; and that a plan very similar to that now under consideration would be adopted. A unique part of the plan, and one yet to be worked out in detail, is the handling of loans on property outside of the state. It is expected that the mortgage banks will open up a considerable loan market, for the rehabilitation of properties now held by courts or creditors, because they will not be dependent, as savings banks are, on the good-will of a few depositors.

GOVERNMENT

AS A STEP TOWARD GREATER PUBLIC CONFIDENCE, the Federal Home Loan Bank Board has asked for revision of many State laws governing building and loan associations. The Board feels that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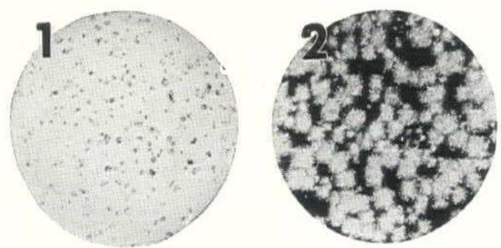

***See how pigment particles (1) actually "blossom out" when mixed with linseed oil (2). Paint made of white lead and oil anchors deep in the surface—sticks on like glue. It stays tough and elastic under the most brutal weathering . . . doesn't crack or scale when surface expands or contracts.**

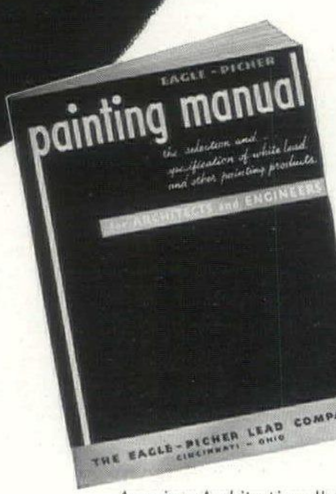

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PHOTO: WIDE WORLD

The Rev. Robert Searle, D.D., Captain Richard L. Reiss of the London County Council, Nathan Straus, Jr., Bishop William T. Manning, Spencer Miller, Jr., and Langdon Post, Chairman of the Housing Authority of New York (left to right) inspect the reproduction of a model slum dwelling at the Conference on Slum Clearance.

probably the surest road to this objective will be found in greater standardization of such legislation; and that confidence, plus more harmony in State regulations, is vital to the construction and financing of new homes in the United States.

While the Board itself has not approved specific legislation, it recently announced that its legal department has drafted suggested amendments for several States, and is further prepared to co-operate with local officials in drawing up suitable revisions for other States. In Kansas and Indiana, where results of current legislation are in evidence, savings and loan institutions have been rehabilitated and made more useful to the program of the State and its citizens, not only through better laws, but by improved methods of supervision.

We quite agree with the opinion of the Board that, in some things at least, the States should have powers equivalent to Federal associations. For example, the Federal associations are permitted to write "direct reduction loans" — loans which are continually reduced through the payment of installments on interest and principal—whereas some state chartered organizations are prevented from writing such loans, despite the fact that they, too, are insured members of the Federal Savings and Loan Insurance Corporation.

Indicating some of the other needs, the Board's statement continues: "The segregation of assets, and write-downs of assets, are too often prevented by State Laws just when they are needed. New statutes should cover these provisions. Lack of uniform reserve requirements is another important point. In the case of dividends, funds should be set aside to make possible a more uniform dividend each year, instead of a high dividend one year and a low one the next. Such fluctuations do not make for confidence and cause investors to hesitate."

Taking a general view, the Board feels that the suggested uniformity would provide for better organization, and, by thus attracting new funds, create a greater volume of thrift money for home financing.

HOUSING

THE GREAT NEED FOR LOW-COST HOMES has been well reflected in the eager grasping of current plans, by both public and private interests. As a matter of fact, in the light of an almost endless stream of "reports," it seems as though all roads lead to small houses.

One of the most recent of these comes from the American Academy of Political and Social Science, whose duty it is to promote a forum on political, social, and industrial problems confronting the present-day world. According to the Academy, from three and one-half to five million more American families of moderate income could afford to own an adequate house if the total purchase price were lowered by 20 per cent; or if interest rates (i.e., financing) were reduced by 2 per cent, and the period of amortization extended ten years. Unfortunately, their estimate is based on 1929 levels of income. To our way of thinking, this lessens its present application, despite rigid assertions that even for 1933 levels of income the number of families affected would be "approximately the same." However, the point remains — with the help of current legislation — a vastly greater number of families can, and should, be housed, than has been possible up to now.

ORGANIZATION OF THE CITIZENS' HOUSING COUNCIL OF NEW YORK was recently announced by Harold S. Buttenheim, Chairman. This new organization represents what is believed to be the first effort to find a solution to the city's housing and slum problems through co-operative effort. Present plans call for the appointment of eight committees, each headed by an expert in the field to be covered, with a personnel selected to include various points of view. Each of the committees will hold a number of open meetings at which technicians, organizations, and individuals will be invited to express their views. It is the hope of the Citizens' Housing Council that the plan will foster the interest not only of those primarily concerned with the social and civic implications of bad housing, but also those who have a business stake like the real estate and construction field. In addition, it will offer an opportunity for representatives of labor and tenants to bring their opinions in to the discussions.

The formation of this council comes none too soon. The present slum and tenement project in New York has virtually reduced itself to a name-calling contest, in theory if not in fact. Landlords and tenants are busy booing and hissing the Tenement House Committee for what they consider unnecessary stringency in the multiple dwelling act. Representatives of real estate interests are accusing the Church of publicizing a faulty exhibit of slum conditions. Between them the wheels have been pretty well slowed down.

One of the latest developments was the formation of the Church Conference on Slum Clearance, under the leadership of Bishop William T. Manning. The Conference has been addressed by such speakers as Captain Richard L. Reiss, of the London County Council, who told what had been done about slum clearance in England; and by many other prominent and influential persons. Most important of all, the Conference has the informal

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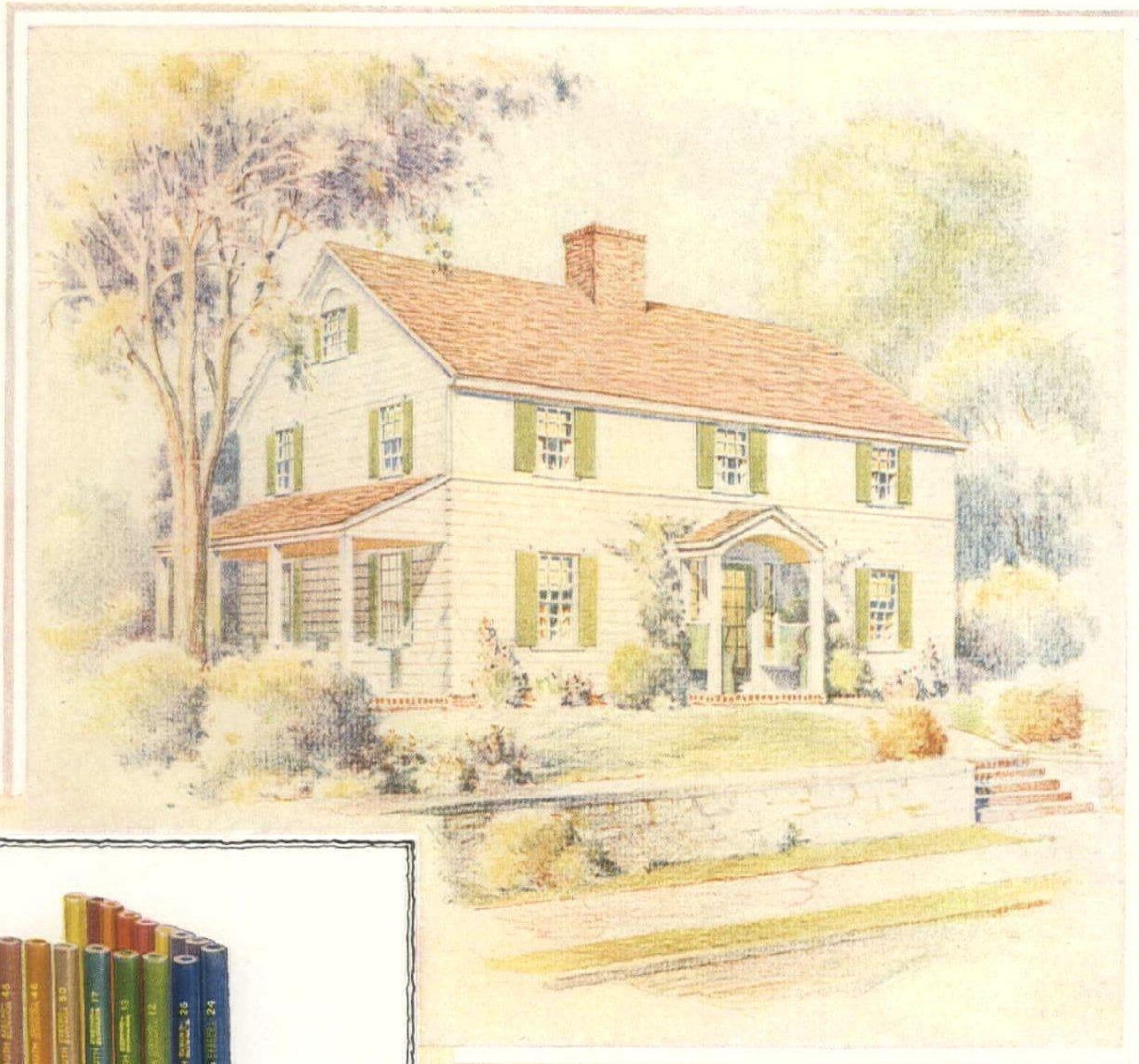

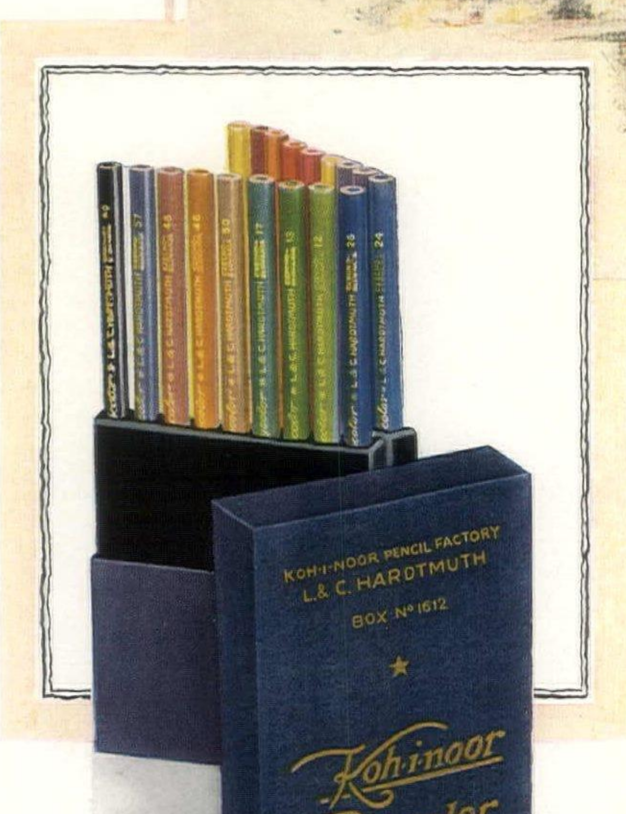

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The above rendering for a proposed residence shows one such combination. This was quickly rendered on tinted charcoal paper over an instrumental layout, the tone of the paper itself being to no small extent responsible for the harmonious effect of the whole. For some purposes darker papers such as browns or greens or grays are better. Frequently the paper itself is left to represent the walls, roofs, shadows or other essential tones. Rough papers are perhaps more popular than smooth as their textural character makes possible interesting effects with a minimum amount of drawing. Tracing paper "floated" on to colored board offers further possibilities.

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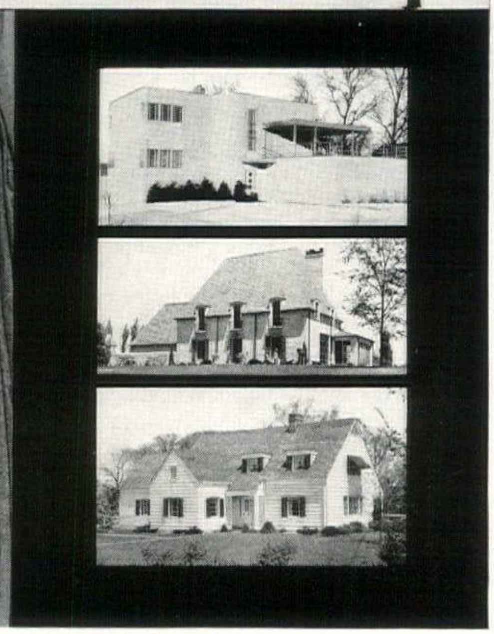

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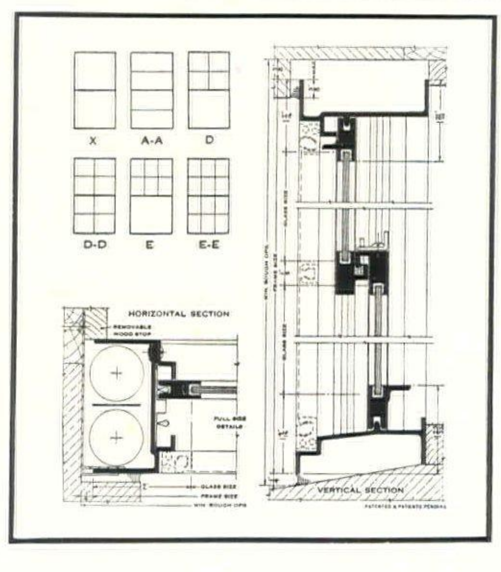

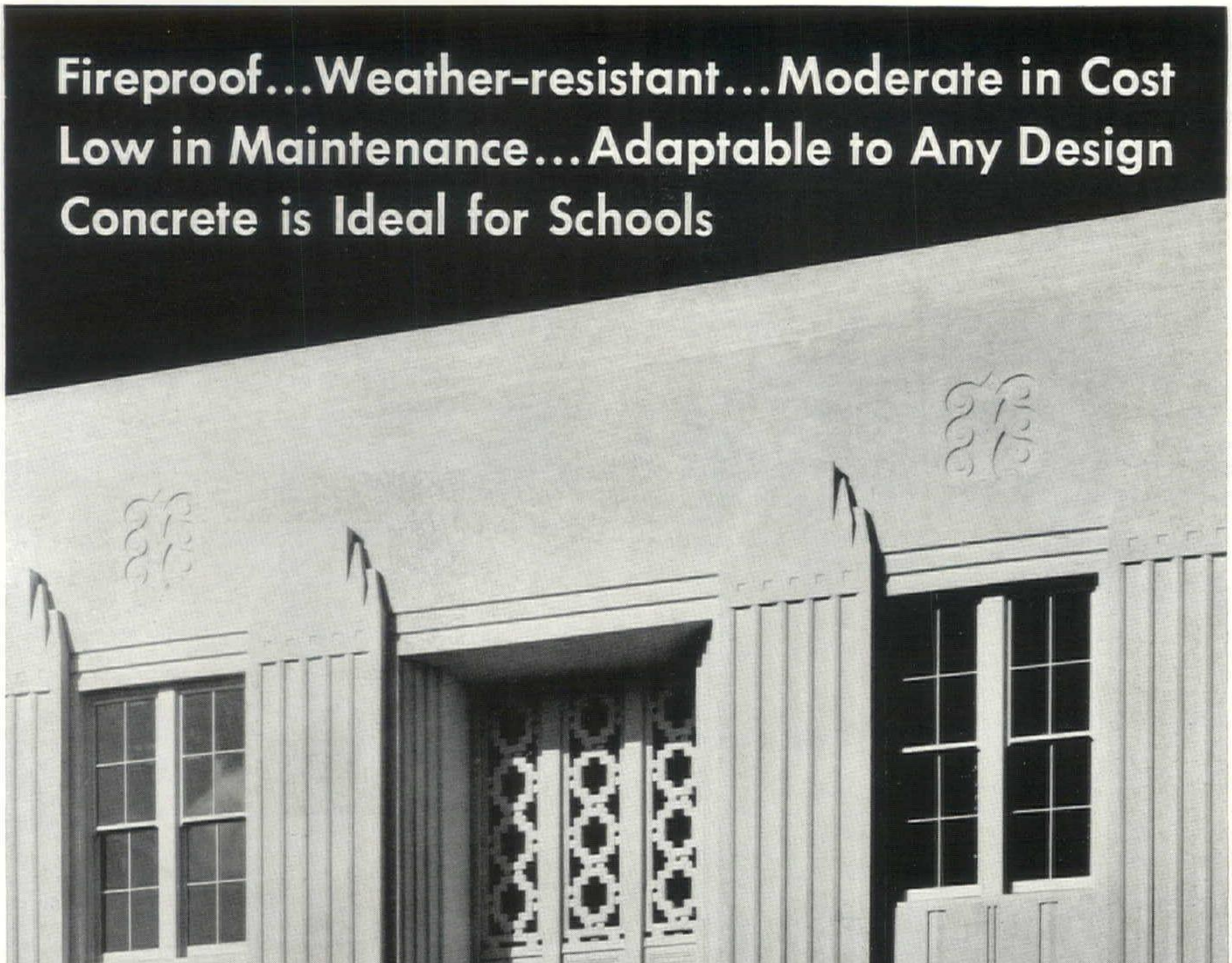

Northwest Junior High School, San Antonio, Texas, shows well the possibilities of concrete as a combined architectural and structural medium. Spandrels, pilasters and flat surface areas cast in plywood forms. Walls: monolithic with frame and floors. Grilles: precast concrete. Finish: buff stucco dash coat. Phelps & DeWees, Atlee B. and Robt. M. Ayres, and Adams & Adams, architects. Matthews & Kenan, engineers. King B. Key, contractor. One of many recent buildings designed for concrete. May we send you the manual *"Forms for Architectural Concrete."* PORTLAND CEMENT ASSOCIATION, Dept. 4-2, 33 W. Grand Ave., Chicago, Ill.

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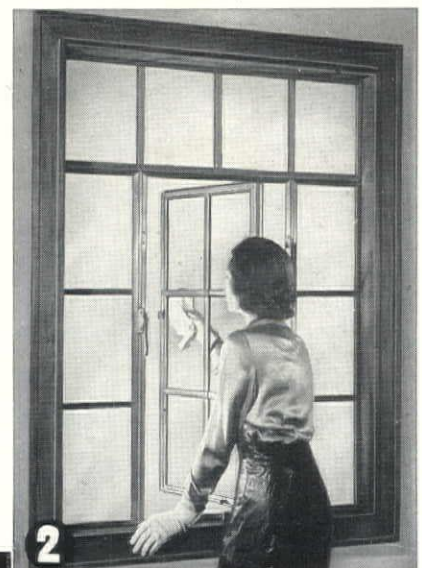

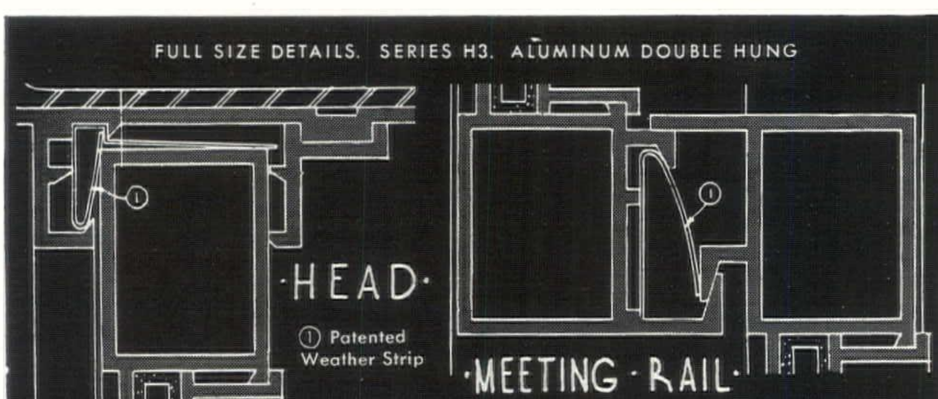

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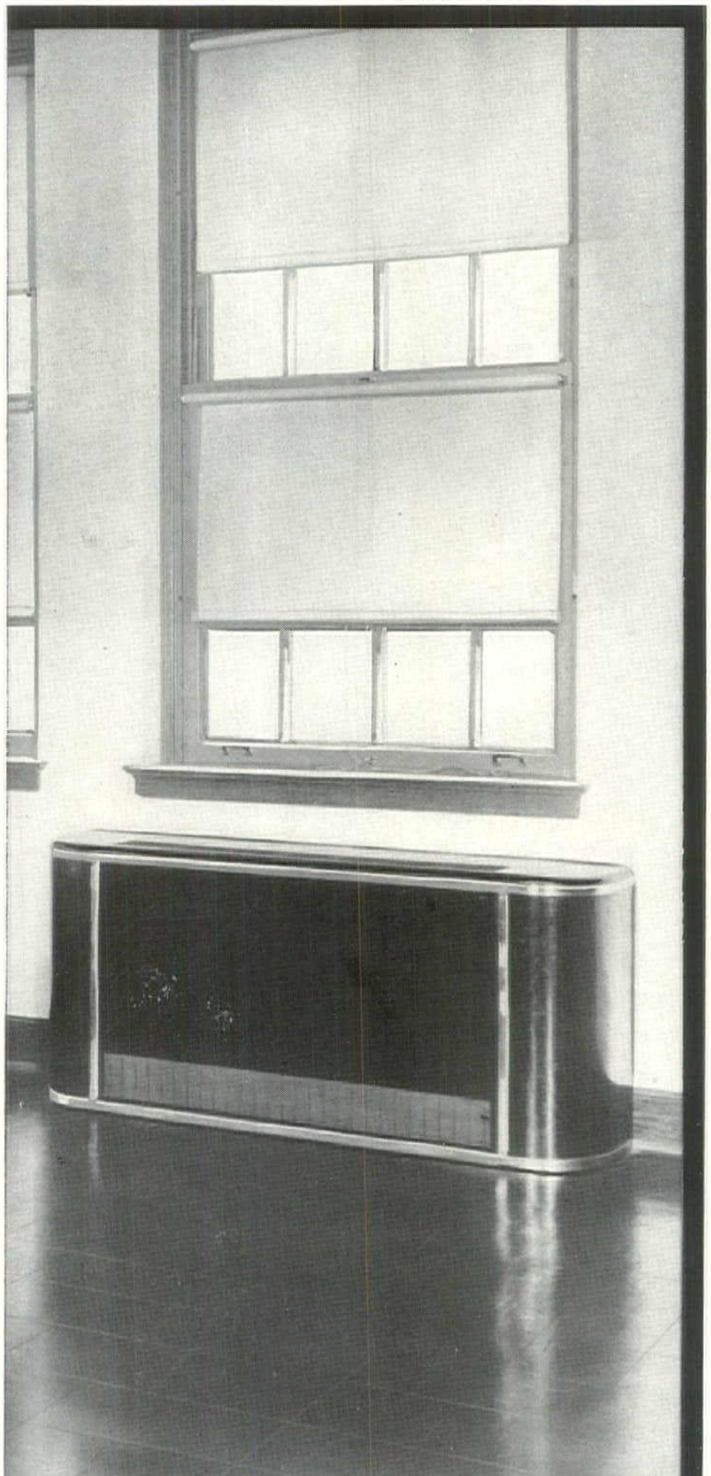

For Junior & Senior H. S. Monticello, New York

Fresh Air . . . filtered and tempered . . . is assured for the Jr. and Sr. High School at Monticello, N.Y. by the 28 Sturtevant Unit Ventilators recently installed.

This is one more example of the wide acceptance by architects of the new Sturtevant Units . . . which have proved the most popular we ever built.

The architects on Monticello Jr. & Sr. High School were Tooker and Marsh of New York City; T. G. Egan Refractory Eng. Co. of Brooklyn, N.Y. were the contractors, and Albert Fentzloff, New York City, the engineer.

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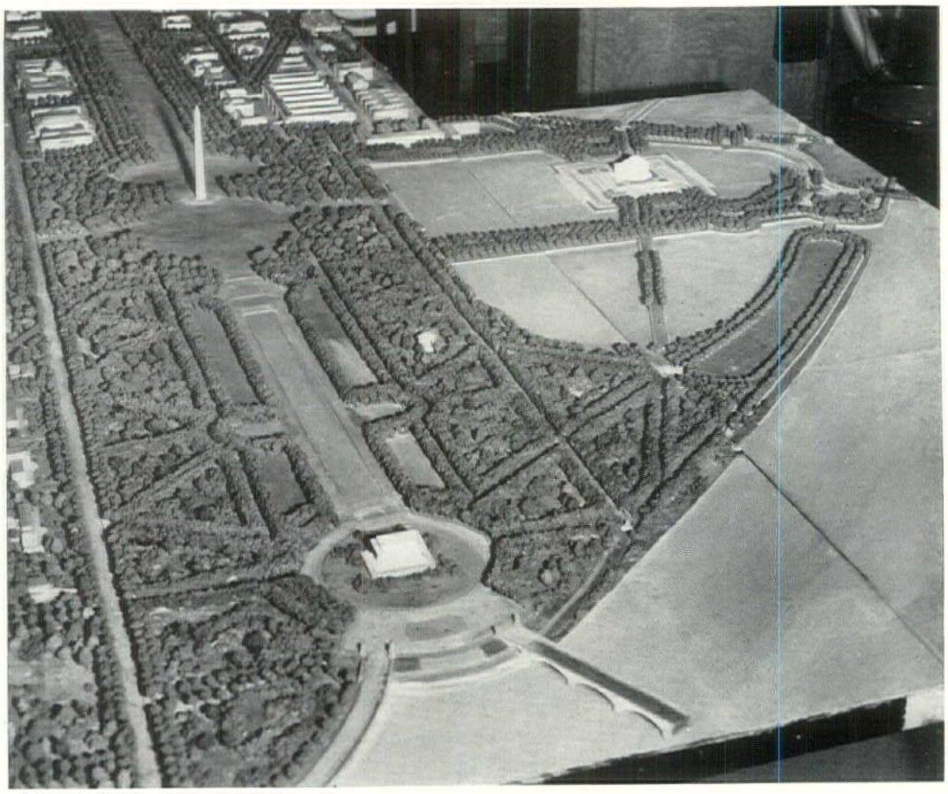

PHOTO: ACME

Model of the proposed Thomas Jefferson Memorial (upper right) showing its relationship to the Washington Monument and the Lincoln Memorial

but warm support of the city and national administrations.

Actually it is still a little early to expect concrete results from any source. Most of the difficulty seems to arise from that age-old trouble of "putting the cart before the horse." In this case the "cart" is the eviction laws, and the "horse" is suitable quarters for those ordered out of condemned properties. Until satisfactory economical housing can be offered to those evicted, there will doubtless be continued trouble.

THE NATIONAL LUMBER MANUFACTURERS ASSOCIATION has made such rapid strides with its program for small demonstration homes, that few outsiders have had time to look behind the scenes, or to keep up with successive public statements.

By way of a quick resume of the earlier steps, the plan had its inception roughly coincident with the publication last May of FHA's "Principles of Planning Small Houses." This bulletin — which, incidentally, is well worth the reading time of anyone not familiar with low-cost housing looked good enough to the NLMA to engender action. Accordingly, they built three units at Bethesda, Maryland, adhering strictly to the conditions and costs set forth as *possible* in the FHA analysis. Their success not only proved that FHA was right, but the unsolicited offers of some 300 people to buy the homes "sight unseen" fairly well established evidence of a large market, ready and eager for such homes. The result was a decision to erect 1,000 units of three houses each, in 1,000 communities, as a demonstration of the fact that small homes are within the buying reach of the buying masses—those living on incomes of $2,000 a year, and less. It now appears that this number will be increased to nearly 4,000 houses.

While it is hardly news to speak of construction as a *key* industry, this present move is so timely that it may develop into the greatest building campaign in the history of the country; and it is bound to carry many other industries with it. Already some 50 trade associations have united, under the leadership of the National Lumber Manufacturers' Association, the National Lumber Dealers' Association, the National Retail Dry Goods Association, and the National Electrical Manufacturers' Association. The goal of this concerted drive is the construction of 450,000 small homes this year, requiring a total expenditure of more than a billion dollars. Home equipment manufacturers are being asked to provide equipment comparable in price to the home itself, and designed to fit this type of home rather than a $15,000 house.

Watchfully perched on the crest of this rising wave is the FHA, ready, with its Insured Mortgage System, to finance up to 80 per cent of the total value of the property on a long time basis; 20 per cent down, the balance to be paid over 20 years in monthly payments of $20 to $25, including principal, interest, taxes, and insurance.

CONSTRUCTION

52 PER CENT OF THE HOME MORTGAGES accepted for insurance by the Federal Housing Administration, as of December 1, 1936, were secured by existing construction, according to a report of the savings, building and loan associations of the United States. The entire mortgage portfolio of these thrift and home loan bodies had 22,737 mortgages accepted, at an average of $3,901 apiece. The 52 per cent reported has undoubtedly eased the burden of thousands of home owners through the medium of reduced monthly amortization payments.

PROBABLY VERY FEW OF US have not at one time or another berated the riveters on a nearby construction job. The elimination of this deafening clatter is one of the most pleasing and important arguments in favor of fusion welding. Unfortunately, however, it has never been quite strong enough to overcome the objection that fusion welding was unsafe to include in New York City building codes on a par with riveting. How far New York lags behind was recently pointed out by H. S. Card, development engineer for the National Electric Manufacturers Association, in defense of a proposed new Building Code now before the Board of Aldermen. "132 cities in twenty-four states have adopted codes permitting welding. In addition, there are twenty large cities where it is permitted but not specifically provided for in the building codes." "Conclusive proof," says Mr. Card, "of the scientific correctness of fusion welding is contained in the fact that many of the massive steel structures in use today are welded. Welding has been used in the gates and penstock pipes at Boulder Dam, in hydraulic turbines, heavy excavating machinery, large unfired pressure vessels, cranes, steel mill machinery, and naval vessels."

THE ACCELERATION OF BUILDING ACTIVITY in 36 key cities of the Pacific Northwest is carrying construction into 1937 at the highest level since 1930. The annual survey conducted by the Equitable Savings & Loan Association, of Portland, indicates a gain in 1936 of 105 per cent. Approximately 40 per cent of the population of Washington, Oregon and Idaho is included in the survey, which showed a dollar permit volume of $33,500,000. This year, for the first time, Equitable's

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WHEN a new building is being constructed or an old building remodeled, one or more places can be found where American Steel & Wire Company Wire Fabric can be used to give the additional strength that will put off the day when repairs will be necessary.

Our Wire Fabric for concrete reinforcement is made in triangle mesh or electric welded square or rectangular mesh. It can be furnished either in rolls or in flat sections to suit your particular requirements.

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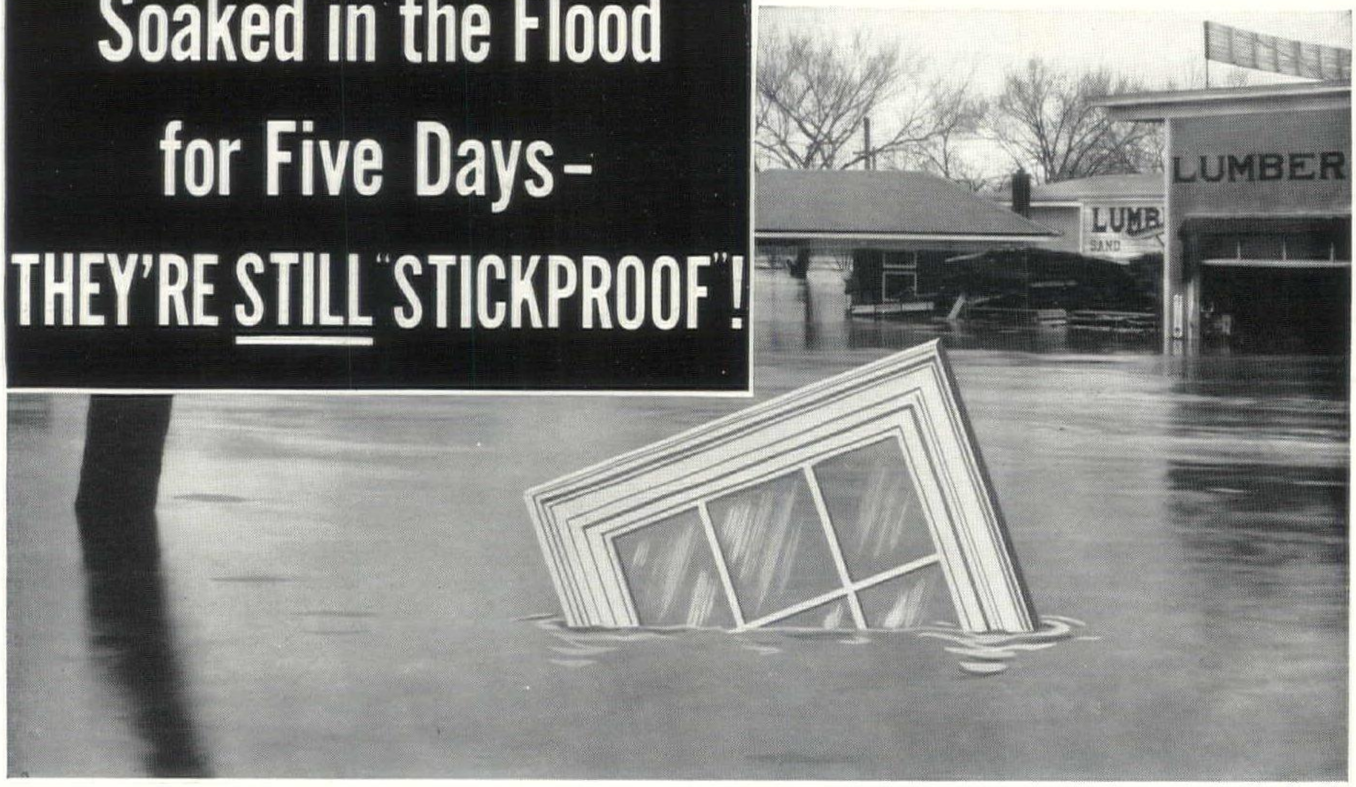
UNITED STATES STEEL

Soaked in the Flood for Five Days–
THEY'RE STILL "STICKPROOF"!



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Silentite is easy to specify, easy to install, and easy for the owner to live with. It's a temper-saving, trouble-proof window that always satisfies. The cost? No more than any other well weather-stripped window and frame.

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SILENTITE
"Pre-Fit"
FRAME • WINDOW • SCREEN AND STORM SASH

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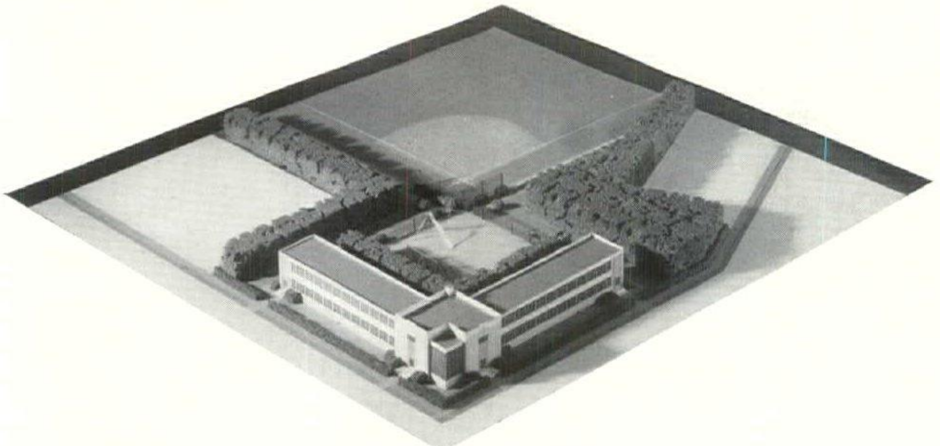


A model of an unusually well-designed school for colored children proposed for Rocky Mount, North Carolina. A. Mitchell Wooten and Associates, Architects

survey included a check of suburban building, and revealed a volume in excess of four and one-half million dollars. This figure is not included in the above statistics.

A similar trend, but on a larger scale, is given in the February issue of "Building Business," the F. W. Dodge Corporation's report covering 37 Eastern States. Chiefly as a result of a 108 per cent increase ($78,000,000) in residential construction, the January 1937 total for building was 37 per cent larger than that in January 1936. Contracts awarded during the month totaled $174-million. This also represented a gain of 36 per cent over December 1936.

DUN & BRADSTREET, INC., has also just completed a survey of the building industry. Plans thus far released for new construction work during 1937 have been sufficiently numerous to indicate that construction will again assume a leading position in the vanguard of the most important contributions to the nation's progress. By far the largest increase is foreseen in the erection of new homes. Although in some cities home building in 1936 was almost three times that of 1935, conservative estimates place the 1937 volume at 50 per cent higher. The more liberal estimates run as high as 100 to 150 per cent, due to the impetus which will be given by the activities of the National Small Homes Movement.

A FURTHER ADVANCE IN REAL ESTATE BOND ISSUES during February, of 1.3 per cent, is indicated by the Amott-Baker Realty Bond Averages, based upon 200 selected issues of properties in New York, Buffalo, Boston, Philadelphia, Pittsburgh, and other eastern cities. The gain for two months ending February 28th was 4.1 per cent.

FAIRS

THE NEW YORK WORLD'S FAIR will start construction in May of the only building to be erected during 1937. It is the Communications Building, designed by Francis Keally, and is the first exhibit building for which plans have been announced. The building will face the north end of the mall leading past the Theme Plaza, and will be the center of ten structures to be erected by private exhibitors in the communications business.

One of the principal attractions of the Fair, according to present plans, will be a model village, its houses equipped and furnished in modern standards of decoration and efficiency. The village will be the central exhibit of the Shelter Area, one of fourteen groups presenting man's basic interests and needs. It is understood from a recent study, that this exhibit will present, for the first time in the history of world fairs, all of the aspects of home making in their proper interrelationship. If a lesson can be taken from other major fairs, the display will influence decoration and furniture design for years to come.

Also speaking of the possible effects of the fair, John T. Briggs, secretary of the New York Society of Architects, said recently that he expected the New York World's Fair to influence architecture, both here and abroad, far more than any previous fairs have done. It may result in the houses of new cities being built upon stilts above grassy plots and beds of flowers; and many other forms of architecture may grow as the result of examples visible at the fair. Mr. Briggs said he was convinced the future needs of cities' building would include increased use of steel and glass surfaces.

HE WHO FIGHTS AND RUNS AWAY is certainly not representative of Western spirit. San Francisco had already planned its Golden Gate International Exposition before definite word had been given on the New York World's Fair. Both were scheduled for 1939, but it was hoped that the New York Fair would not be ready soon enough to interfere. Since it will however, the San Francisco exposition directors have decided to accept the fact as a challenge. The International Exposition will undoubtedly have to take second place as to size, but it need not give ground for quality, charm, and distinction. Eleven Western States have assured the fair officials of their co-operation to make the exposition a joint showing of all that these states possess of color and interest. The major feature relied upon to give the exposition unique appeal is, of course, the man-made island site in the center of San Francisco Bay. Exposition directors believe that industrial exhibits have been overdone, since the Chicago Fair. As a result the emphasis will be on picturesque and unusual features of the people, customs, arts and crafts, of the entire Pacific Basin.

THE INTERNATIONAL HOUSING FEDERATION, of Frankfurt, Main, and the International Federation for Housing and Town Planning, of London, will hold a Congress in Paris from July 5th to 13th, 1937. The date falls within the time set for the Paris Exposition, and it is planned to arrange, in connection with the Congress, a series of excursions and study tours.

ART

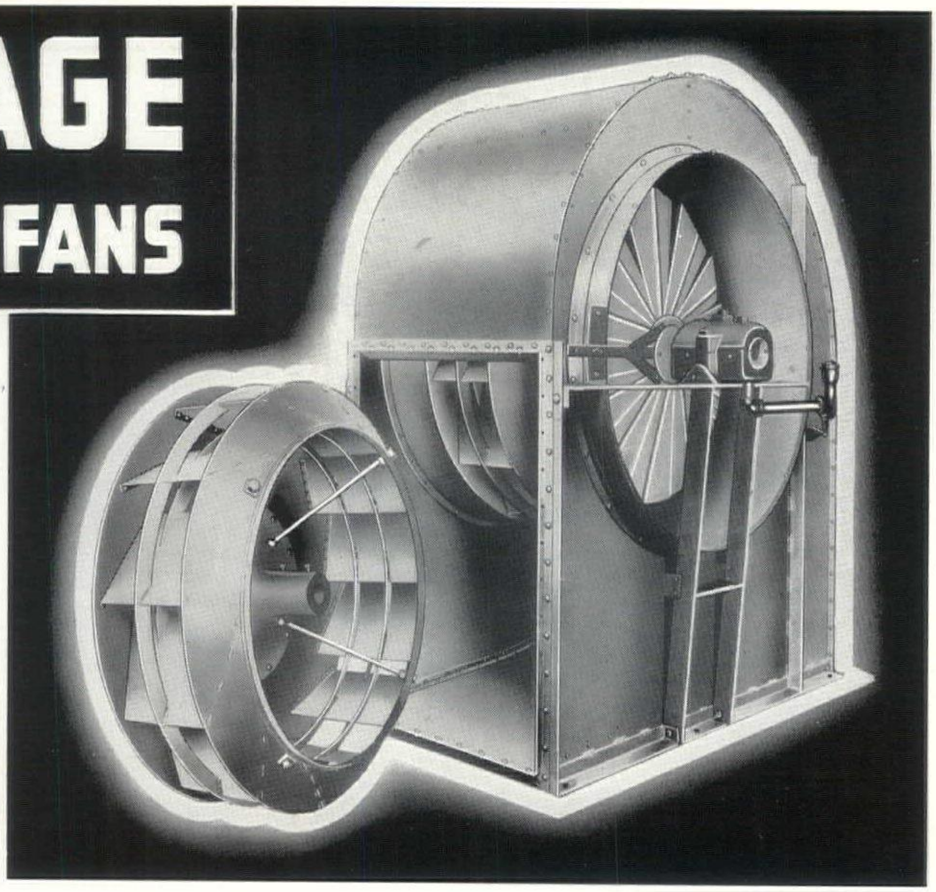
WITH THE PASSAGE OF THE BILL ACCEPTING ANDREW W. MELLON'S gift to the nation, a group of pictures unequalled by any private collection in the world becomes the property of the American people. The collection forms the nucleus of what it is hoped will develop into a national art gallery comparable with the best European collections.

The bill passed both houses without much delay, although Senator Robert M. LaFollette, and a small group of Senators, stirred up some rumpus in seeking to remove what they charged were "strings" attached to Mr. Mellon's gift. Senator Tom Carter, D., Texas, who shepherded the bill through, lost no time in making a vehement answer to Senator LaFollette. "It ill becomes us," he said, "to assume the position of bargaining when we are offered a gift such as this."

We agree with Senator Carter.

The world will probably always have some inhabitants who insist on calling half a glass of water, "half empty," when they could just as easily call it, "half full!"

CLARAGE TYPE W FANS



(Right) Illustrating large Type W Fan equipped with Clarage Vortex Control (in fan inlet), and standard wheel. To assure smooth-running, all wheels are accurately balanced both statically and dynamically.

CLARAGE AIR WASHERS are built in six types and many sizes to meet every type of service. Widely used for ventilation, comfort and process air conditioning.

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Second, because of exceptionally high efficiencies plus a *full* self-limiting horsepower characteristic, in many cases these fans can be driven by motors one size *smaller* than you would normally expect. And they operate quietly!

Thus, on practically every job, substantial savings in motor first cost are not only possible but very probable — and operating economies *always* the rule.

Any size of fan can be furnished with Clarage Vortex Control, a patented device as shown above. Automatically or manually operated, Vortex Control gives any desired capacity regulation, the fan operating at constant speed. It eliminates the need for an expensive variable speed motor and elaborate control equipment — a big saving.

Specify Clarage for:

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covering this latest Clarage development. Once acquainted with this new fan equipment, we believe you will wish to specify and use it consistently, due to its very definite advantages.

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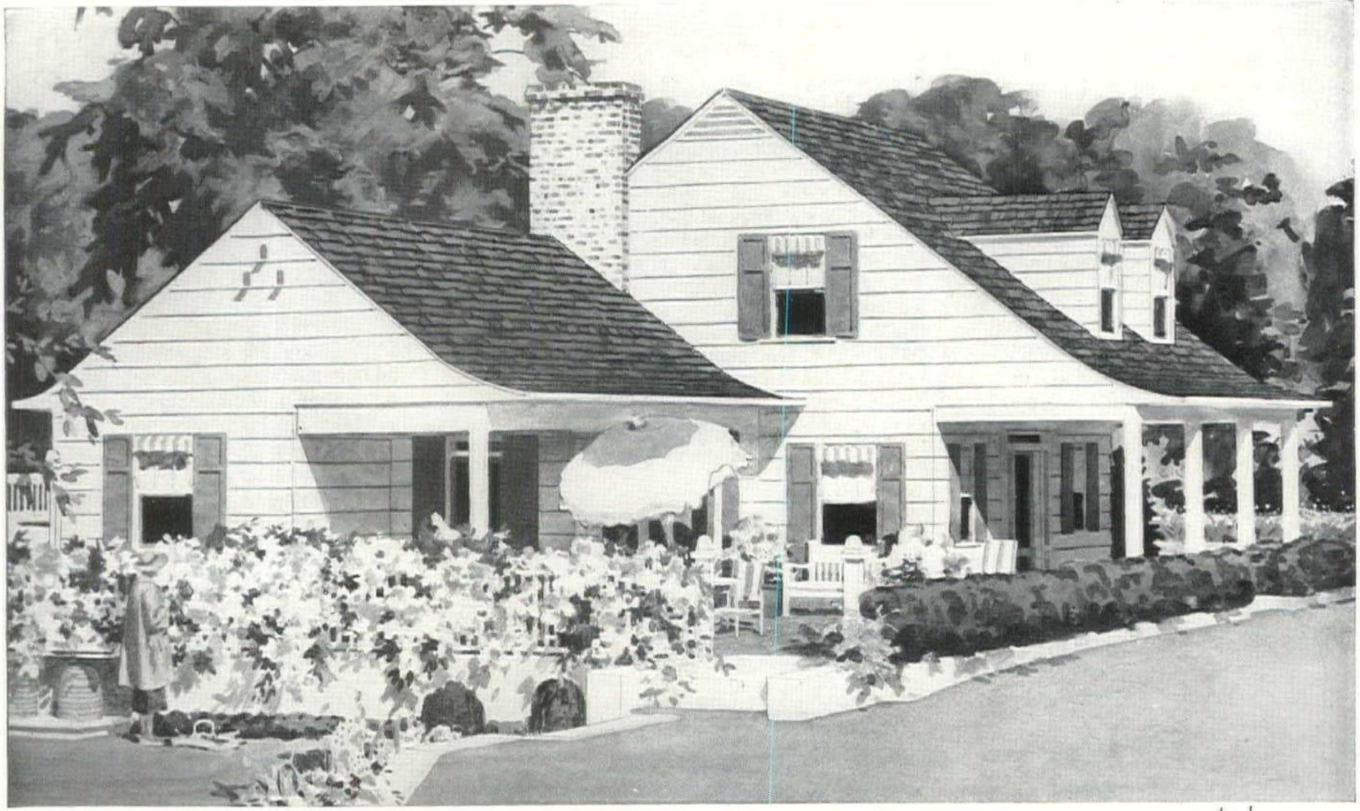
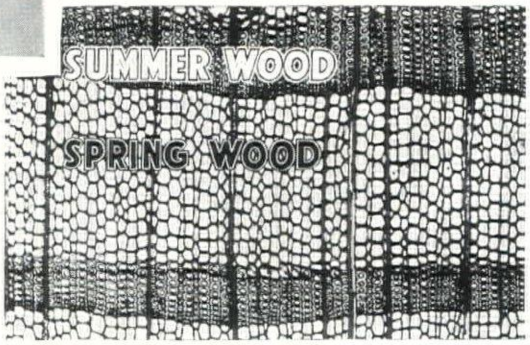


WET *April* — DRY *July*

— *that's why wood grows like this*



● *Look at the end grain of a board under a microscope. You will see something very much like this. Note the denser cell structure of the summer wood. Many paints have difficulty adhering to such a surface. Dutch Boy White-Lead gets a good anchorage on both spring and summer wood. That's one of the reasons why this paint does not scale off.*

... and that's a very good reason for specifying White-Lead

APRIL SHOWERS... architects specifying paint. Offhand, you might say that these two ideas are totally unrelated. Actually, however, there is a very direct link.

Wood cells that grow in the spring generally give a surface that holds paint better than the wood formed by the summer-grown cells. The latter are often trouble-makers. They're small with hard, thick walls less porous than those of spring wood. Certain paints have difficulty adhering to this dense surface. After a short term of service, they start to scale off.

But not Dutch Boy White-Lead. This paint gets a good firm hold on both spring and summer wood. It does not "let go" but continues to present an unbroken surface to the weather.

Still another point to be considered is wood's incurable habit of expanding and contracting. Some paints haven't enough elasticity. They crack under the strain. But not Dutch Boy White-Lead. This paint is highly elastic when first applied. And it stays that way through years of service.

Every application of Dutch Boy White-Lead is a tailor-made paint job —mixed to suit the special requirements of the surface to be painted—tinted to the exact shade you and your client desire. By specifying Dutch Boy White-Lead, you secure that combination of beauty and durability which is a fundamental objective of good architecture.

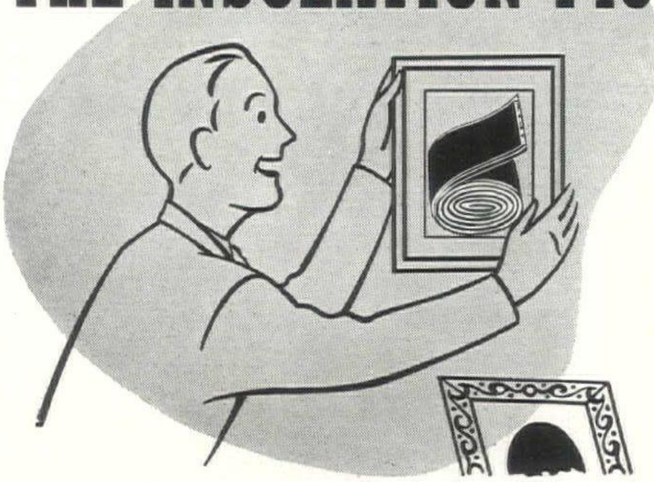
DUTCH BOY WHITE-LEAD

Good Paint's Other Name

NATIONAL LEAD COMPANY

111 Broadway, New York; 116 Oak St., Buffalo; 900 West 18th St., Chicago; 659 Freeman Ave., Cincinnati; 1213 West Third St., Cleveland; 722 Chestnut St., St. Louis; 2240 24th St., San Francisco; National-Boston Lead Co., 800 Albany St., Boston; National Lead & Oil Co. of Penna., 316 Fourth Ave., Pittsburgh; John T. Lewis & Bros. Co., Widener Bldg., Phila.

THE INSULATION PICTURE HAS CHANGED



...Be Sure the Insulation YOU Specify Can Meet Every New *Condition*

● Back in 1922, when Balsam-Wool was first introduced, Wood Conversion Company engineers realized the need for *moisture protection.* That's why even the first Balsam-Wool had a waterproof covering.

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DOUBLE-SEALED Balsam-Wool is also fire resistant—termite treated. It has a positive method of application that will not permit settling, and that assures continuity of insulation. It provides permanent efficiency—as thousands upon thousands of applications have proved.

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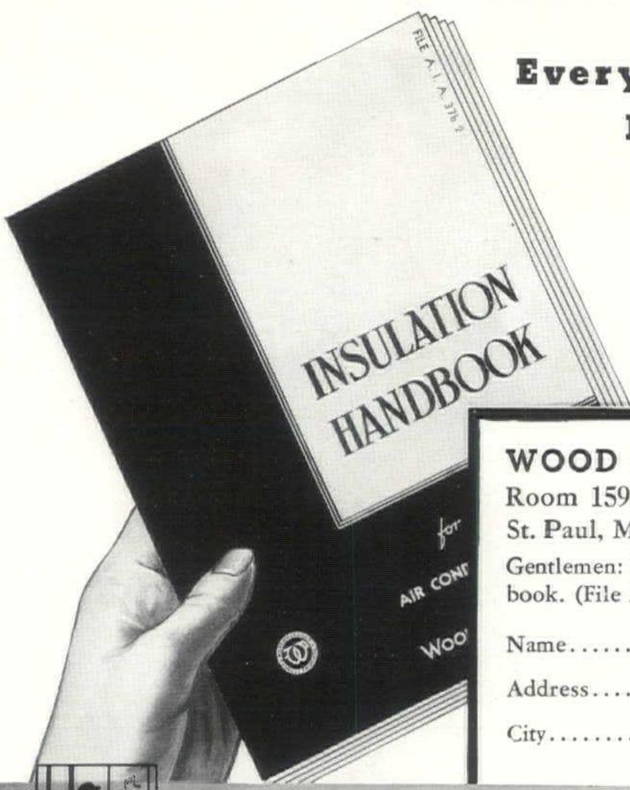

Every Architect Should Have This NEW INSULATION HANDBOOK

This book is "just off the press." It contains valuable information on insulation and its association with air conditioning, in addition to charts and data on the proper application of insulation. It also gives a detailed analysis of the heating and cooling requirements for an average size home. Write for a copy of this useful book today.

WOOD CONVERSION COMPANY
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Gentlemen: Please send me, without obligation, your new insulation handbook. (File A. I. A. 376-2)

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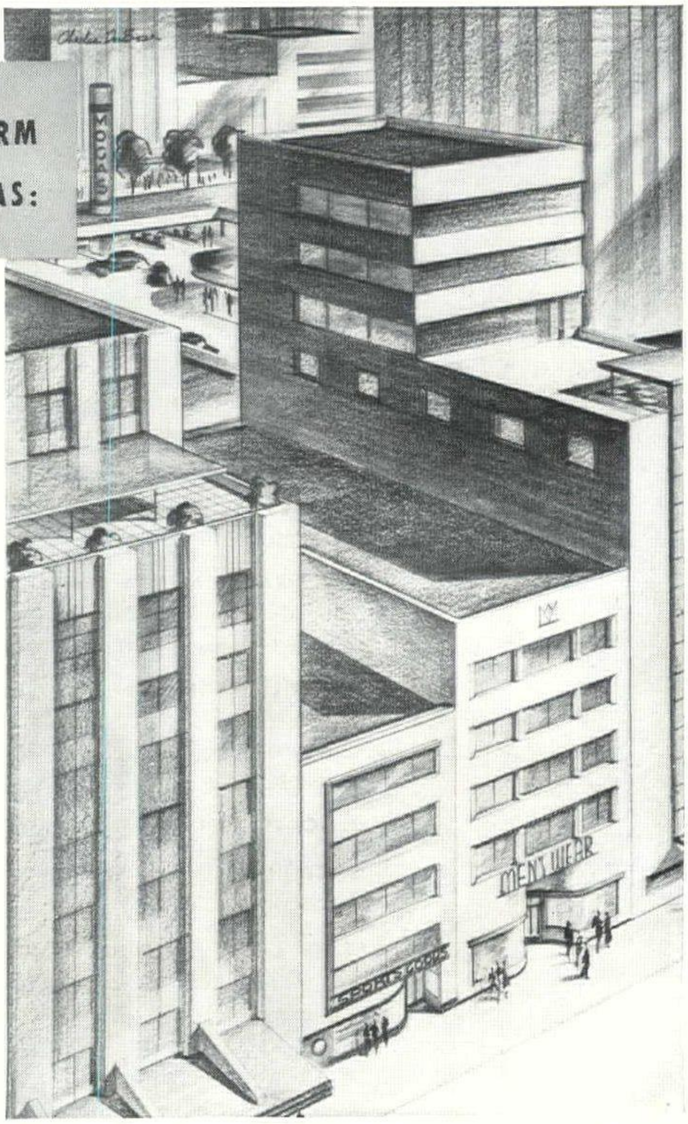

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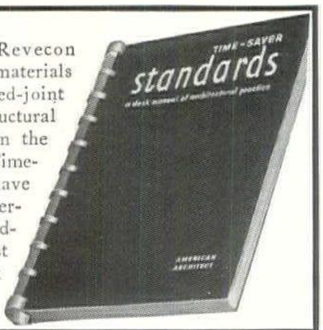

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AMERICAN ARCHITECT
AND ARCHITECTURE

THIS MONTH

DR. N. L. ENGELHARDT has been a consistent advocate of school architecture keeping pace with the constantly improving technique of modern education.

THE LITTLE RED SCHOOLHOUSE in common with the "pie that mother used to bake" is now a sentiment of the past. Therefore, instead of merely publishing pretty pictures of school architecture, we have integrated the parts of recent schools for Elements of School Buildings.

VOTERS AND SCHOOL BOARDS think of school architecture in terms of facades and imposing entrances. The Portfolio is devoted to excellent examples of school entrances in various sections of the country.

PROGRESSIVE EDUCATORS have gone far afield to seek out new devices to interest and stimulate pupils. Audio-Visual Studios are the newest development along these lines.

IT IS PRACTICALLY A CLICHE to say that some of the best contemporary architecture is being done in the Scandinavian countries. Yet even in Sweden the new Secondary School by Ahrbom and Zimdahl is an outstanding accomplishment.

BETTER LIGHTING eliminates the eye-strain and nervous exhaustion that make many a pupil seem dull and backward. W. G. Darley of the General Electric Company sets up standards of good lighting and the means of achieving them in his article, The Design of School Lighting.

CLOCK TOWERS result in prompt pupils and a fitting subject for Favorite Features.

ONCE IN A BLUE MOON there comes a renovation as interesting as the modernization of the George R. Dyer House by Bradley Delehanty.

STATE LAWS governing standards for class room design were analyzed to give a comprehensive picture of minimum planning in the Unit Planning of Class Rooms and Time-Saver Standards on the same subject.

NEXT MONTH

WALTER GROPIUS first came into international prominence as the head of the Dessau Bauhaus. Now at long last he has come to America to teach at Harvard. Dr. Gropius will discuss some of his theories on architectural education.

LITTLE HAS BEEN DONE to integrate domestic architecture into styles and materials in relationship to the geography of the United States. This will be done with new houses in the May issue.

REINHARDT AND HOFMEISTER had a very difficult plan problem to solve in doing the new branch for the East River Savings Bank in Rockefeller Center.

UNIT PLANNING OF BATHROOMS is of paramount importance to all architects interested in obtaining the maximum for the minimum in small house design.

Dr. and Mrs. Gropius getting a bird's-eye view of New York from the Rainbow Room in Rockefeller Center

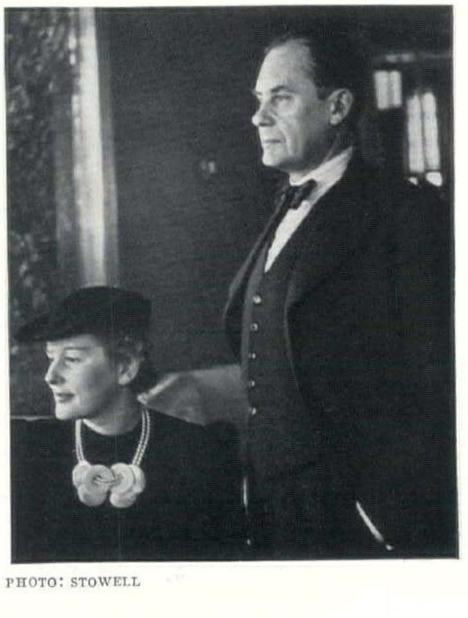


PHOTO: STOWELL

PHOTO: WI

So long as our "educational" institutions above the grade of the Kindergarten (which is truly human) persist in foisting a feudal, and hence artificial, system of thinking and feeling upon a free, liberty-loving, democratic, active-minded people, just so long shall we have spiritual poverty instead of spiritual wealth in our civilization and in our art: For our art cannot differ from our civilization and our civilization cannot differ from our education.—Kindergarten Chats (1902) by Louis H. Sullivan

THE SCHOOL OF TOMORROW

BY N. L. ENGELHARDT

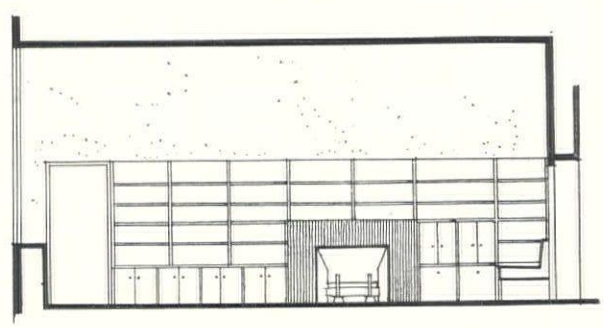
Dr. Engelhardt, Professor of Education, Teachers College, Columbia University, has served as Educational Consultant in the development of school building programs and in the planning of school buildings in many parts of the United States.

"MARK HOPKINS on one end of a log and the student on the other" symbolizes a phase of education which will persist. The individualization of guidance and instruction must continue to be stressed and assuredly will play a more important role in the future school than in the past. Some interpreters of the Mark Hopkins' theory leave the suggestion of simplified curriculum and of a return to teaching and environmental conditions of decades ago. Fortunately, their hopes will never again attain realization.

The educational program of a nation must keep in tune with the social, economic, and governmental progress which a nation makes. In fact, the ideal educational program outstrips other progress. It anticipates changes, provides for human adjustment, equips far-sighted leadership for consummation of progress, and constantly keeps in the van of the procession. Next to government itself, the most powerful force in American life is public education. It is the agency upon which the individual must rely for fitting introduction into the social order. It must provide opportunity for ready adjustment. It must recognize individual talent and stimulate to successful action. It must broaden horizons, develop world appreciations and overcome provincial barriers. It must implant the highest ideals of home responsibility and direct toward honest, courageous citizenship. Its training must make for happiness in vocation and leisure. The social action growing out of its instruction must result in general human betterment. Teachers, parents, and citizens with such a vision can mold public opinion as can no other agency our American life affords. Forward through education must become, as never before, the watchword of our nation.

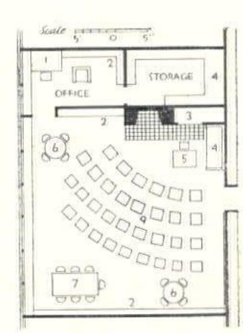
The school of yesterday accomplished many worth while purposes. Its success was frequently so pronounced that the public accepted it with a minimum of reservation. Its failures were not too glaring in a country of apparently unbounded resources and rapidly piling wealth. Its chief fault was its static nature, its lack of adaptation, its reliance on tradition, and its bland assumption of continued fitness for a rapidly changing social order. Lay school board members acted in terms of the educational concepts of their youth, teachers with a modicum of training assumed preparation for a life career, curriculum took on a semi-sacred character, and youth was handed diplomas guaranteed to solve the difficulties of a lifetime. Education was not thought of as a mode of living or as a continued process of growth through adulthood. It had its beginnings at a non-scientifically determined point in life and frequently ended in the nebulous periods of adolescence or the turbulent teens of immaturity. In many places, the schoolhouse of yesterday stood apart from the community. It probably was accorded an undue reverence and respect. Its facilities were few, the world's masterpieces in its library were limited in number, and the day's program provided a mere beginning in individual development. The building, although owned by the citizens, was more often than not closed off to their use. Crying needs for community growth and individual readjustment were left unheeded. This kind of school still exists in too great numbers in the United States. In this day and age such a school is a "deceit and a fraud." It creates public confidence that it is carrying its load, but it lets the public down when its contributions to human readjustment are most sorely needed.

Educational leadership has already stimulated the development of schools in this country, the curriculum and contributions of which are far in advance of the traditional. Abrupt transition from one phase to another of educational progress is rarely, if ever, accomplished in a democratic society. Suddenness of change is only achieved by governmental fiat, which is fortunately lacking in our scheme of things. This country already has an abundance



Front Elevation

1. Teacher's Desk
2. Bookcase
3. Cabinets and Woodbox
4. Bench
5. Teacher's Table
6. Reading Table
7. Conference Table
8. Corkboard
9. Students' Chairs



ENGLISH DISCUSSION ROOM

LAWTON SCHOOL, SAN FRANCISCO, CALIFORNIA

D. A. RIEDY and C. E. J. ROGERS, ARCHITECTS

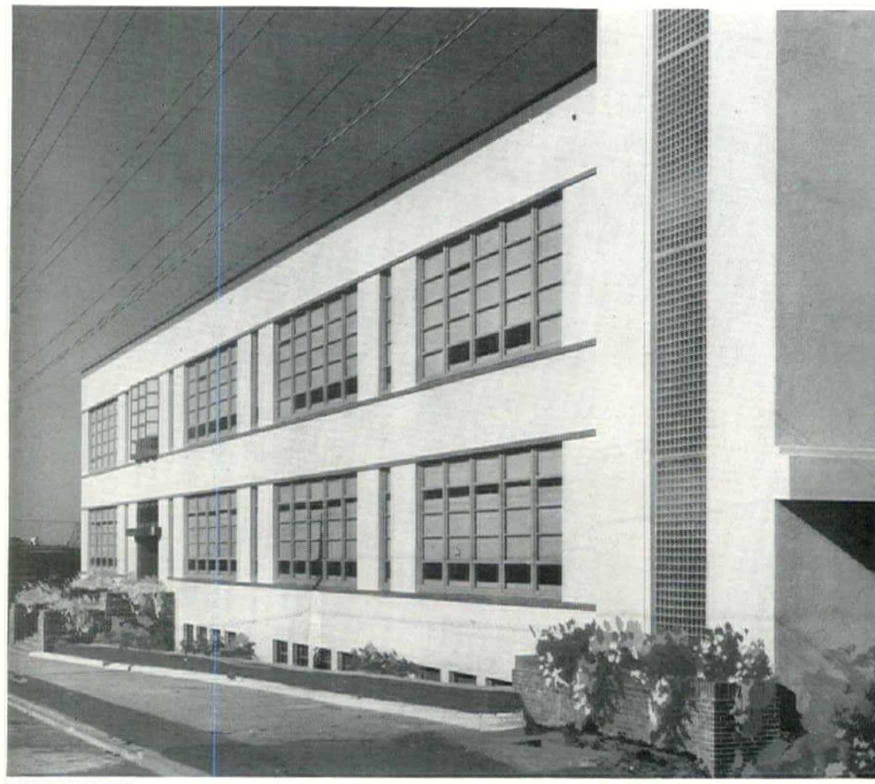
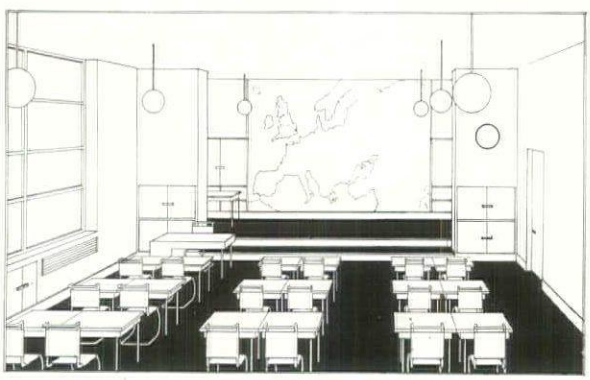


PHOTO: MOULIN



Perspective

1. Teacher's Desk
2. Work Table
3. Files (cabinet over)
4. Cabinet
5. Map
6. Teacher's Table
7. Students' Tables
8. Bookcase
9. Gramophone Booths
10. Bulletin Board
11. Blackboard
12. Duct

PROPOSED LANGUAGE CLASSROOM

of leadership endowed with vision and the courage to advance. The vision and courage must also become the social equipment of laymen in all ranks of society. Men and women devoting their lives and careers to public education should be encouraged to put their visions into action, to formulate the plans to meet society's future needs, and to develop all aspects of education which may provide for human adjustment.

The public education program which has gone through the recent major depression will no doubt show vast improvements as a result. It must assume new responsibilities. Public education working with other social and productive agencies must play a major part in anticipating and warding off future depressions. Men and women equipped in our public schools should acquire insight and vision to cope with the economic difficulties they encounter. Re-education, readjustment, and rehabilitation have become permanent phases of the program and not merely the requirements of a disastrous period. The educative process must begin with earliest childhood and the normal period of schooling must be extended far beyond our nation-wide practice. Co-operation between home and school in child development must become more of a fact than a fiction. Guidance throughout the school career must be practiced and not merely preached. Curriculum adjustments must be effected with greater frequency. New opportunities for human service must be discovered and training therefore provided. The advantages of national experiments in education will come to the fore and suggest new adjustments for unemployed youth. Education will gradually assume new meaning.

It is appalling to note the slowness with which an educated nation makes progress. Granted all the achievements through inventions, the multiplication of socially-minded agencies, and the national acceptance of liberal human principles, yet the general improvement of man's conditions proceeds at a snail's pace. The disgraceful slums of urban and rural areas defy our productive and administrative genius to eradicate them. Thousands of mothers are labor-slaves in homes yearning for adjustment. Thousands of men seek the finer advantages which the social heritage can readily contribute. In hundreds of small cities and villages, community life still moves without purposeful air or stimulating opportunity. Democracy cannot thrive under such handicaps. Public education can plan its institutions to become the focus of community life. It can stimulate its leadership to open its curriculum to these and similar problems. It can arouse its unduly contented intelligentsia to meet the significant challenges which true democracy presents.

POLYTECHNIC HIGH SCHOOL, LONG BEACH, CAL.

H. DAVIS, ARCHITECT

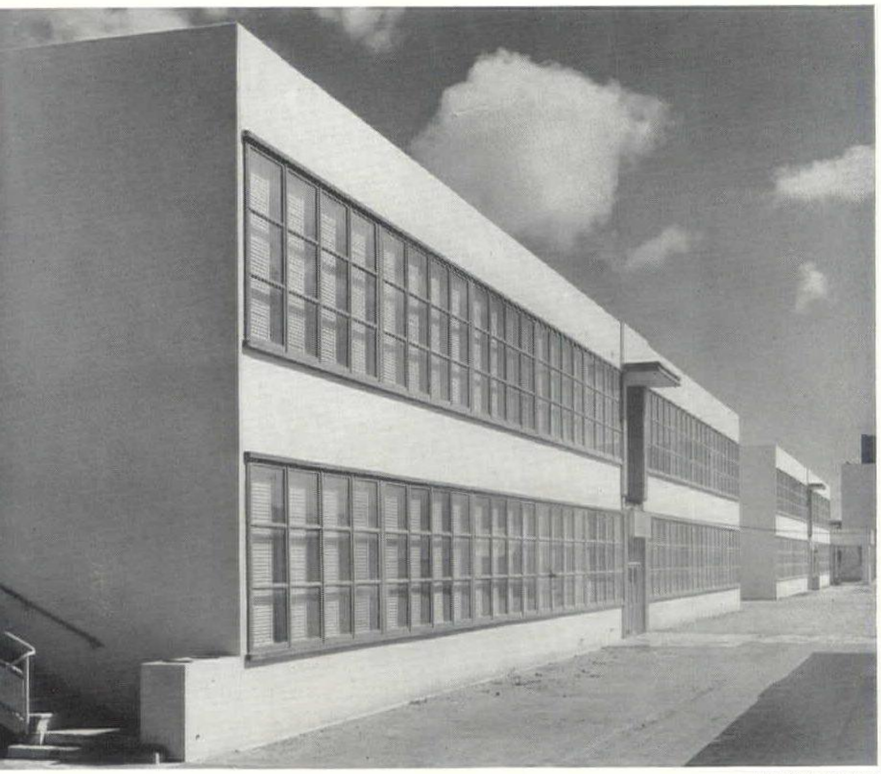
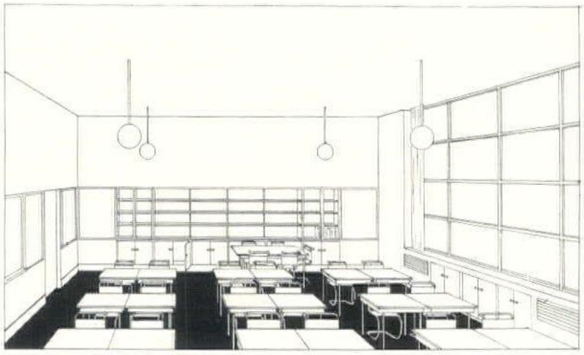


PHOTO: HAIGHT

Some lessons may be learned from other lands. An elementary school in Milan, Italy covers a forty-acre site where once only dismal slums existed. Its facilities and program offer food for thought. There is a nursery school in which the youngest are studied, taught, and guided through the social intricacies of early childhood, and conventional classroom buildings for formal instruction in the primary and intermediate grades are scattered about the grounds. Sleeping quarters are provided so that children from poorer homes may be housed under reasonably sanitary and comfortably equipped facilities. Cafeterias provide luncheons where children learn table manners directly under teacher guidance. A little theatre makes for opportunities in speech and presentation. A model farmyard with all the domestic animals of the farm enables the children to understand the contribution the farm makes to the nation's productive life. Here is found a model farm dwelling, the instruction in which correlates highly with that of the gardens developed by the children, and a model urban home reproduces life conditions in the city. An orchard and a small fruit section give new insights into food problems. Here are to be found all types of domestic fowl, the hen, duck, turkey, goose, and the like. The children are taught their care and their place in a national subsistence program. Two fishponds are used to teach fish culture. In fact, the school is not just a building but a community in which direct contact is given with the major problems of living. Music, art, and physical development round out this curriculum. Certain types of life adjustments should come readily to children who have enjoyed such advantages.

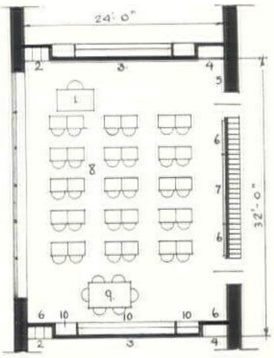
American elementary schools are undergoing rapid change. Large acreages are being provided. Recreation and contacts with nature are assured. The buildings themselves are no longer thought of as mere nests of classrooms. The classrooms are being transformed into attractive liveable spaces. Activity workrooms are supplementing classrooms. The library entices because of its beauty and attractive layout of books. The auditorium affords opportunity for combined adult and child activity. The music and the art studios, the industrial and homemaking laboratories provide for parent as well as child instruction. Such a community school stimulates wide use. It encourages citizens of all ranks to accept opportunity. It supplants the humdrum inarticulateness of community life with communal action and better understandings. It arouses latent talents; it creates democratic attitudes.

Every community school should have its museum of community achievements, its record of community accomplishments. Its corridors should teem

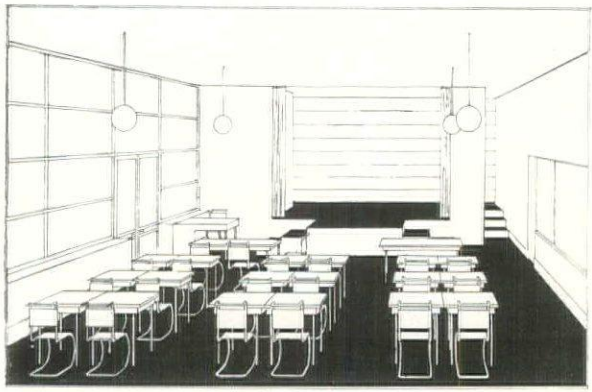


Perspective

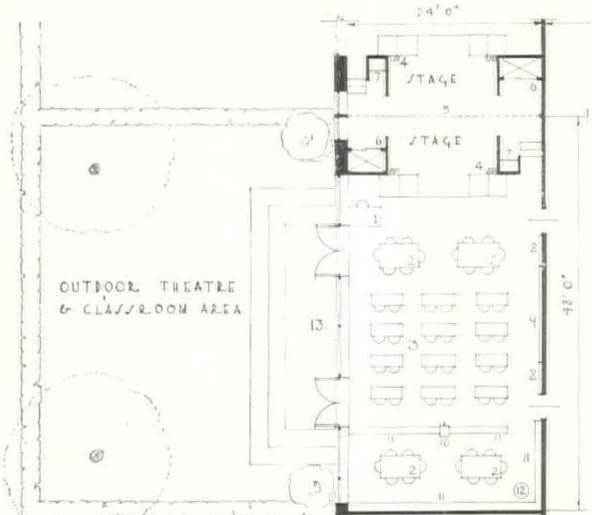
1. Teacher's Desk
2. Files (cabinet over)
3. Chart Cases
4. Vent Duct
5. Bulletin Board
6. Display Board
7. Blackboard
8. Students' Tables
9. Work Table
10. Bookcases



A CLASSROOM WHICH FITS TEACHERS' NEEDS



Perspective



1. Teacher's Desk
2. Work Tables
3. Students' Tables
4. Stage Curtain
5. Sound-proof Curtain
6. Wardrobe
7. Sink
8. Bulletin Board
9. Blackboard
10. Projector
11. Bookcases
12. Suspended Globe
13. Outdoor Stage

PROPOSED ENGLISH CLASSROOM

with exhibits of educational interest. Its talking pictures should bring world understanding to its citizens. Every boy and girl should be recognized as the wards of the community whose successes are recognized and whose failures are overcome by professional care and community solitude. School and community must be integrated and the child resources of the community conserved to the utmost. Will such a school tend toward less delinquency? What would have been the fate of the nineteen youngsters under twenty years of age recently awaiting the electric chair in an eastern prison if such a school and such a community had offered them guidance and care?

Such elementary schools are not mere theoretical fancies. They exist in many states. May their numbers increase! Enlightened lay initiative and follow-up action are prerequisites.

The high school of tomorrow may to the greatest degree show change among all present day public education institutions. Its program has already undergone drastic modification. Acknowledgment of its rapidly mounting responsibilities will produce further improvement and adaptation. These schools cannot solve their increasing problems and retain traditional curricula or attitudes. When mature professional groups study this problem conscientiously, their first attack is upon the nature of the curriculum.

The compartmented subject matter curriculum is difficult to defend. Small classrooms with their lack of equipment seem to have no place. Large laboratories, adjoined by student-teacher curriculum workshops and conference rooms, seem desirable. Individual and group projects and activities are encouraged. The needed library facilities are incorporated in the laboratories. Physical and social sciences become integrated. Motion pictures and, no doubt, television, will be called into frequent action. Speech instruction is given its rightful share of laboratory, rehearsal and audition spaces. The mechanisms of the speech arts are used by individuals for their self-improvement. Languages are taught with reproduction devices selecting an individual's faults and listening booths are equipped for individual use. The language arts emphasize man's needs in society and its facilities are arranged to stimulate dramatization, to encourage forum participation, and to arouse leadership qualities.

The high school of tomorrow requires sufficient land to make possible reasonable future growth. Not monumental structures but building units seem indicated to meet strategically the needs of all forms of land culture, home and mechanic arts education, and physical and health education.

The future high school welcomes all. Its program is cosmopolitan and comprehensive. It recognizes that society can no longer assimilate into worth while employment youth of high school age and admits that the high school can give youth a better training then the reformatory at two or three times the annual cost.

The greatest change will come in administration. Guidance, curriculum, and administration become thoroughly interlocked. Not one or two classroom units of space will be assigned this service but provision will be made for continuous individual diagnosis, for constant psychological and psychiatric service, for complete testing, and anecdotal records. Curriculum laboratories will accumulate and make available pertinent materials in all ranges of human activity, affording suggestions and stimulating growth for individuals or groups. The administration laboratory will be the focus of student interest and a clearing house for his problems.

Individualized instruction will be encouraged in this future school. Group activity in conformity to socialization needs will continue beyond present-day tendencies. General courses opening up new vistas will appear with greater frequency than at present. Renewed stress will be placed upon man's relationship to his world and his fellowmen. Individuals will be guided into acceptance of their responsibilities for their physical, mental, social and moral fitness to serve themselves and their fellowmen.

The school of tomorrow will be far in advance of the school of today as today's is far removed from yesterday's. It will presuppose man's desire to progress and man's willingness to contribute to the happiness and success of others. It will become a reality to the degree that educational workers foresee the ideal and consecrate service to the realization of their dreams.

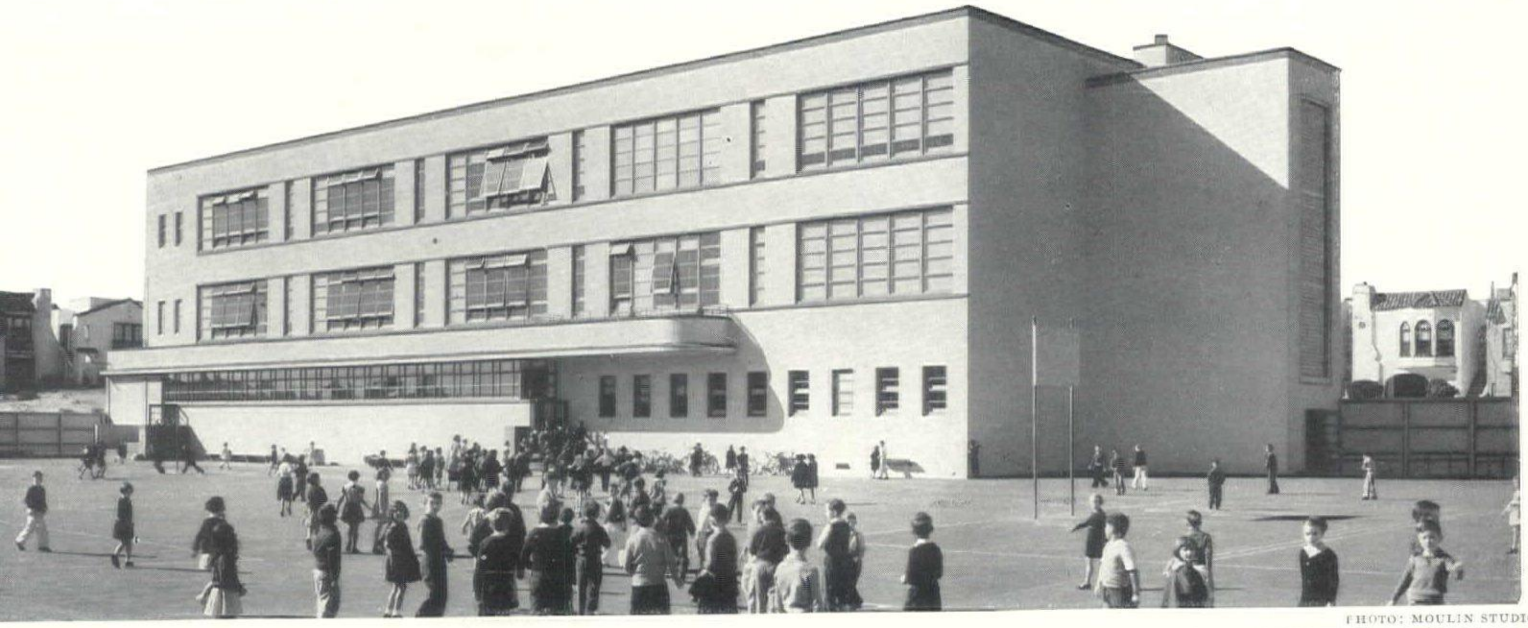


PHOTO: MOULIN STUDIOS

AWTON SCHOOL . . . SAN FRANCISCO   DODGE A. RIEDY and C. E. J. ROGERS, ARCHITECTS

ELEMENTS OF SCHOOL BUILDINGS

THE CHANGES that have occurred in educational policy in recent years are due in great part to a renewed public consciousness and responsibility. They demand in turn fundamental changes in school buildings and in the attitude and approach of those responsible for their design and construction.

• Education is believed today to be more a process of skilled guidance than of instruction, and the mental growth of a child held intimately related to his physical growth and health. The problem confronting the educators and architects is finding the means that will carry this theory into practice, to see that the surroundings of education are healthful, and that physical activity receives as much attention as mental activity. The building in which the student is taught and in which he spends more than half his active youthful life should have an influence that conforms to the values and principles of the teaching afforded him. Unfortunately, the changes in education have not yet materially changed the surroundings of education.

• While it is beyond possibility to include in this presentation every type of school building, and far less possible to illustrate each type in its relative importance, it is believed that the establishment of criteria or standards for the various elements that comprise school buildings, and views illustrating the application of these standards, allow reasonable bases for comparison. The standards herewith presented should in no sense be considered fixed; they will change significantly within a very short period. Just as education is constantly subject to change, the school plant must constantly adapt itself to the new needs. Such standards do not in themselves make possible the planning of a schoolhouse; school building planning involves the adaptation of standards to the needs of a locality.

• Expressed in the standards presented are the recommendations of the many State Boards participating in schoolhouse construction, the National Council on Schoolhouse Construction, the Standard for various types of school buildings as set forth by Drs. Strayer and Engelhardt of Teachers College, Columbia University, and the best contemporary practice.

CORRIDORS

It Is Recommended:

1. SIZE

That for main corridors the minimum clear passageway be 10 feet, and preferably 12.

That for secondary corridors, particularly with classrooms located on one side only, minimum clear passageway be 8 feet.

2. CONSTRUCTION

That the floors, walls, and ceiling be of fireproof materials.

That wainscoting, of a height to prevent traffic rubs, be of a vitreous, wear-resistive material which will not readily take pencil or soil imprints.

That floors be of durable materials that permit easy, rapid cleaning without spotting.

That ceiling baffles or other acoustical treatments be employed to reduce traffic noises to a minimum.

That sanitary coves be provided where corridor walls and floors meet.

That saddles or thresholds be eliminated as much as possible to facilitate cleaning.

That changes of floor level, blind pockets, and dead ends serving more than one classroom on each side, be avoided.

3. LIGHTING

That adequate natural lighting be provided through the agency of locker alcoves, stair lighting, or with limited corridor sections having classrooms on one side only.

That artificial lighting to the amount of 5 footcandles be provided.

4. EQUIPMENT

That all doors of classrooms and special rooms opening into corridors be hung so as not to interfere with the traffic flow, and be able to be locked from the corridor side only.

That all exit doors and doors to stairways opening in the direction of traffic exit be equipped with door checks, stops, panic bolts, push plates, kick plates, pulls, and the proper designation.

That gates, to prevent access to such parts of the building as might be used after school hours, collapse into wall recesses and have sufficient height to prevent scaling.

That drinking fountains, display cases, lockers, waste receptacles, and radiators be recessed so as not to interrupt passage.

That fire extinguishers be recessed and placed near to the floor to prevent dropping and consequent failure of operation.

That bulletin boards and notices be located at points free from dense traffic and intersections.

PHOTO: MOULI

Lawton School, San Francisco
D. G. Riedy and C. E. J. Rogers

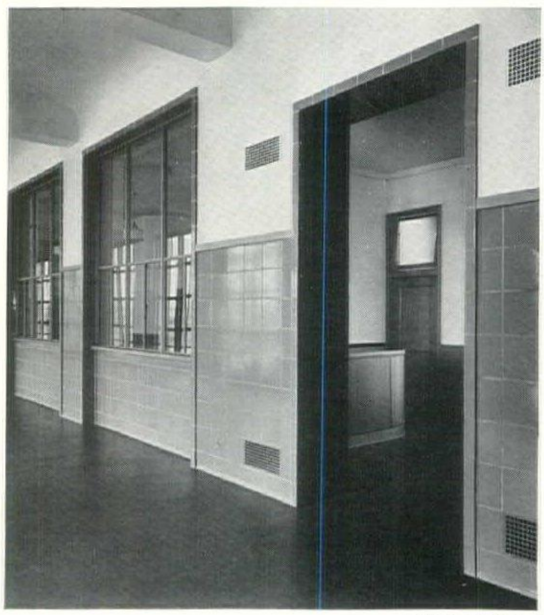


PHOTO: MOULIN

George Washington H. S., San Francisco
J. R. Miller and T. L. Pflueger

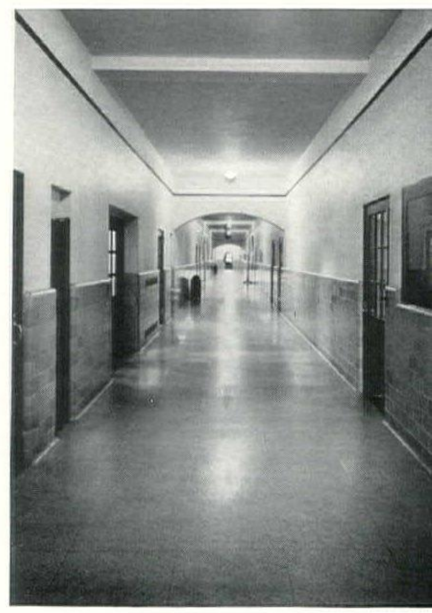
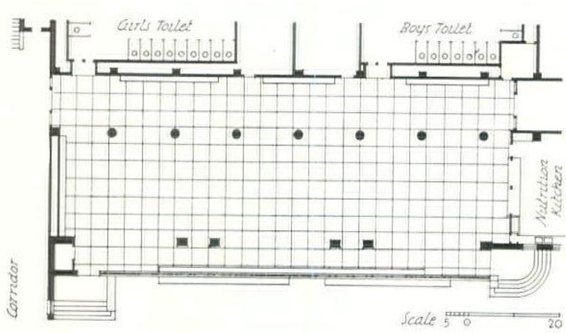
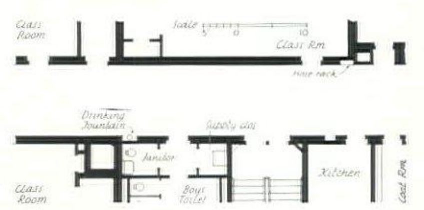


PHOTO: SCHNAL

Woodrow Wilson School, Westfield, N. J.
Coffin and Coffin



Lawton School, San Francisco
D. G. Riedy and C. E. J. Rogers



Woodrow Wilson School, Westfield, N. J.
Coffin and Coffin

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Cecil A. Schilling and C. Arthur Schilling

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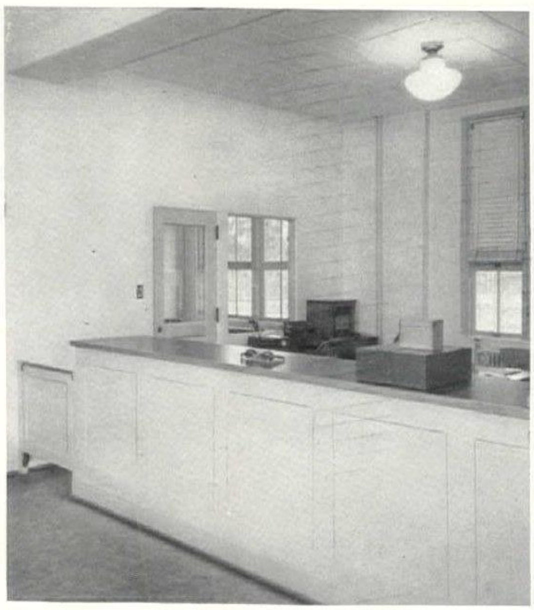
K. S. Wing



Washington Junior H. S., Long Beach, Cal.
W. H. Austin

ADMINISTRATION

It Is Recommended:

1. LOCATION

That the administration suite be located on the ground floor, preferably near the main entrance.

2. SIZE

That the minimum unit in any school consist of one private office containing a vault and supply closet and one waiting room containing bookcases, filing cabinets, teachers' mail box, and a bulletin board.

3. PRINCIPAL'S PRIVATE OFFICE

That there be access to the general office and the reception room, and direct exit to the corridor.

That equipment consist of a desk, several chairs, a table, bookcase, filing cabinet, and radio connected by means of a loudspeaker system to all classrooms.

That there be provided a private toilet room in direct connection with the principal's office.

That a closet or coat room be provided.

That both natural and artificial light be adequately provided, and the room be well ventilated.

4. GENERAL OFFICE

That there be direct entrance and exit upon the main corridor.

That easy access to the principal's private office, supply room, vault, and reception room be provided.

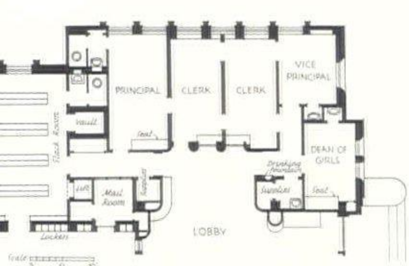
That a counter containing filing cabinets, records, teachers' mail boxes, etc., divide the room into a work space and a public space.

That equipment include the master program clock, bulletin board, switchboard, public telephones, and key cabinet, besides the required desks, work tables, and chairs.

That a coat room for office employes be provided.

That there be ample natural light and artificial illumination to the extent of 20 foot-candles on all work planes.

That, where conditions and need warrant, a health suite fully equipped and consisting of a waiting room, a medical clinic, nurse's room, and a dental room, be provided adjacent to the administration suite.



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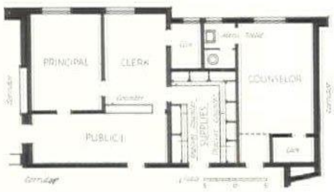
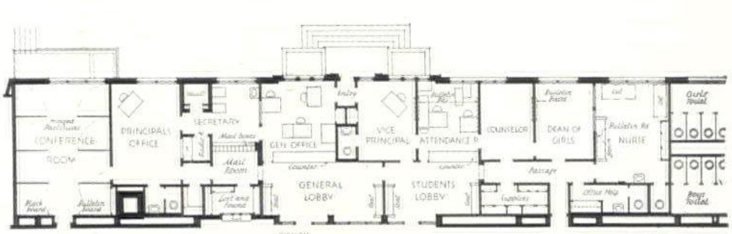
Cecil A. Schilling and C. Arthur Schilling



Burbank Elementary School, Long Beach, Cal.
K. S. Wing



Washington Junior H. S., Long Beach, Cal.
W. H. Austin

CLASSROOMS

It Is Recommended:

1. SIZE

That the width of a classroom, unilaterally lighted, be not more than twice its height.

That under normal conditions the height of a classroom be 12 feet.

That there be not less than 16 square feet of floor space per pupil.

That the length be determined by the desired seating capacity and the type of activity involved.

That regardless of the capacity, the length never be less than the width.

2. CONSTRUCTION

That floors be durable, warm, easy to clean, noise-resisting, and resilient.

That walls be acoustically treated to minimize the infiltration of noise from outside sources, and be of a finish with a light reflecting value of not less than 50 per cent or more than 70 per cent.

That ceilings be free from projections and have a light reflecting value of at least 75 per cent, and preferably more.

That doors be 3 feet wide by 7 feet high.

That there be one door for elementary school classrooms, and two doors for secondary school classrooms.

3. LIGHTING

That the glass area be one-fifth to one-fourth the area of the floor—determined by latitude and presence or absence of light obstructions.

That the windows extend the full length of the room.

That the top of the upper sash of the windows be not more than 6 inches below the ceiling.

That sill heights be not less than 34 inches or more than 38 inches to prevent light entering below the plane of vision of seated pupils.

That translucent shades be hung from the center of the windows and operate in both directions.

That general artificial illumination be to the extent of 20 footcandles.

4. EQUIPMENT

That for elementary school classrooms suitable space for children's outer-garments be provided at the rear of the room, either by ventilated coat rooms not less than 5 feet wide and with an outside window area of not less than 12 square feet, or by ventilated wardrobes easy of access and convenient for use, opening directly into the classroom.

That for purposes of adaptability chalkboards be of the multiple-leaf type or of the reversible chalk and cork board type.

That adequate bulletin board space be provided, the amount varying according to the need of display material in various subjects.

That special provision be made for the storage of text-books, magazines, charts, paper, etc., and all other materials required for teaching.

That pupils' seats and desks be designed for individual use and in no way fixed to the floor.

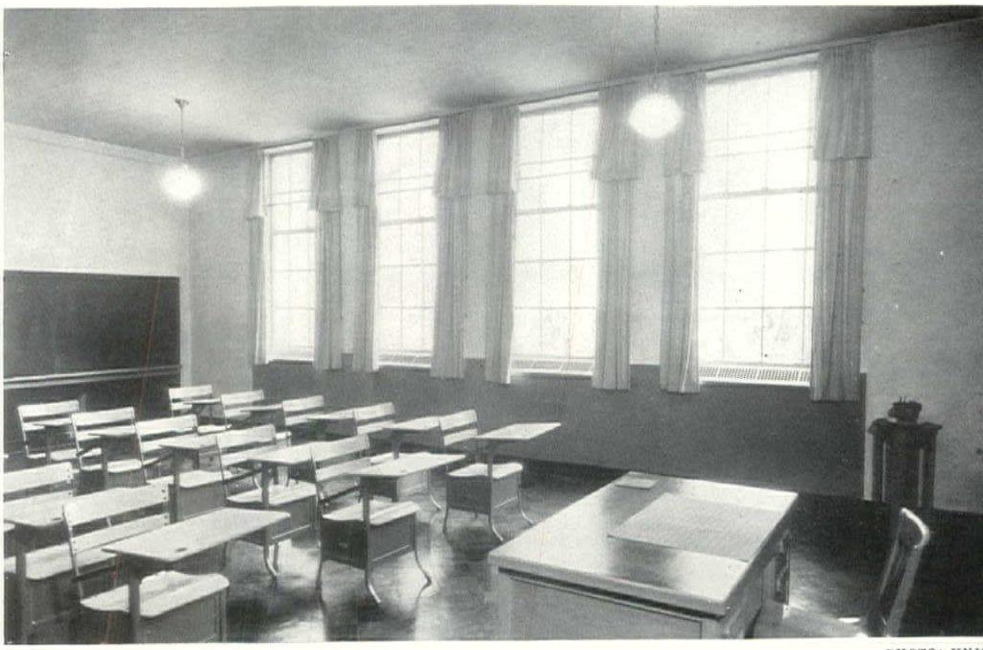


PHOTO: UNI

Typical Elementary—Raymond, Jefferson, Lincoln, Sheridan Schools, Bloomington, Ill. Schaeffer and Hooton

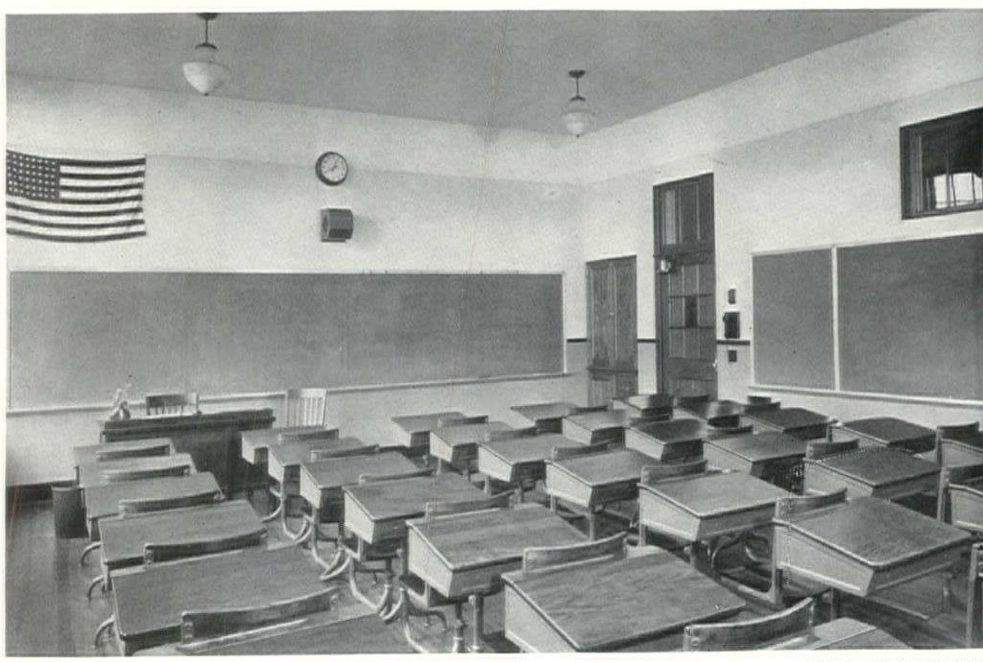
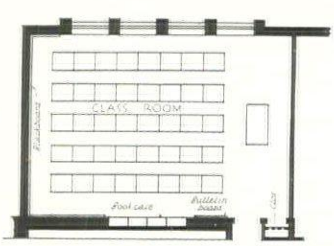
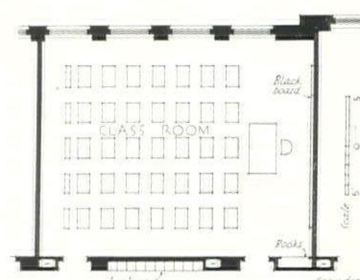


PHOTO: SANBORN STU

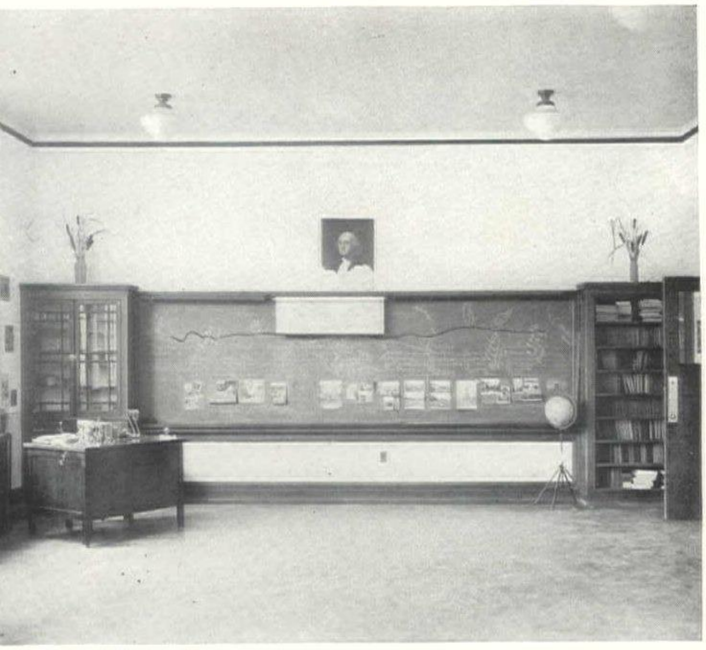
Pierre S. du Pont High School, Wilmington, Del. E. William Martin



Typical Elementary — Raymond, Jefferson, Lincoln, Sheridan Schools, Bloomington, Ill. Schaeffer and Hooton



Pierre S. du Pont High School, Wilmington, Del. E. William Martin



Cold Spring School, Cold Spring, N. Y.
Tooker and Marsh

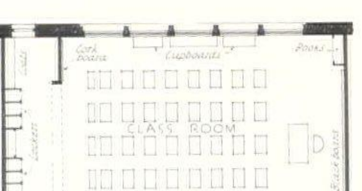
PHOTO: HENRY

Corpus Christi School, New York, N. Y.
Wilfrid Anthony

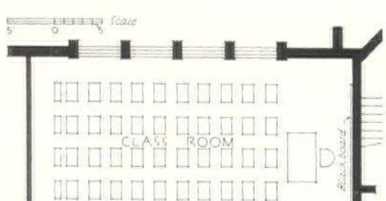
Typical Primary—Raymond, Jefferson, Lincoln, Sheridan Schools, Bloomington, Ill. Schaeffer and Hooton

PHOTO: SCHNALL

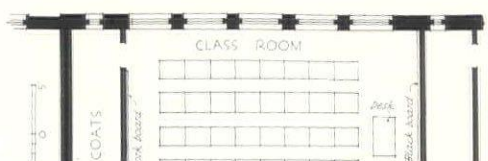
Woodrow Wilson School, Westfield, N. J.
Coffin and Coffin



Cold Spring School
Cold Spring, N. Y.
Tooker and Marsh



Typical Primary—Raymond, Jefferson, Lincoln, Sheridan Schools, Bloomington, Ill.
Schaeffer and Hooton



Woodrow Wilson School
Westfield, N. J.
Coffin and Coffin

SCIENCE ROOMS

It Is Recommended:

1. LOCATION

That orientation be such as to provide maximum sunlight.

That, conditions permitting, there be an instructors' room (preparation room), storeroom, and conservatory.

2. SIZE

That there be a minimum of 30 square feet of floor space per pupil.

That, if such rooms as a conservatory, storeroom, and preparation room are provided, the total floor space should provide 35 to 40 square feet per pupil.

That the width be not less than 20 feet, and not more than 24 feet.

That there be provided at the front of the room a minimum of 7 feet between the first students' tables and the front wall.

3. LIGHTING

That the window area tend to approximate one-fourth rather than one-fifth of the floor area.

That opaque shades or draperies be provided in addition to translucent shades.

That supplementary lighting be provided at the necessary locations to the extent of 20 footcandles.

That in all other respects, standards for general classroom lighting, both natural and artificial, prevail.

4. EQUIPMENT

That the minimum provision for science work consist of library tables, demonstration table for the teacher, cabinets with adjustable shelving and cupboard space below, an aquarium, a terrarium, soil boxes, and sink with running water.

That, if conditions permit, additional equipment consist of a carting table, a projection machine and roller screen, a movable lantern stand, an apparatus cabinet, museum case, chart case, bookcase, notebook case, display case, and gas, electric, and water connections.

That all work tops, sinks, and drain boards be acid-resisting.

That the conservatory have maximum window area, growing beds with storage cabinets below, and a tile floor.

That, if the storeroom is to be used as a dark room, there be adequate ventilation provided.

That ample blackboard space be provided at the front of the room behind the demonstration table.

That at least 15 square feet of bulletin board be provided.

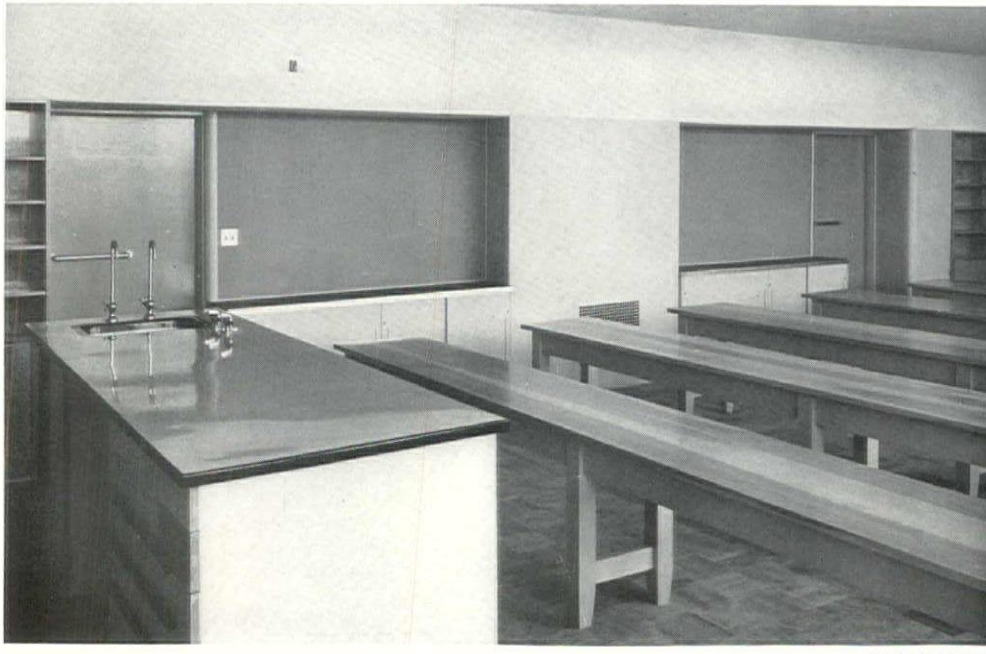
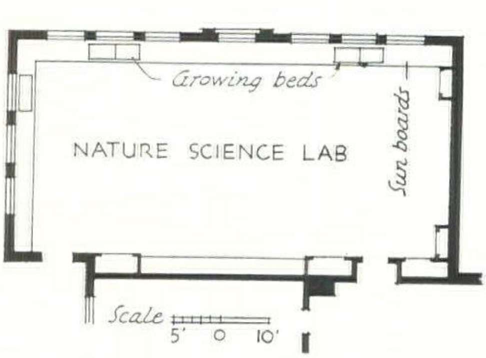


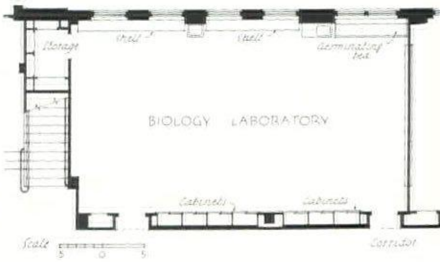
PHOTO: HAIGH

Polytechnic High School, Long Beach, Cal.
H. Davis

Alice E. Carlson School, Ft. Worth, Texas
Joseph R. Pelich



Alice E. Carlson School, Ft. Worth, Texas
Joseph R. Pelich



Arlington Heights Senior H. S., Ft. Worth
Preston Geren

PHOTO: HAIGHT

Polytechnic High School, Long Beach, Cal.
H. Davis

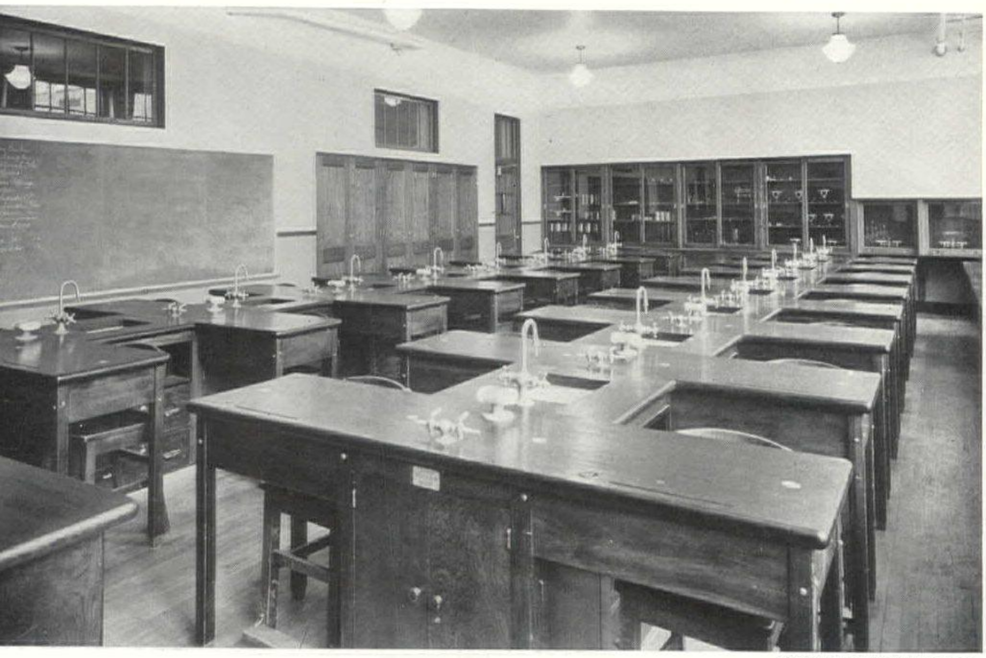


PHOTO: SANBORN STUDIO

Pierre S. du Pont High School, Wilmington, Del.
E. William Martin

LABORATORIES

It Is Recommended:

1. LOCATION

That laboratories have an exposure which minimizes confusing shadows.

That danger to the remainder of the school building because of fire or explosion be minimized by proper isolation.

That there be direct connection to a preparation room and storage room.

2. SIZE

That the number of pupils to be provided for be determined, and the type of furniture be selected before the size of the laboratory is fixed.

That the area be ample to provide for both laboratory work and recitation.

That a minimum of 20 square feet of floor area be allowed per pupil in addition to the area devoted to individual work units.

That there be provided a minimum of 7 feet between the front line of students' laboratory units and the front wall.

3. LIGHTING

That the standards of lighting, both artificial and natural, as presented for science rooms, be applied in all respects.

4. EQUIPMENT

That the instructor's (demonstration) table have an acid-resisting work top and sink, gas and electric connections, and hot and cold water taps.

That each student's laboratory unit have a minimum of 30 inches length, an acid-resisting finish, gas and electric connections, hot and cold water taps, and storage cupboards.

That drains do not empty into septic tanks.

That fume hoods be provided in chemistry laboratories.

That a separate room for the storage of chemicals be provided, and that this room be well vented and equipped with a locking device.

That direct current electric connections be provided.

That for large apparatus there be a storeroom with ample shelf space, plus a soapstone sink, water, gas, and electric connections and proper ventilation, for use as a dark room.

That there be storage cabinets and cases to house adequately all other equipment.

Pierre S. du Pont High School, Wilmington, Del.
E. William Martin

KINDERGARTENS

It Is Recommended:

1. LOCATION

That a northern exposure be avoided.

That the kindergarten be on the ground floor and open directly on an outdoor play space or terrace.

That an entrance separate from the rest of the building be provided.

2. SIZE

That the width of the room, unilaterally lighted, be not more than twice its height.

That the height be at least 12 feet.

That 30 square feet of floor space be allowed per pupil.

That an alcove or work room of approximately 200 square feet be provided.

3. CONSTRUCTION

That floors be warm, durable, easy to clean, noise-resisting, and resilient, preferably of hardwood or linoleum.

That walls be decoratively treated and have a light reflecting value of not less than 50 per cent or more than 70 per cent.

That ceiling construction provide means of supporting rope ladders, swings, and other special kindergarten apparatus.

That window seats be provided with easy access to materials stored therein.

That a fireplace planned for use be provided.

That as near the main entrance as possible there be provided a coat room and toilets.

That toilets be under teacher control and be of juvenile type, one for boys and one for girls.

That a drinking fountain be provided.

4. LIGHTING

That the window area (exclusive of an end bay window) be at least one-fifth of the floor area.

That sill heights be not less than 24 inches or more than 28 inches.

That in all other respects standards set for general classroom illumination prevail.

5. EQUIPMENT

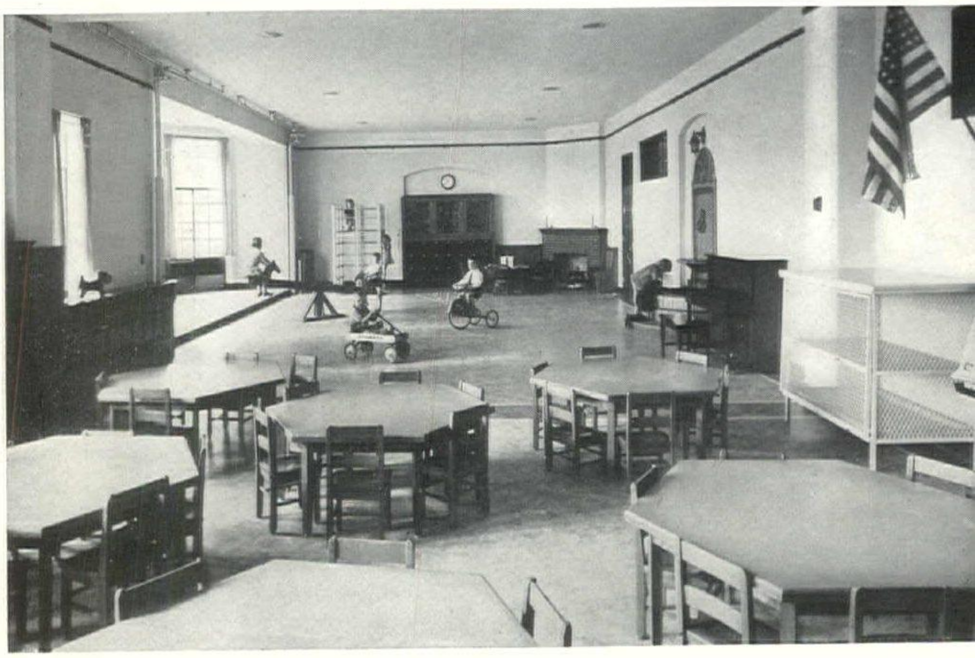
That individual chairs be of three heights, 9 inches, 10 inches, and 11 inches.

That tables be of two heights, 19 inches and 21 inches.

That there be ample display board throughout the room.

That chalkboards and display boards be not more than 20 inches above the floor.

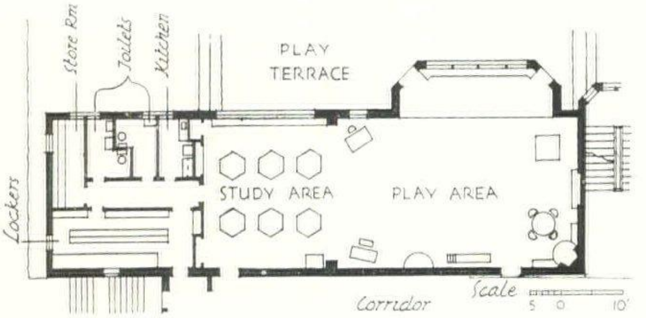
That either shelf and box storage or individual project lockers be provided for pupil use, and that there also be provided shelf, box, and case storage for teacher use.



Public School No. 26, Yonkers, N. Y.
A. G. Corbin

PHOTO: MURRAY P

Lloyd Harbor School, Huntington, L. I.
E. S. Hewitt



Public School No. 26, Yonkers, N. Y.
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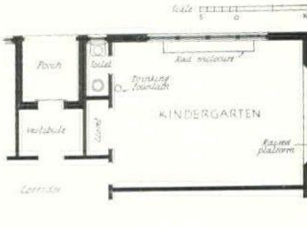


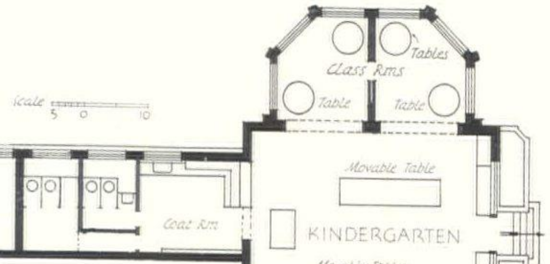
Lloyd Harbor School, Huntington, L
E. S. Hewitt

PHOTOS: MARTIN

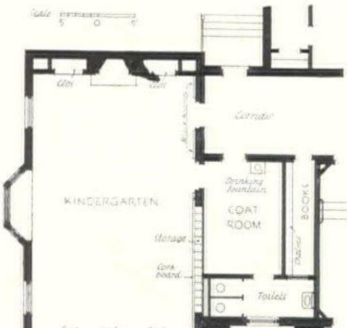
Grover Cleveland Elementary School, Pasadena, Cal.
R. H. Ainsworth

PHOTOS: SCHNALL

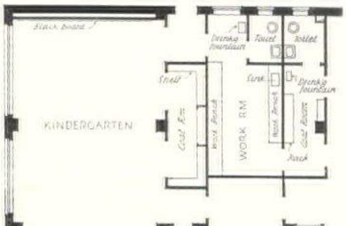
Woodrow Wilson School, Westfield, N. J.
Coffin and Coffin



Grover Cleveland Elementary School, Pasadena, Cal.
R. H. Ainsworth



Woodrow Wilson School, Westfield, N. J.
Coffin and Coffin



Corpus Christi School, New York
Wilfrid Anthony

STAIRWAYS

It Is Recommended:

1. NUMBER

That no two-story building have less than two stairways.

That the number be sufficient to empty the building in three minutes or less; the basis of actual determination being that 120 pupils in line, two abreast, can pass a given point in one minute.

That for each 100 individuals of the building capacity above the first floor level, the minimum aggregate width be 22 inches (1 unit).

That no classroom door be more than 100 feet away from the entrance to a stairway.

2. SIZE

That stairways be not less than 44 inches wide, exclusive of not more than a 3½ inch projection of the handrail within this dimension.

That risers be not more than 7 inches high and treads, including nosing, not more than 10½ inches wide.

That there be not more than 16 and not less than 3 risers to a run.

That intermediate landings be of at least the same width as the stairs.

That the central balustrade be 5 feet high and solid for 1 foot at the bottom.

That where the stair width exceeds 3 units (22 inches each), center handrails be provided.

3. CONSTRUCTION

That all stairways be of fireproof construction.

That there be no wells between runs of stairs.

That the edges or nosing of all treads be of non-slip material.

That handrails be provided on both sides of the stairway, and their height conform to the needs of the children using the building.

That the noise of travel be minimized by properly located sound baffles or other acoustical treatment.

That all stairways permit passage from the ground level to the top story.

That all doors opening into stair enclosures swing in the direction of exit travel, be at least 3 feet wide, and constructed of metal or metal covered, with clear wire-glass panels, as approved by the National Board of Fire Underwriters.

That all exit doors be provided with anti-panic locks and be of the single-leaf type wherever possible.

That when double exit doors are used, a center mullion be provided.

4. LIGHTING

That all stairways be naturally lighted.

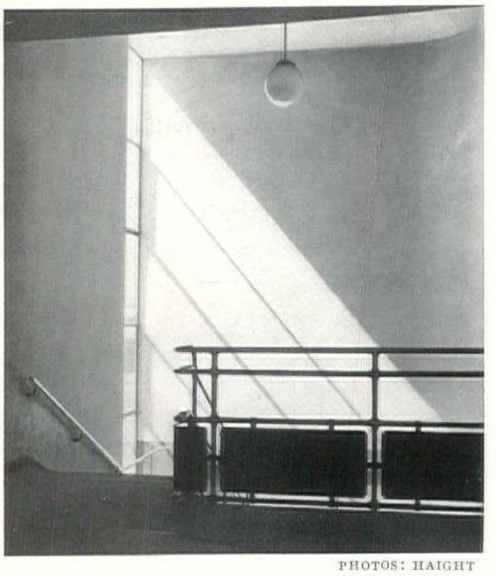
That for windows opening on stair landings the sill height be not less than 40 inches.

That if continuous vertical windows open on landings, protective railings at least 40 inches high be provided.

That artificial illumination to the extent of 5 footcandles be provided.

PHOTO: MO

Lawton School, San Francisco, Cal.
D. A. Riedy and C. E. J. Rogers



PHOTOS: HAIGHT

Polytechnic High School, Long Beach, Cal.
H. Davis

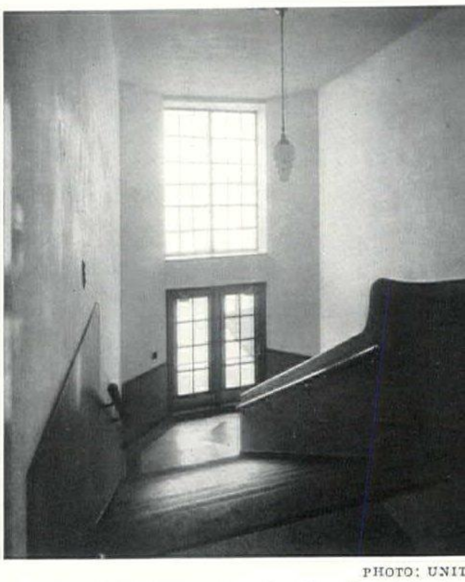
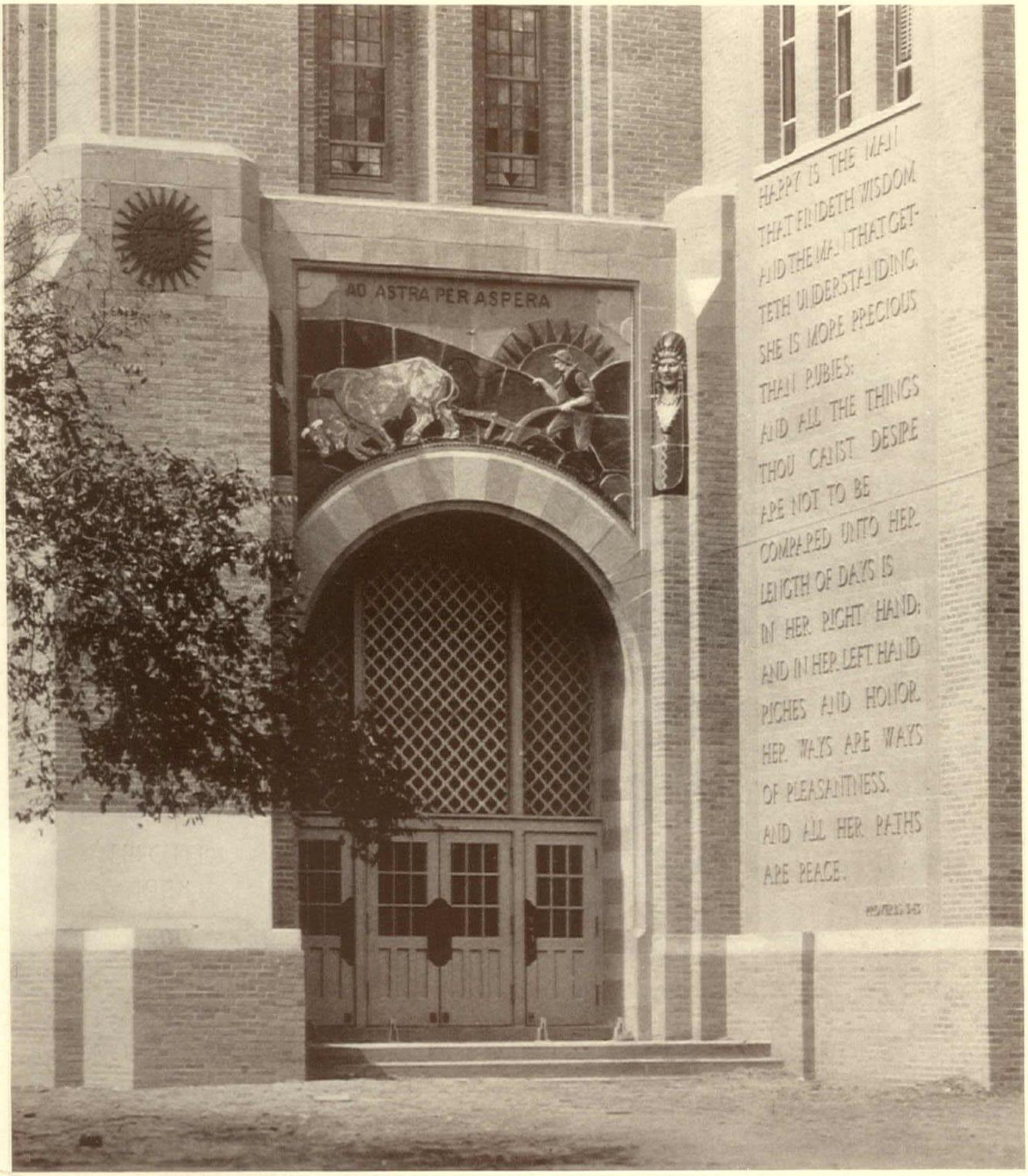


PHOTO: UNIT

Raymond, Jefferson, Lincoln, Sheridan Schools, Bloomington, Ill. Schaeffer and Hooton

THE PORTFOLIO

. . . School Entrances . . .

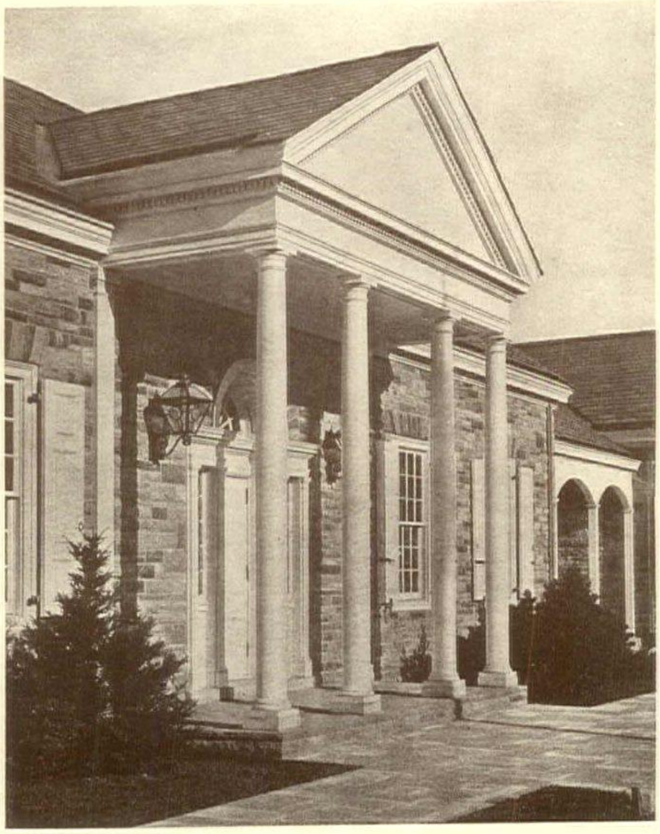


Wichita High School North, Wichita, Kan.
Glen H. Thomas

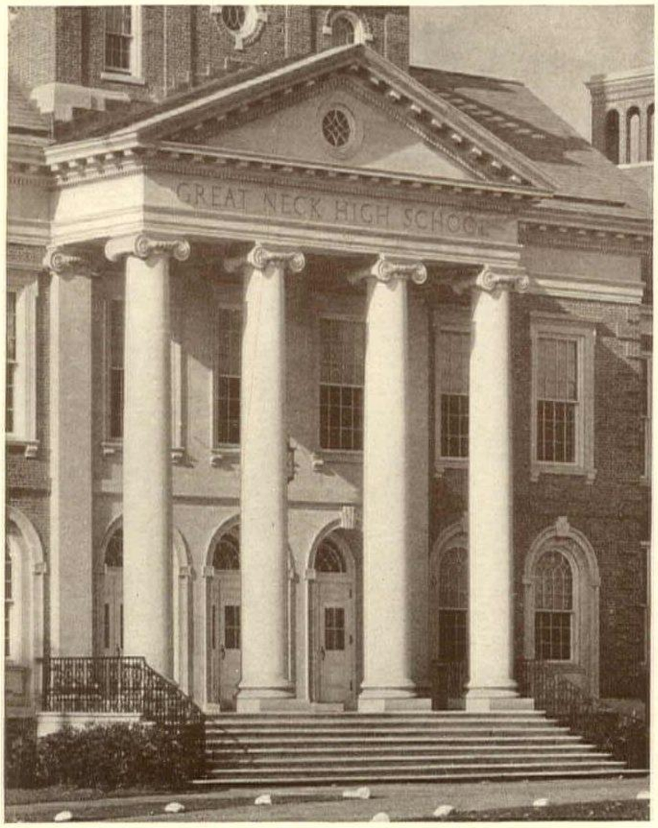
PORTFOLIOS IN PREPARATION—Residential Entrances Without Porches, May . . . Flêches, June . . . Tombstones, July . . . Vertical Sun Dials, August

The Editors welcome photographs of these subjects. . . . Forms close eight weeks in advance of publication. A list of the subjects that have appeared will be sent upon request. Certain of these past Portfolios are available to subscribers at 25 cents each; or five subjects for one dollar.

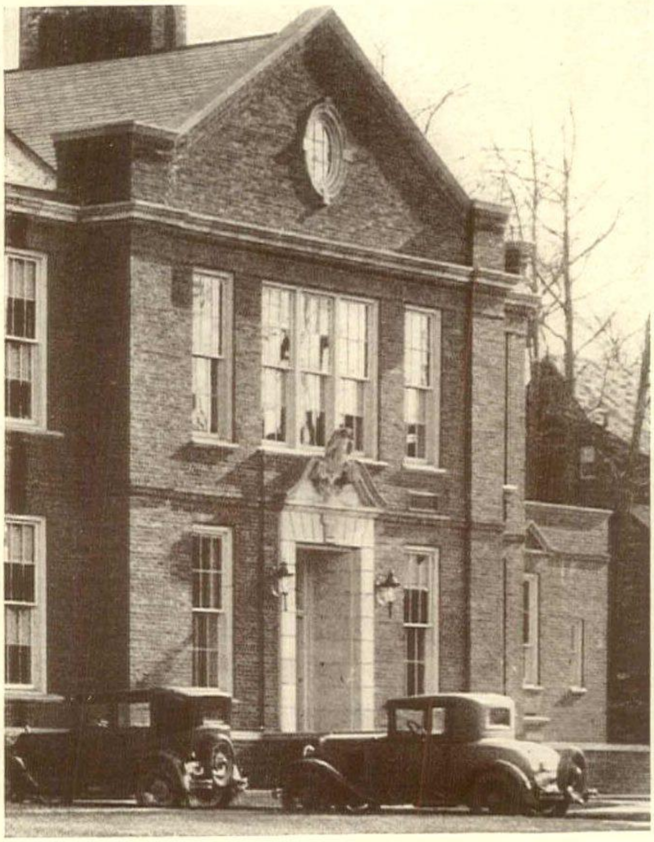
NUMBER 126 IN A SERIES OF COLLECTIONS OF PHOTOGRAPHS ILLUSTRATING VARIOUS MINOR ARCHITECTURAL DETAILS



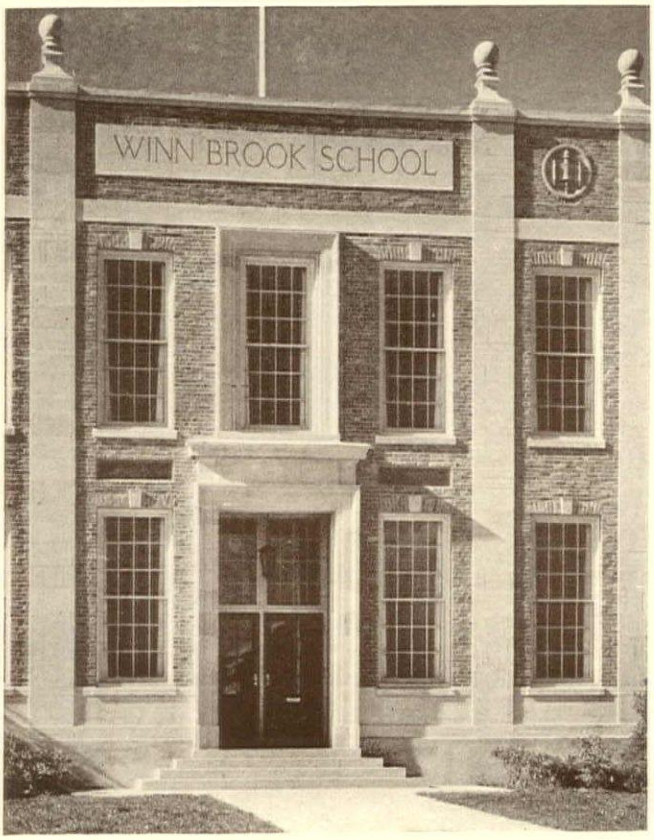
Central School, Van Hornesville, N. Y.
Ernest Sibley



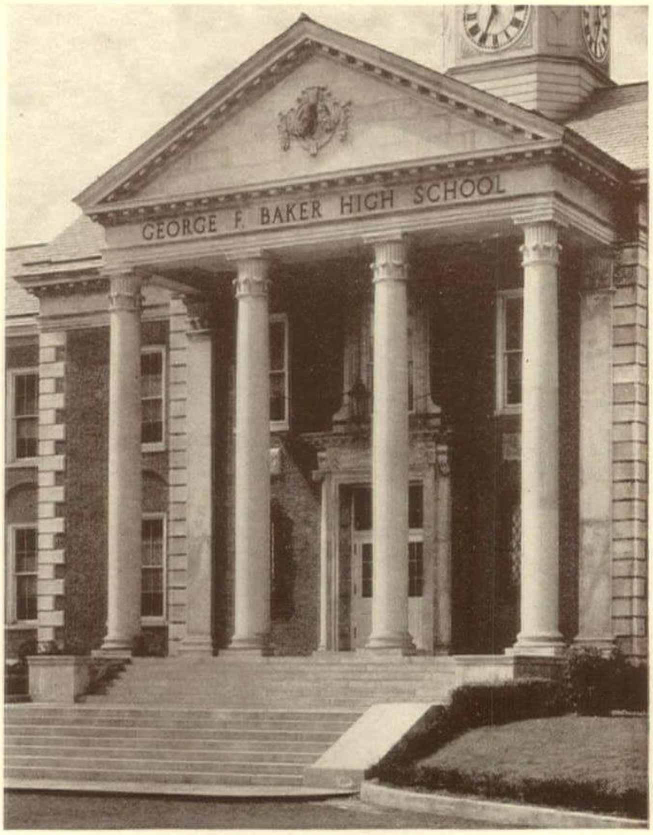
Great Neck High School, Great Neck, N. Y.
Guilbert & Betelle



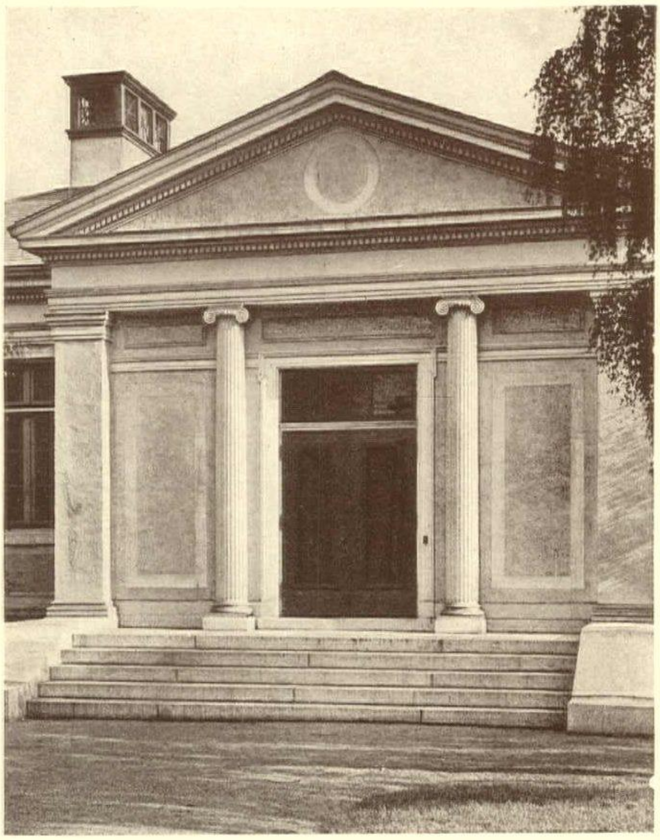
James Russell Grade School, Teaneck, N. J.
Norman T. Anthony; Smith & Ward



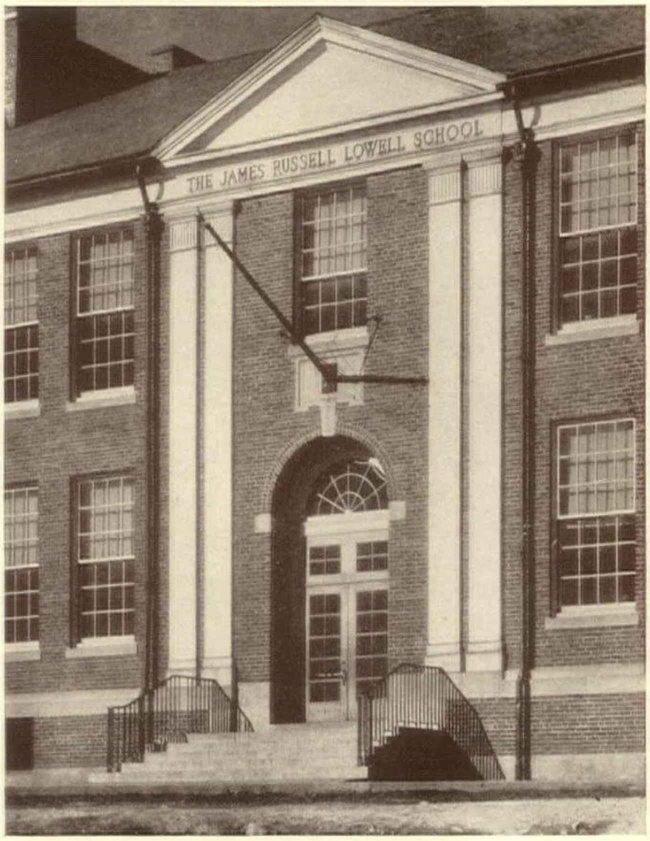
Winn Brook School, Belmont, Mass.
Wadsworth & Smith



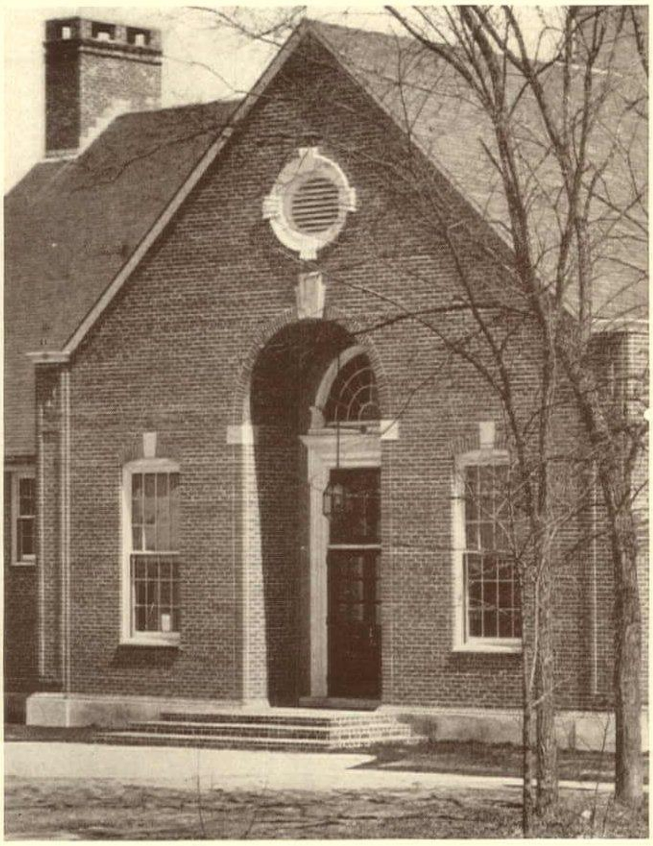
George F. Baker High School, Tuxedo Park, N. Y.
Guilbert & Betelle



Wellesley Kindergarten, Wellesley, Mass.
Kilham, Hopkins & Greeley

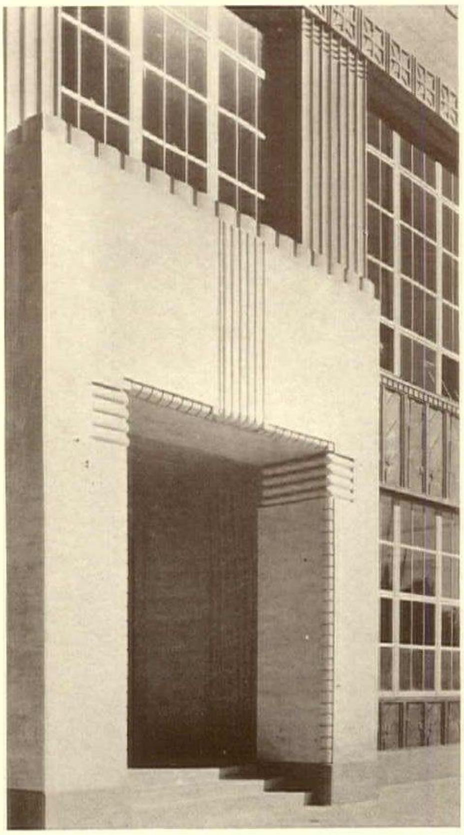


James Russell Lowell School, Watertown, Mass.
Kilham, Hopkins & Greeley

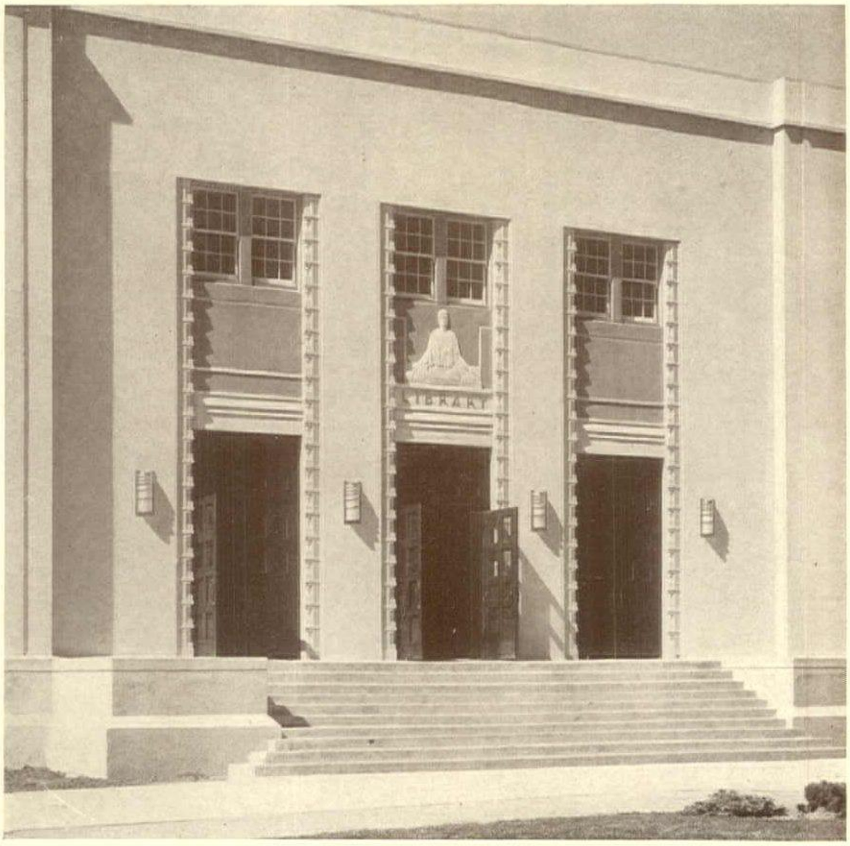


Chepatchet School. Gloucester Township, R. I.
Albert Harkness & Everett Higson

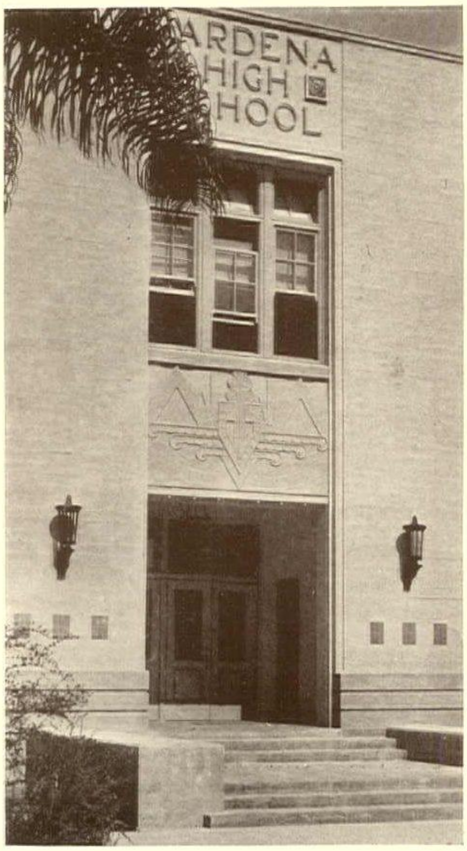
Technical High School, Stockholm, Sweden
Sven Markelius and Uno Ahrén



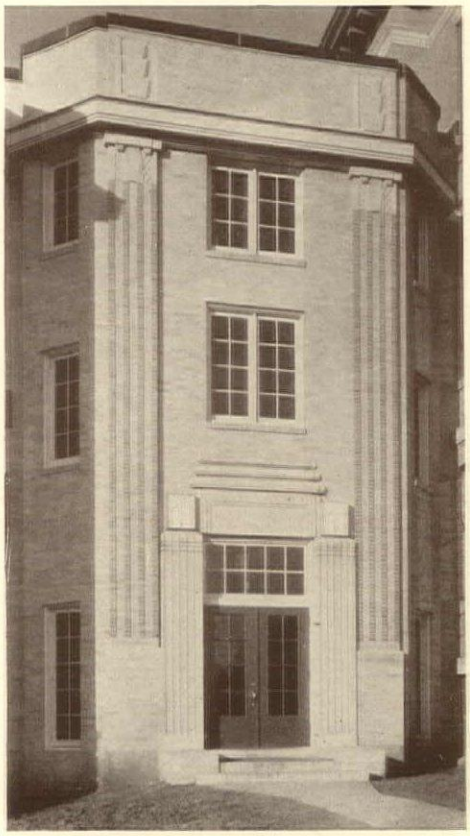
Huntington Park (Calif.) High School
George M. Lindsey



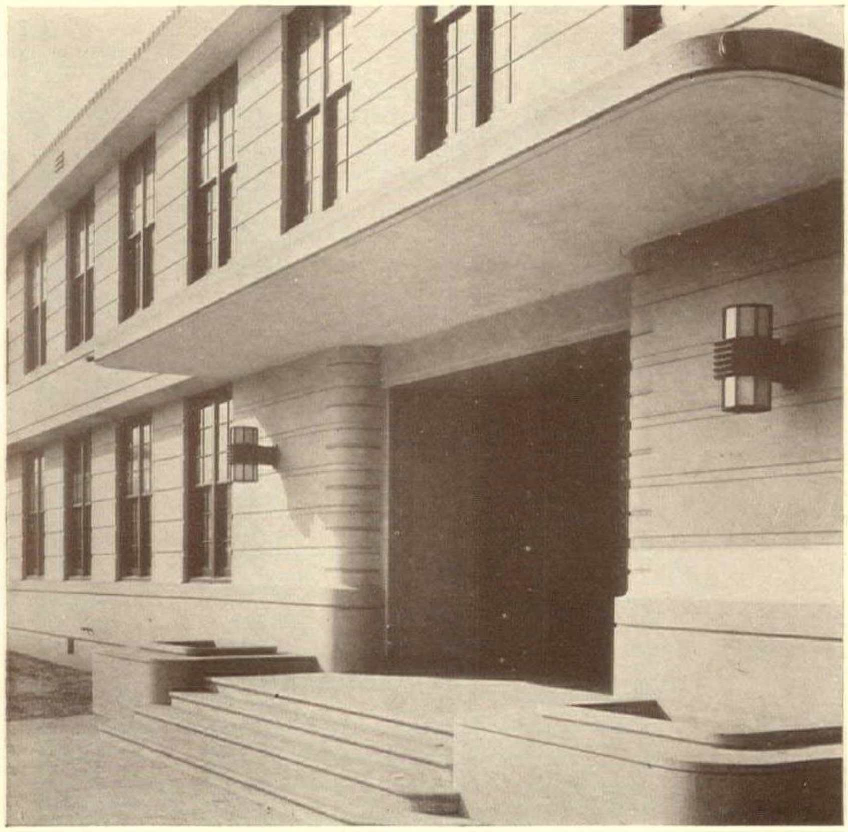
High School Library, Hollywood, Calif.
Division of Architecture, State of California



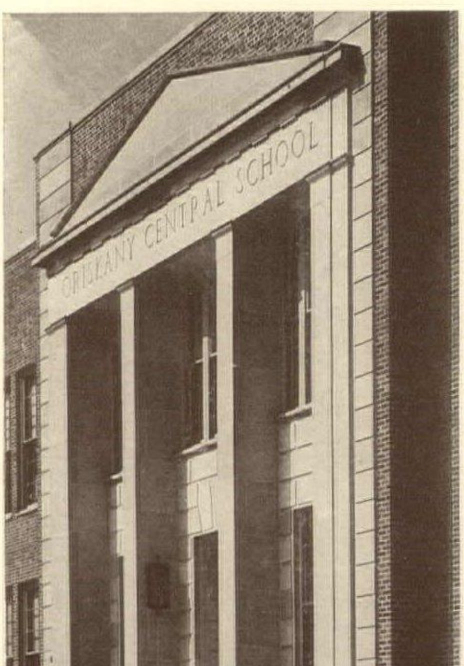
High School, Gardena, Calif.
Division of Architecture, State of California



Woburn High School, Woburn, Mass.
Kilham, Hopkins & Greeley

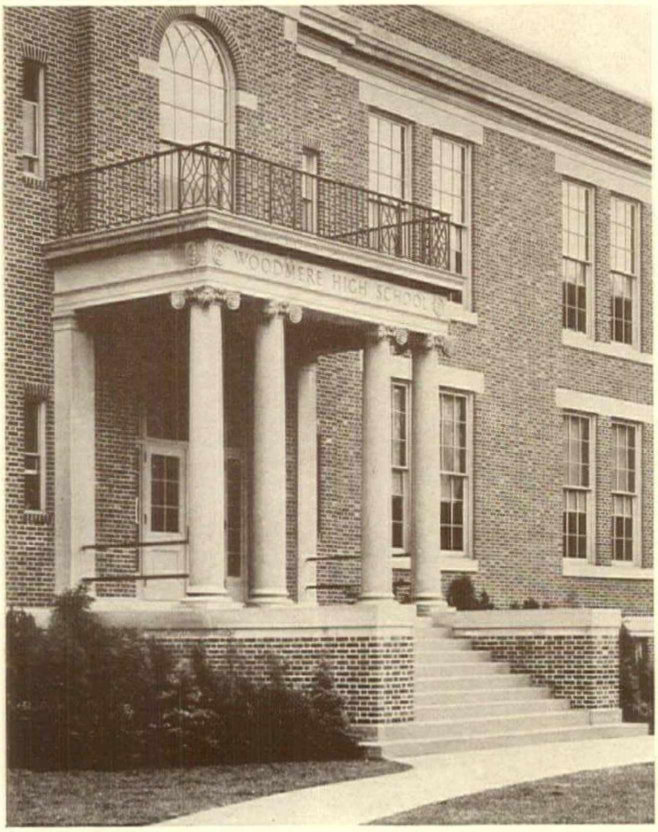


Manual Arts High School, Los Angeles, Calif.
John and Donald R. Parkinson

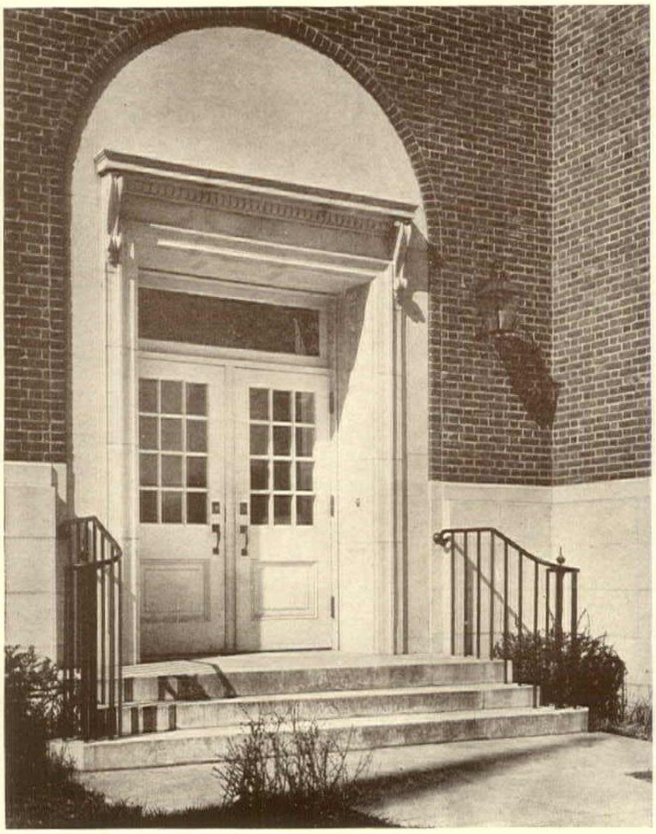


Oriskany Central School, Oriskany, N. Y.
Bagg & Newkirk

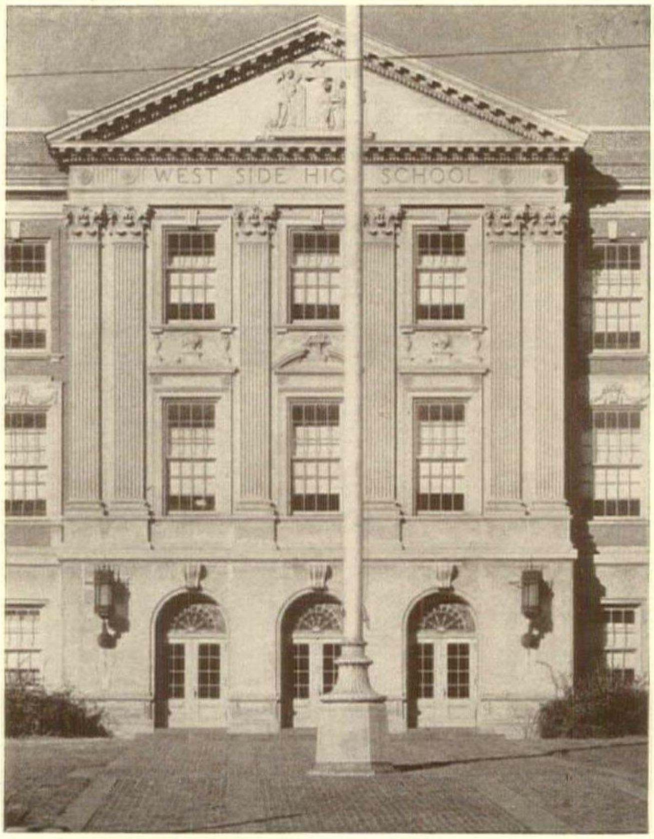
Hollywood High School, Hollywood, Calif.
Division of Architecture, State of California



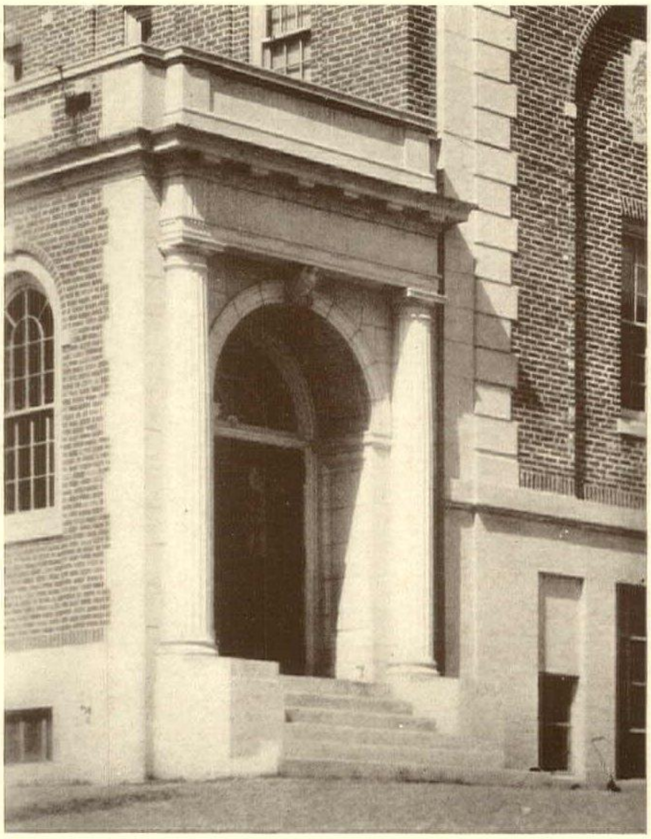
Woodmere High School, Woodmere, N. Y.
Henry Bacon



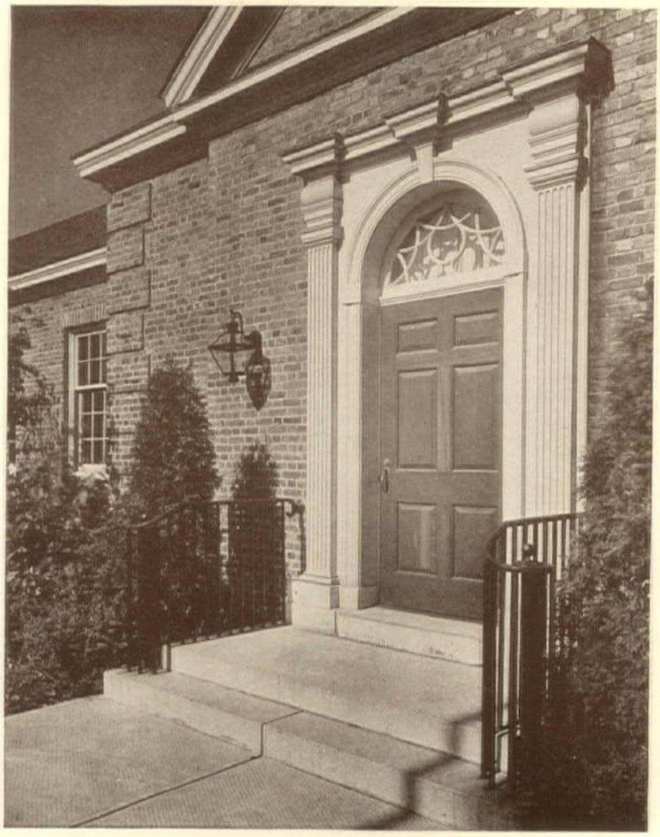
Pupils' Entrance, Orange High School, Orange, N. J.
Ernest Sibley



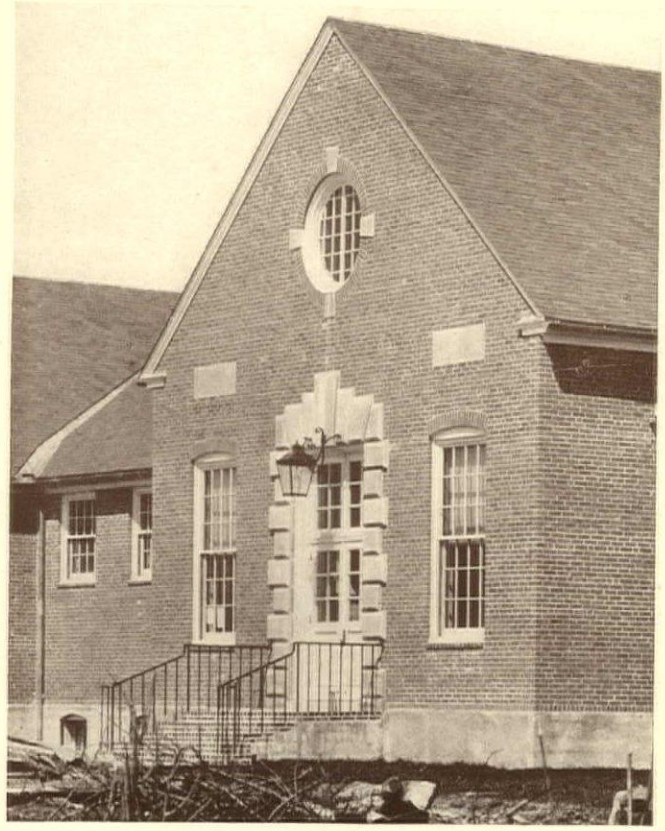
West Side High School, Newark, N. J.
Guilbert & Betelle



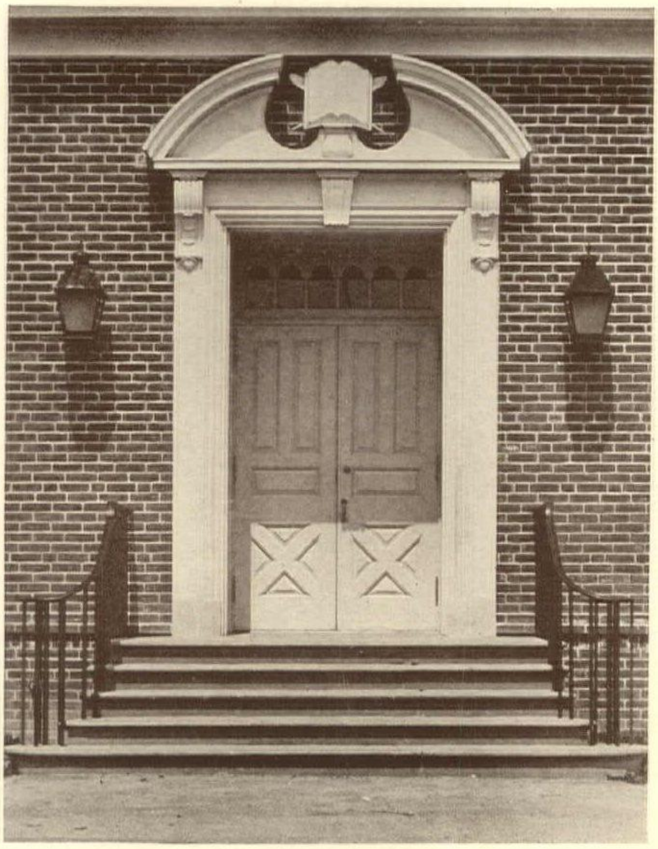
Shawsheen School, Andover, Mass.
Ripley & Le Boutillier



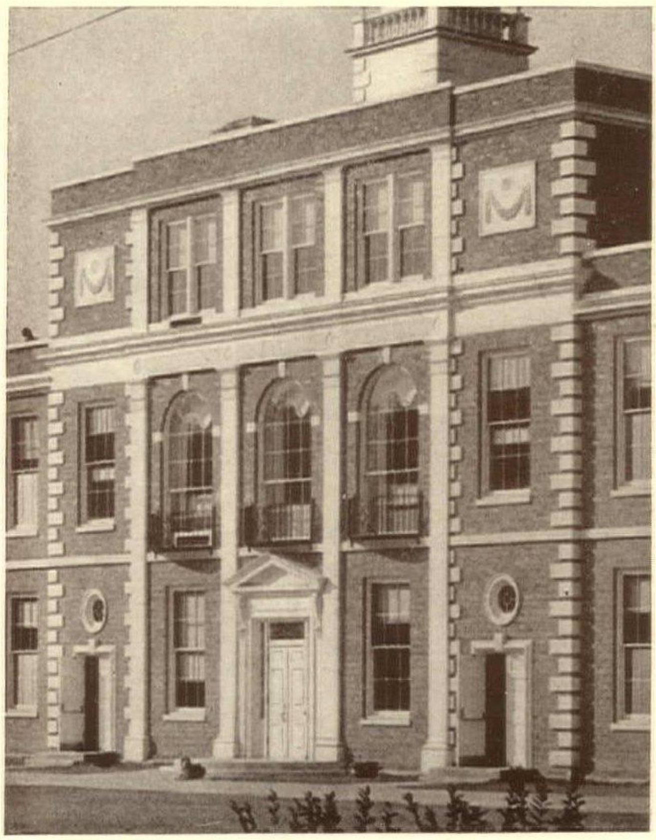
Music Room Entrance, Ludlam Elementary School, Hempstead, N. Y.
Ernest Sibley



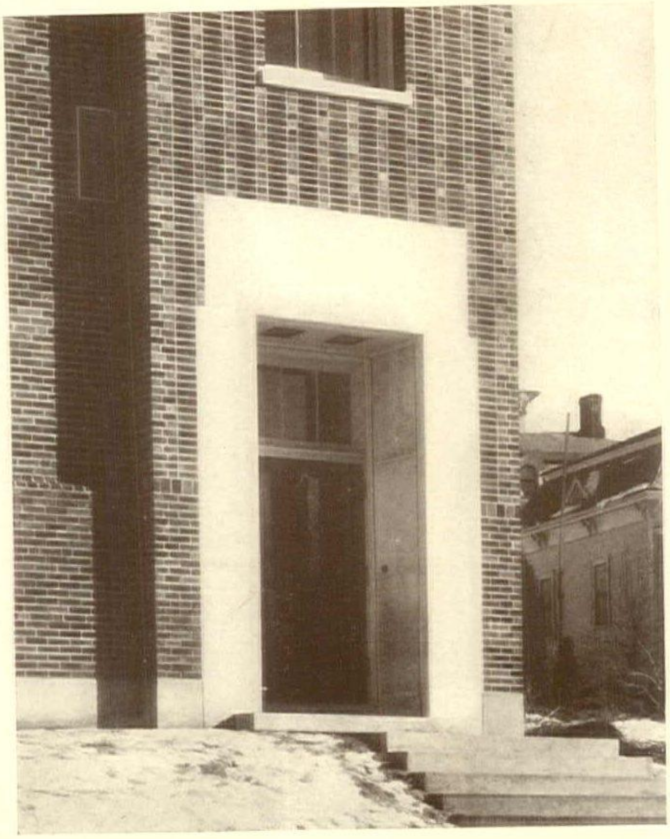
Harmony School, Gloucester, N. Y.
Albert Harkness & Everett Higson



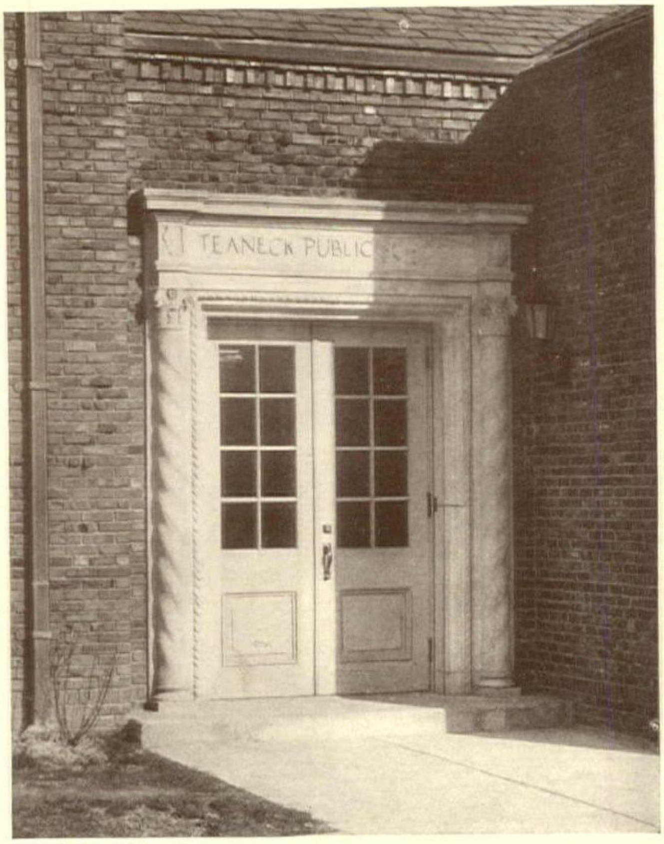
Christiana School, Christiana, Del.
Massena & Du Pont



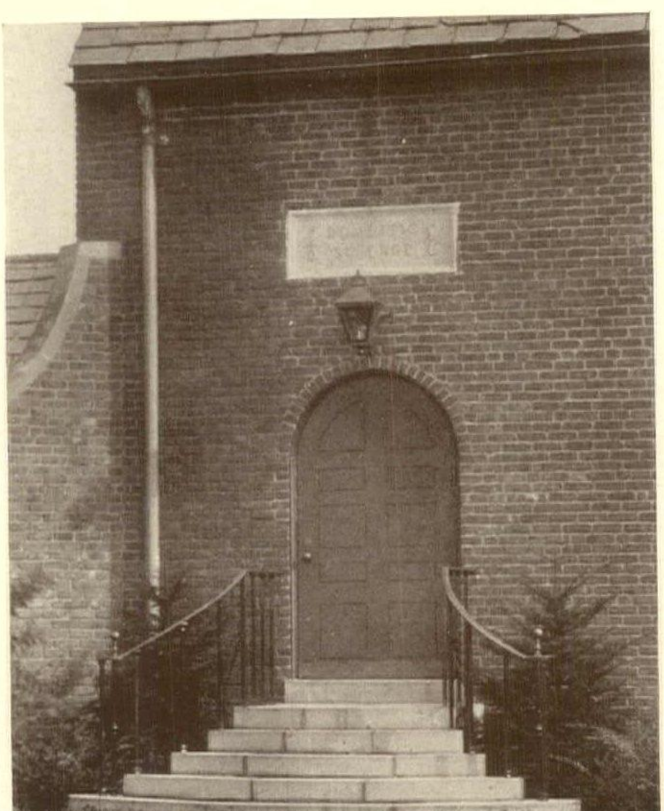
Lake George High School, Lake George, N. Y.
Edward S. Hewitt



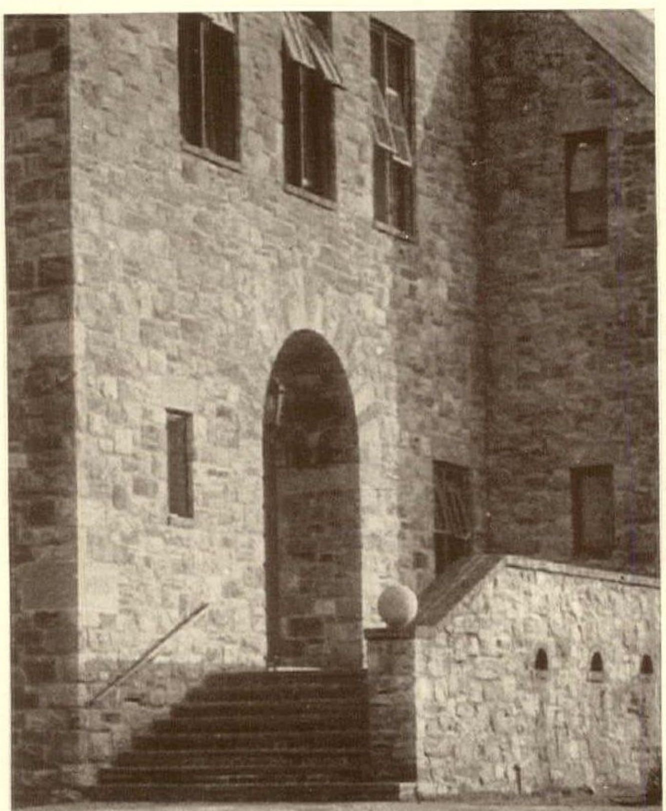
Charles J. Emerson School, Stoneham, Mass.
Kilham, Hopkins & Greeley



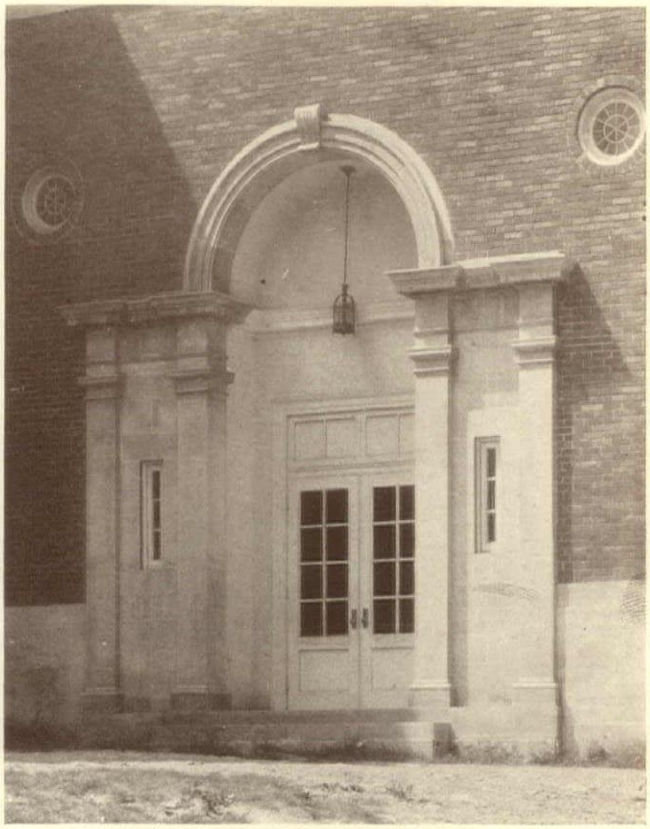
Nathaniel Hawthorne School, Teaneck, N. J.
Hacker & Hacker



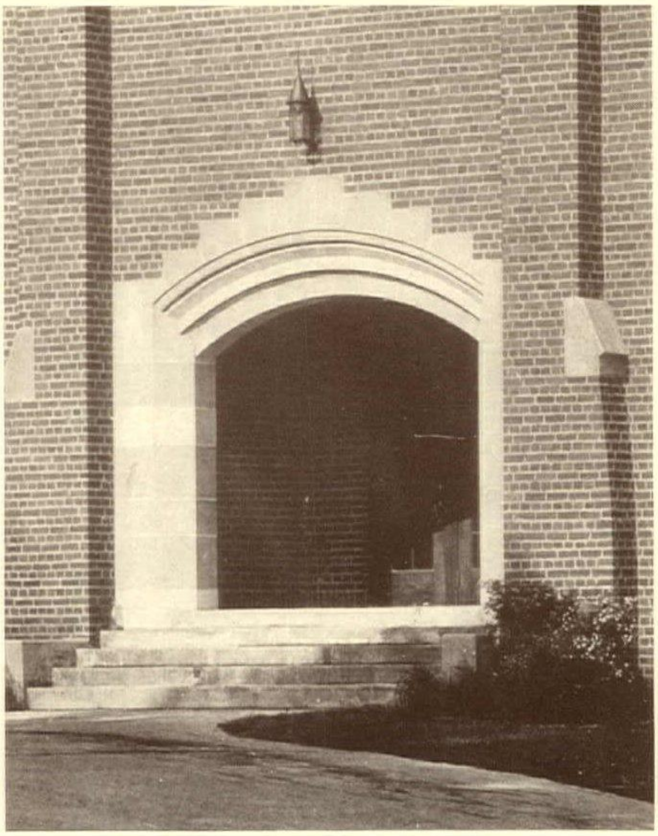
Flower Hill School, Port Washington, N. Y.
Wesley Sherwood Bessell



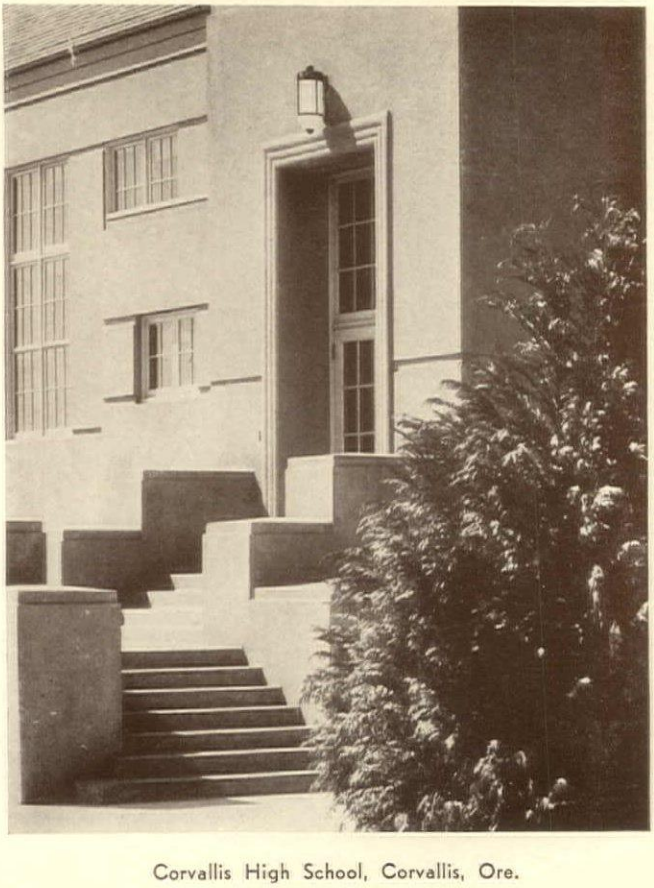
The Horace Greeley School, Chappaqua, N. Y.
James Renwick Thomson



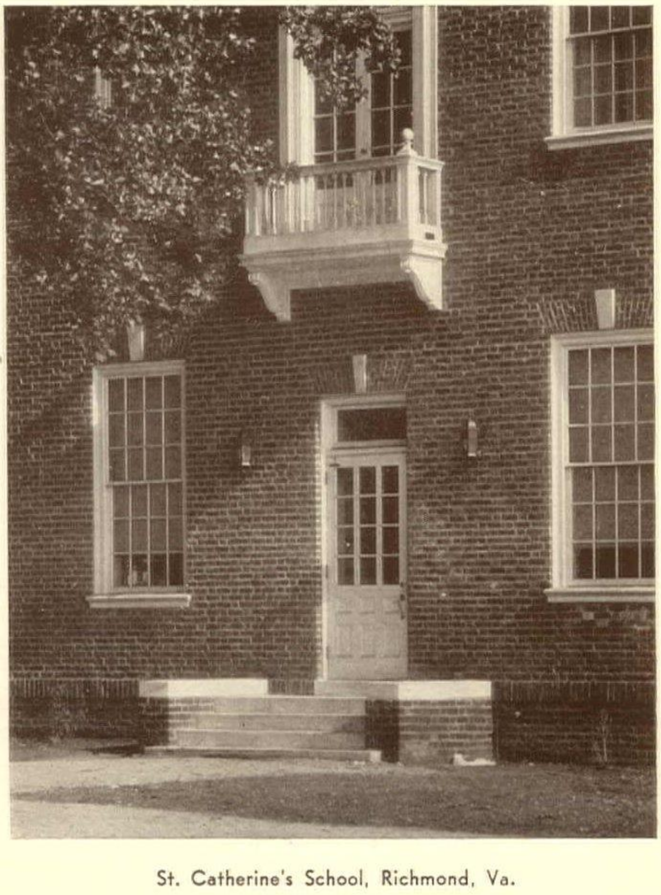
Harrodsburg School, Harrodsburg, Ky.
Nevin, Wischmeyer & Morgan



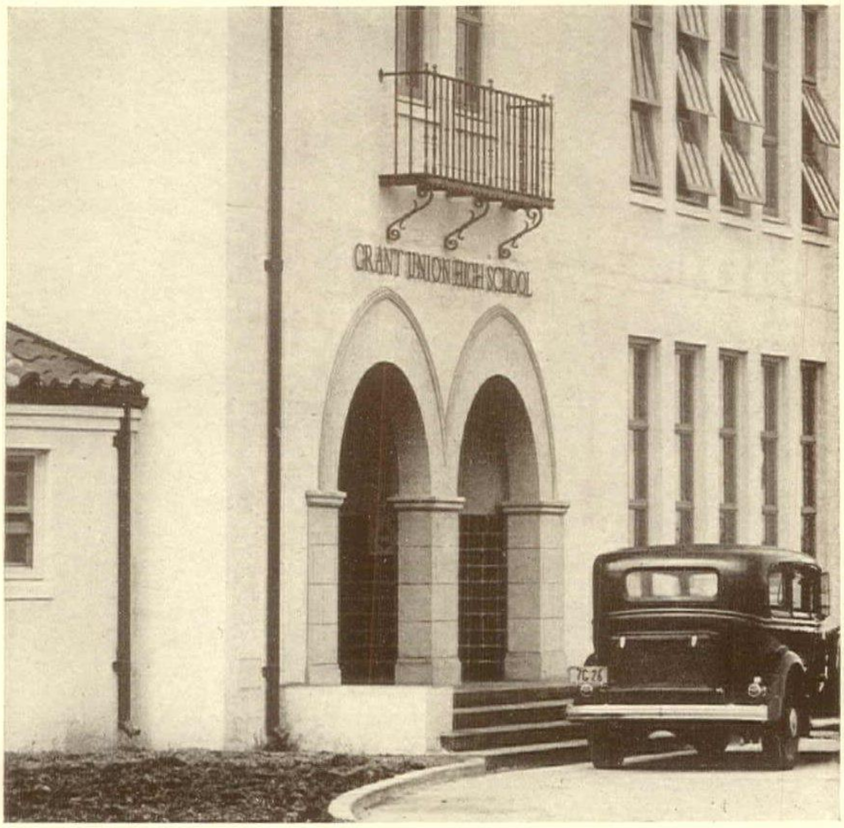
Oakwood Village High School, Dayton, O.
Schenck & Williams



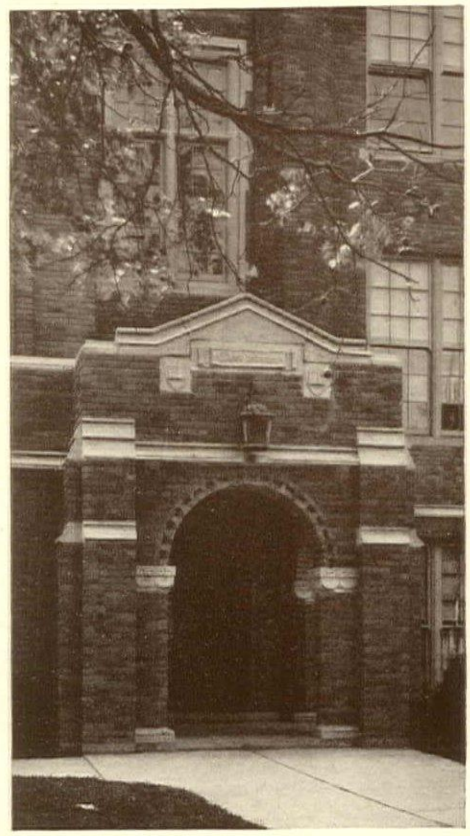
Corvallis High School, Corvallis, Ore.
Whitehouse, Stanton & Church



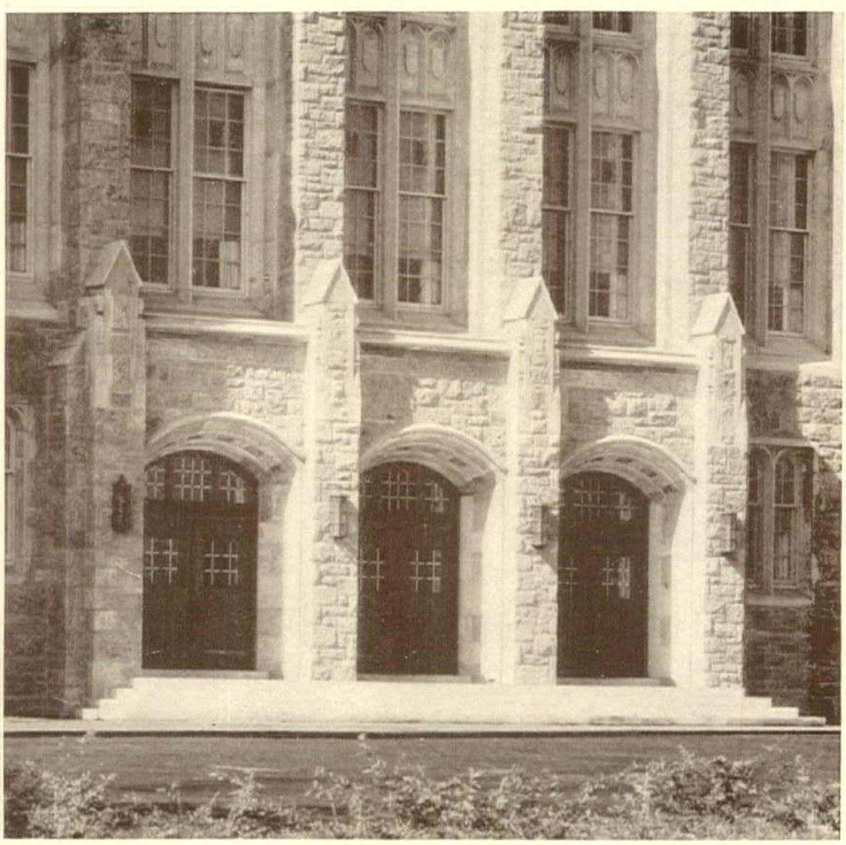
St. Catherine's School, Richmond, Va.
Hobart Upjohn



Grant Union High School, North Sacramento, Calif.
Harry J. Devine

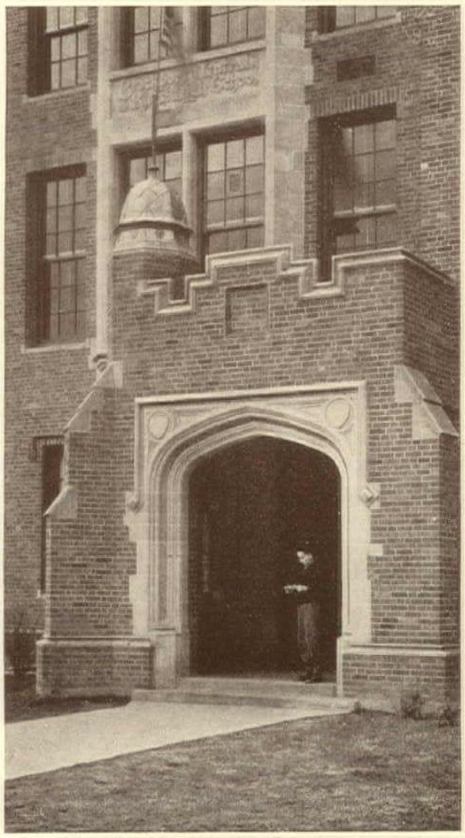


Honeoye Falls (N. Y.) High School
Dryer & Dryer

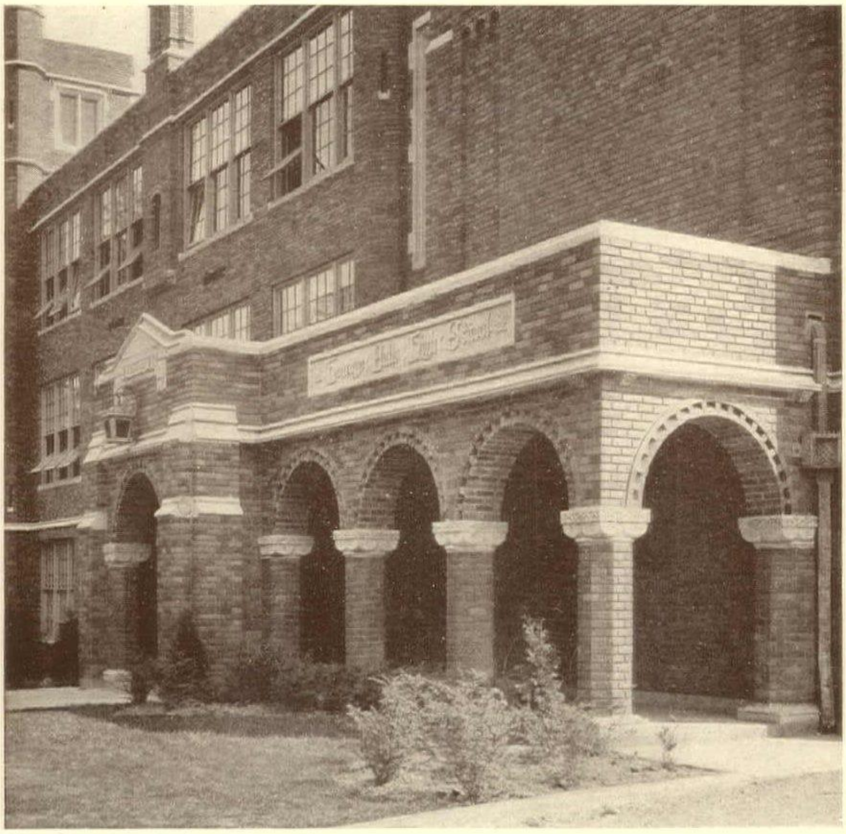


White Plains High School, White Plains, N. Y.
Starrett & Van Vleck

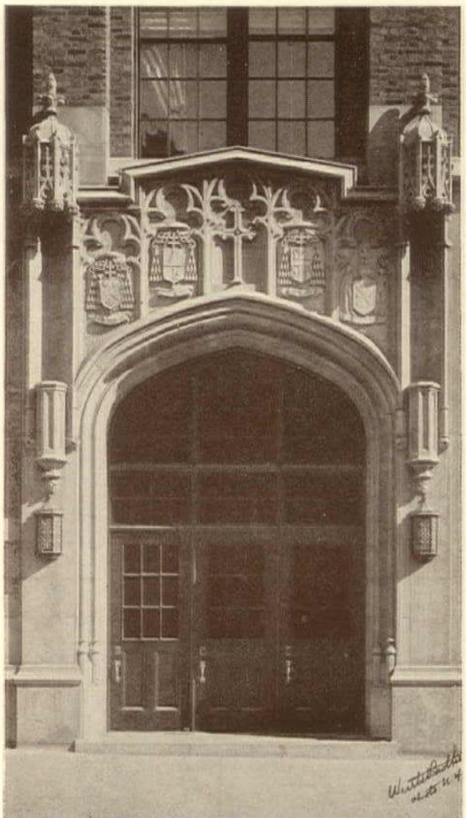
Flower Hill School, Port Washington, N. Y.
Wesley Sherwood Bessell



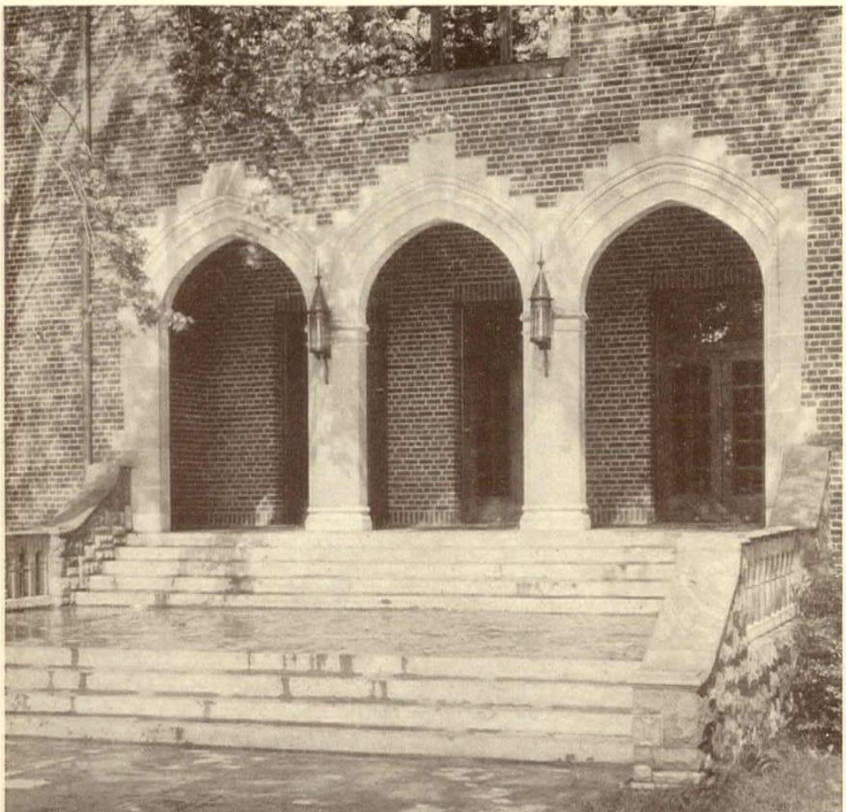
Brockport (N. Y.) Central Rural High School
Dryer & Dryer



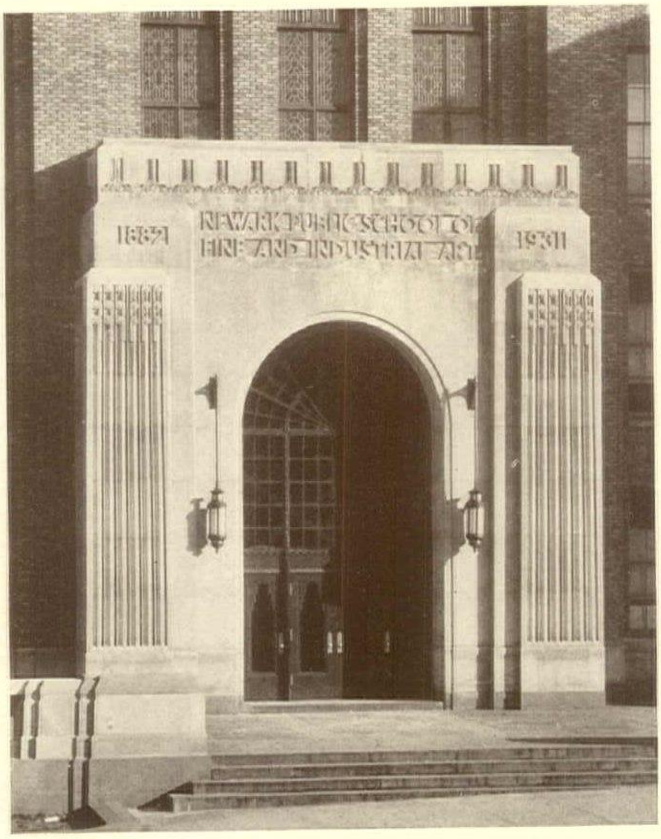
Honeoye Falls High School, Honeoye, N. Y.
Dryer & Dryer



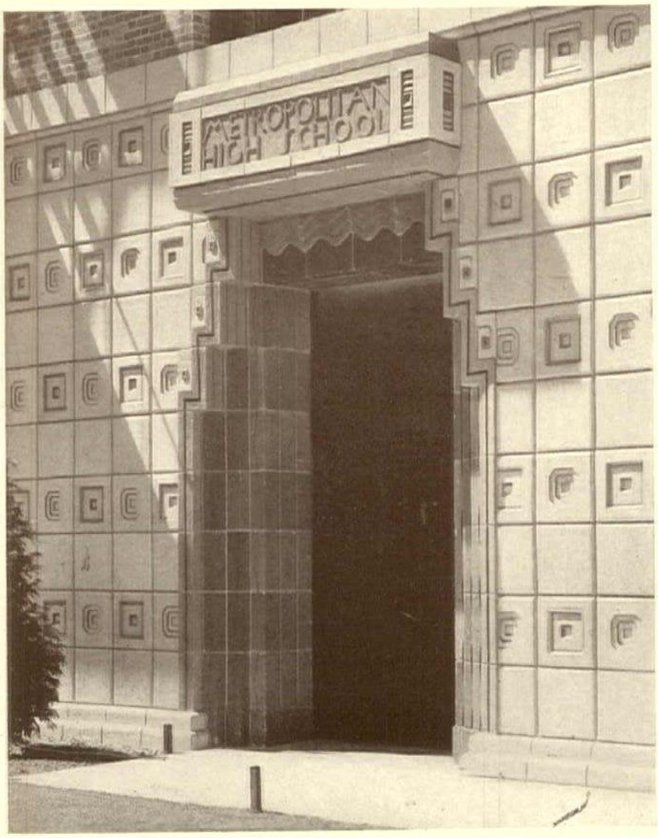
Cathedral High School, New York, N. Y.
Robert J. Reiley



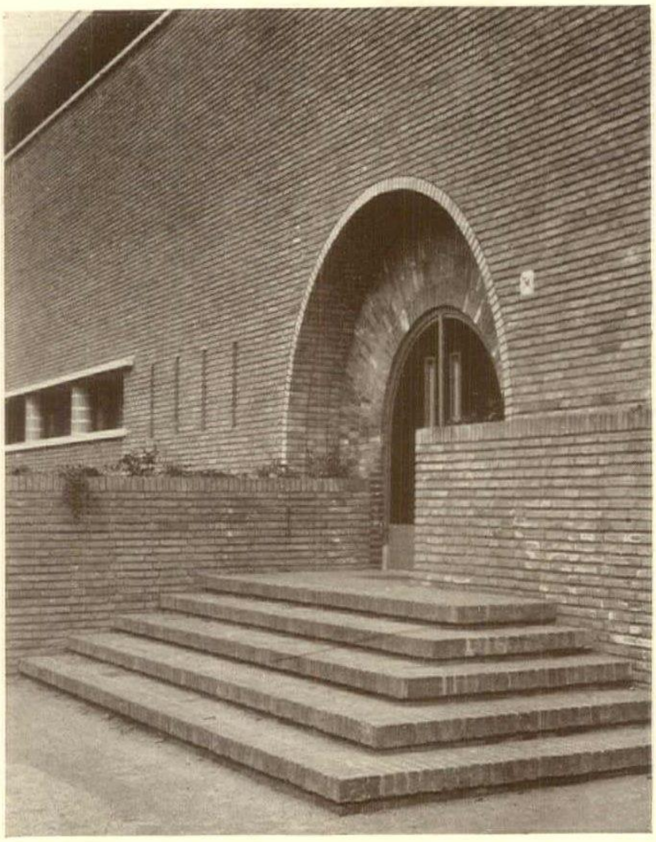
Oakwood Village High School, Dayton, O.
Schenck & Williams



Newark Public School of Fine and Industrial Art, Newark, N. J.
Guilbert & Betelle



Metropolitan High School, Los Angeles, Calif.
Noerenberg & Johnson



School in Hilversum, Holland
W. M. Dudok

Municipal School, Amsterdam, Holland
Office of the City Architect

RCHITECTURE OF SCHOOLS

THE designing of schools, like houses, is a perennial problem for architects. There is always a demand if not always the financial wherewithal for much needed new school houses. And the need is due not only to a growing population but to a more efficient system of educational administration in the form of "consolidated schools" to replace the myriads of little red school houses that once dotted the countryside. But this change, made possible by the school motor bus, is hardly as important as the changes yet to be made in keeping pace with the remarkable progress in the philosophy, purposes, techniques and paraphernalia of modern teaching. No longer are standardized bleak uninspiring cubicals with forty fixed seats and a blackboard the accepted solution. Progressive educational methods demand flexibility in the classrooms and the creation of a stimulating atmosphere conducive to concentration, interest and the very real pleasure of learning. This challenge to the architectural profession is being aggressively met by a growing group of intelligent, competent designers. Their greatest problem is not a technical one of solving physical requirements but rather one of educating a lethargic voting public and reactionary school boards. And this problem is two-fold, first, in persuading the school building committee to erect a modern structure adaptable to discernible future needs rather than a pretty monument that will be pedagogically obsolete before it is completed; and secondly to prevail on them to select their architect on the basis of his technical ability to produce such a building rather than make their selection on political grounds. These are problems worthy of the best efforts of the profession which strives "to be of ever increasing service to society."

CHOOLS OF ARCHITECTURE

IT has almost become a tradition to blame most of the ills of the profession on the schools of architecture. This, we imagine, is largely a matter of "saving face" on the part of the individuals who have failed to realize that the formal education in architecture at the university is but the beginning of the life-long study which must be pursued by the architect himself. Four or even six years is much too short a time to give a thorough training in even the materials and techniques of the profession, much less to attempt to do more than indicate the necessity of further study in the many arts, sciences, and businesses that impinge on the work of the profession. The schools are definitely conscious of the breadth of vision necessary for more competent architectural practice, and are endeavoring to orient the student's thinking, to give him a point of view and a method of attack. The techniques in this process vary necessarily in the different schools, as particular conditions must be met. The methods of the famous Bauhaus School have been admired and discussed in American architectural schools, and America now welcomes Walter Gropius to the School of Architecture at Harvard University, realizing that his stimulating personality and the working out of his methods of teaching will be of inestimable value to architecture in America.

Kenneth K Stowell

EDITOR

William Platt and Eric Gugler as Robert Peabody and Daniel H. Burnham

J. Andre Fouilhoux as a very modernistic architect of today

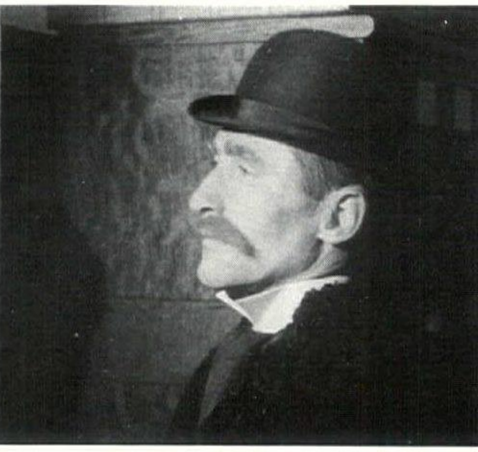
Fritz Steffens as J. W. Rich, trea of the newly formed Institute in

ARCHITECTS INTO ACTORS

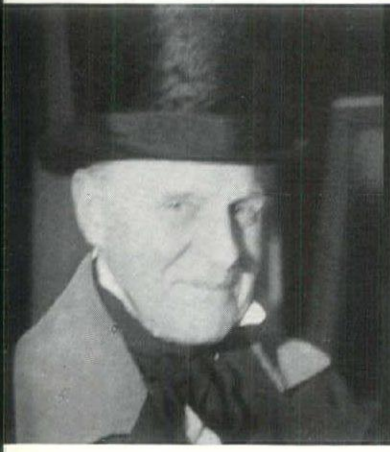
Celebrating the eightieth anniversary of the founding, in New York, of the A.I.A. the New York Chapter recently presented a dramatic review of architecture in fou incidents: 1857, 1876, 1893, and 1937, under the direction of Wesley S. Bessel

Edgar I. Williams as Calvert Vaux, one of the founders

Harrison Gill as Louis Sullivan in 1893

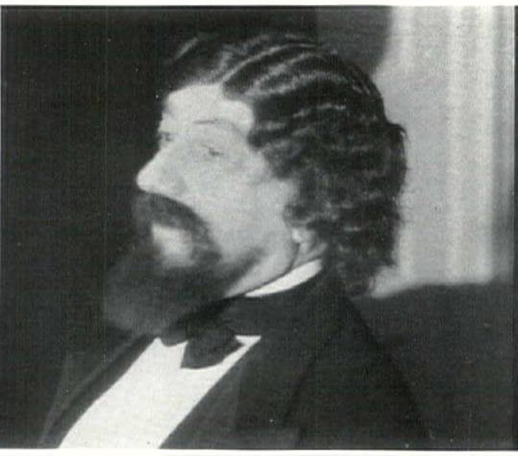


Harvey Stevenson as Charles Follem McKim in 1893



Electus D. Litchfield as Charles Babcock, a founder

Hobart Upjohn as his grandfather, Richard Upjohn



Julian Clarence Levi as Leopold Eidlitz in 1857

Lucian E. Smith, a conservati client in the hands of a moderni

Figure 1. A 16 millimeter projector in operation in a classroom.

FROM "HOW TO USE THE EDUCATIONAL SOUND FILM" BY M. R. BRUNSTETTER

The author is indebted to Mr. H. Gard Knox and Mr. J. S. Ward of Electrical Research Products, Inc., for technical assistance in preparing part of this article.

THE AUDIO-VISUAL STUDIO

Y F. L. DEVEREUX

Space Requirements for the Sound- Picture Program in School Buildings

[DUCATIONAL talking pictures make - master teaching possible for every classoom. But they do much more than that, nportant though it is. They do what textooks and all other educational aids have ever before been able to do. Through ending the aural with the visual, through ombining the use of those twin windows of e soul, the eyes and the ears, in sensations sight and hearing so fundamental in the arning process, talking pictures wave the and of reality over schools and classrooms id the dead come to life and the whole inorama of the peoples and things of the orld come upon the stage to act in the assroom their parts in the processes of the lucation of the child.

The talking picture not only reproduces e actuality of life and makes it available educational experiencing, but it actually nproves upon life as an educational oppornity. Experience is a great teacher, but is often an inefficient teacher in that it aches equally the good and the bad, the sential and the trivial. To be able to reoduce the realities of life and yet control id direct them by eliminating the nonsential, by changing their tempo, by rerranging their sequences to increase efctiveness, by using every appeal of the ramatic in each situation, even by repeatg all the details of experience if desired, iese and numerous other possibilities of udio-visual instruction make it possible for ie schools to take advantage of the effectiveness of experience as the great teacher without the inefficiency of learning attending the actuality of experience.

Ever since teaching began, efforts have been made to add to the effectiveness of the process. Methods have been improved and materials have been added. Scientific apparatus, flat pictures, models, exhibits, charts, maps, stereographs, stereopticons, film slides, silent motion pictures, the phonograph, the radio, all have contributed to a degree in lending reality to teaching, but always their effectiveness was limited. It remained for sound pictures to integrate the aural with the visual and to make available to the teacher the degree of realism possible only with the union of the use of the two greatest of the senses.

In planning to install sound reproducing apparatus in schools, administrators and architects will be interested in some of the problems involved. The first consideration is naturally the selection of apparatus which will provide faithful reproduction adequately at all times. Other important items to be considered are:

1. The size of the systems needed.
2. Their arrangement for either permanent installation or mobile use.
3. The available power supply characteristics.
4. Accessory facilities desirable, such as
   (a) Sound distribution system.
   (b) Phonograph attachments.
   (c) Hearing aids.
5. Acoustics.

Large institutions generally require multiple application of these various types of sound reproducing apparatus. It goes without saying that the apparatus to be selected should embrace the latest approved developments. Rigid specifications should be written relating to the performance characteristics of the apparatus and they should include the electrical, mechanical, optical, and acoustical requirements of the system.

TYPES OF REPRODUCING EQUIPMENT

There are two types of reproducing equipment, one employing sixteen millimeter film and the other thirty-five millimeter film. The sixteen millimeter film is made of cellulose acetate and is relatively non-inflammable. The thirty-five millimeter film is usually made of cellulose nitrate and is highly inflammable. However, thirty-five millimeter film is also available in cellulose acetate, or safety stock.

CLASSROOM USE

Portable sound motion picture projectors using sixteen millimeter film are best adapted to classroom needs, for this type is easy to operate, is light in weight and readily moved. Its performance will be satisfactory for all average classrooms, and generally speaking, for the smaller assembly rooms. This equipment may be operated either by the teacher or a pupil. The seating plan should enable each member of the

Figure 2. 16 millimeter sound film projector with teacher operating.

Figure 3. Two 16 millimeter type projectors and projectionist.

class to view the screen comfortably. The screen and loudspeaker should be placed at the front of the room, with the projectors in the rear of the room on an axis perpendicular to the screen's plane. The room must, of course, be darkened while a picture is being shown. A power-supply outlet should be in the rear of the room at desk height from the floor. This outlet will provide current for the projector and, if necessary, for the amplifier. It is desirable to have another outlet at the front of the room for the loudspeaker unit behind the screen. If sound equipment is to be used frequently, a conduit should be provided for the speech circuit from the projector to the loudspeaker. This arrangement will eliminate the necessity of having loose cables on the floor. A light switch placed near the projection stand will be of advantage to the operator in controlling the lighting in the room. Power and speech circuits must not be run in the same conduit.

Rear projection of motion pictures through a translucent screen requires that the screen be placed a distance from the front wall of the room equal to the width of the picture desired. Thus an image five feet wide requires a projection distance of five feet. This ratio applies to both the 16 and 35 millimeter film.

THE AUDIO-VISUAL STUDIO

The audio-visual studio is a natural outcome of modern trends in the development of the new education. It provides a room which may be used continuously throughout the day in connection with the work of a school or of a department of a school. It has the advantage of being designed primarily for sound picture projection, thus making it possible to obtain the very best results. If students are to follow the film presentation in a way that will be most beneficial to them, picture and sound should be reproduced under conditions conducive to bringing out all the constantly improving technical qualities entering into the manufacture of the sound film. The sound motion picture is a device to create the illusion of reality. Its reproduction is as important as its making. Students, accustomed to the technical excellence of the motion picture theater, should be given the best audience conditions possible when the world is brought to the classroom.

The sixteen millimeter equipment seems most practical for classrooms, but in the studio either the sixteen millimeter or the thirty-five millimeter may be used. Moreover, equipment may be maintained in such a state of readiness and handiness that laborious preparations do not constitute an obstacle to its utilization.

In addition to contributing to the integration of the instructional program, the studio permits of economy in the amount of projection equipment required. In some cases,[1] where motion pictures have been used exclusively in classrooms, projectors have been provided in the ratio of one for each six classes. But it is estimated that one audio-visual studio accommodating several classes would increase the ratio to one projector for each twelve classrooms.

In elementary schools the entire sound picture program may be confined to the audio-visual studio when funds are not available for the more extensive program of classroom use. The number of pupils enrolled in an elementary school and the size of classes will be factors controlling the number of studios required.

In junior and senior high schools studios are properly a part of each departmental unit where a sufficient number of pupils are involved to require a separate studio. The shape of the studio should be such that all the observers may be seated within an angle of 60 degrees from the center of the screen, and not too close to it. There should be accommodations for seventy-five to one hundred pupils. Excessive distances from the screen should be avoided.

Unobstructed vision of the whole screen is essential for every observer in the studio. The size of the prospective audience, t dimensions of the room, the area of t screen, and the type of seating arrangemen are all factors to be considered here. Slo ing the floor slightly and mounting t screen on a roller suspended from the ce ing are devices helpful in meeting th standard. In any seat, the vertical angle the eye between the horizontal to the top the screen should not exceed 40 degrees. separate projection room is desirable sin either thirty-five millimeter or sixteen mill meter equipment may be used in the studi This provision largely eliminates any di traction from the operation of the machine It should be noted that the use of a proje tion room implies that there will be a reg lar operator. The teacher should rema with the class. However, where only th sixteen millimeter equipment is to be use with the teacher as the operator, the use a separate projection booth may interfe with class management.

The projection room should be separa from the studio. It must be fireproofed accordance with specifications later d scribed for the projection room in auditor ums. The equipment should consist either two thirty-five millimeter or two si teen millimeter sound picture projector with an amplifier and loudspeaker. In o der to create the most perfect illusion sound emanating from the picture, the lou speaker must be located behind the scre at the front of the room. For this purpos in permanent installations, a perforate screen is advantageous. If it is required th equipment be moved, a collapsible scre with beaded surface will be found satisfa tory if the viewing angle is not too wide.

If a projection room and special proje tionist are provided a buzzer will be fou convenient for the teacher's use in signa ing the operator to begin projection or adjust the sound volume. An intercomm nicating telephone is even better.

The type of seating arrangement shou be adapted for the grades to be served. A elementary school not large enough to ha two audio-visual studios will have to ma special provision for seating primary ch dren in the studio. In some schools sma chairs are carried into the projection roo whenever pictures are shown to young ch dren. Movable chairs equipped with fol ing tablet arms are desirable. They may fastened together in groups to facilitate ha dling. A floor covering of battleship lin leum will reduce the noise from moving th chairs.

Figure 6 shows a floor plan for an audi visual studio in a small elementary scho building. It involved major structur changes in an unused classroom located in mediately adjacent to the central entran on the first floor.

Inside partitions are planned along or side and at the rear. This creates an in side room, which eliminates the problem

1. In the Pittsburgh, Pennsylvania school system, the standard is one 16 mm. motion picture projector for every ten classrooms or less.

cluding light and permits better control acoustic conditions. A second entrance m the corridor is provided, both doors be of soundproof construction.

THE AUDITORIUM

The school auditorium must be planned the variety of purposes which it can serve operly. In modern schools this room is center of the intellectual, musical, and ial activities of the entire school group. Smith has so aptly said, "Better than y other single institution, the school stage n be at once a playground, shop, work- om, and laboratory; and experience oves how appealing youth finds it."[2]

From experience and research certain ndards[3] have been derived for the con- uction, finish, soundproofing, acoustical atment, illumination, equipment, and ar- ngement of the school auditoriums which n best serve the purposes of modern edu- tion. When these standards have been orporated into the plan of an auditorium, conditions required for satisfactory use sound pictures will have been met.

From the standpoint of both the visual d the acoustical elements,[4] it is desirable at a sound picture auditorium be neither duly long and narrow nor very shallow d wide. "Long" and "shallow" refer to distance from the stage to the rear. e best results are probably obtained when length is somewhat greater than the dth, but is not more than one and one-half nes the width. If the width of an auditori- n materially exceeds the length, many spec- ors must view the screen obliquely, and und distribution is difficult. In a long, rrow auditorium, however, conditions for serving and listening at the rear are like- to be much poorer than if the auditorium ere shorter and wider. A ratio of length, dth, and height in the proportion 5 : 3 : 2 ill be found desirable. In planning a new ilding the conventional fan-shaped theater pe of auditorium may well serve as a odel for the shape of the school auditori- n. The size of the room, whether or not will have a balcony, and similar consid- ations, will depend upon the number of udents to be served or upon other local nditions. It is most important that a com- tent expert in acoustics advise the archi- ct who plans an auditorium in which und pictures will be used. It is not ough to say that the auditorium properly adapted acoustically for the human voice will serve equally well for the mechanical reproduction of speech.

When an installation is to be made in an existing building, it is usually not practicable to change the dimensions of the auditorium. If the room is rectangular, the angle of vision in the two front corners may be too oblique to make these seats desirable, in which case this space should be walled in or used for other purposes. Acoustical treatment will render the room satisfactory for sound pictures if that condition does not exist. The stage, curved rear walls, and domes in the ceiling are likely to be sources of difficulty. Natural light should be controlled easily and quickly. Ventilation must be adequate.

The sixteen millimeter portable sound equipment recommended for the studio will probably give satisfactory service in the smaller auditorium under certain conditions. If the distance from the projector to the screen is comparatively short and if the cubature of the room is not too great, the small equipment may serve very well. It is estimated that for a projection distance of 45 feet in an auditorium seating three hundred or four hundred persons, a sixteen millimeter sound system will provide a satisfactory picture and sound quality. Although this type of equipment has been used for greater projection distances and in auditoriums seating a much larger audience, it is unwise to expect too much in the way of service for large groups. For large auditoriums a thirty-five millimeter sound system will be found very much more satisfactory.

REQUIREMENTS FOR 35 MM. REPRODUCTION

The architect will find the following information about

I The Projection Room
II The Stage
III Power

of material assistance in specifying thirty-five millimeter apparatus.

I—PROJECTION ROOM

The minimum desirable floor space for a two projector installation is 14′ long x 12′ deep x 10′ high. The room should comply with local ordinances as regards fire protection, ventilation and exits. In connection with the projectors certain space is required for switches, fuse panels, etc., and provision should be made for the rewinding of films. A room for arc lamp power

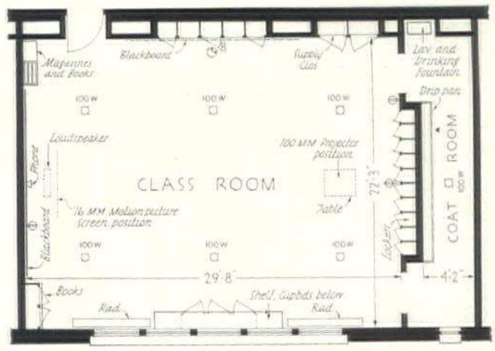


Figure 4. Typical grade school classroom equipped for educational sound-pictures.

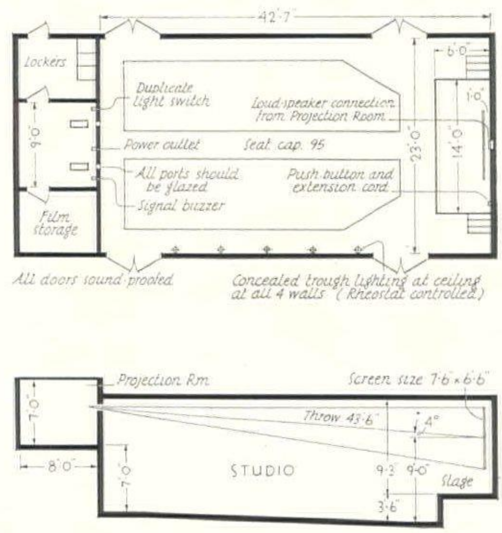


Figure 5. Typical plan and elevation for new construction of audio-visual studio.

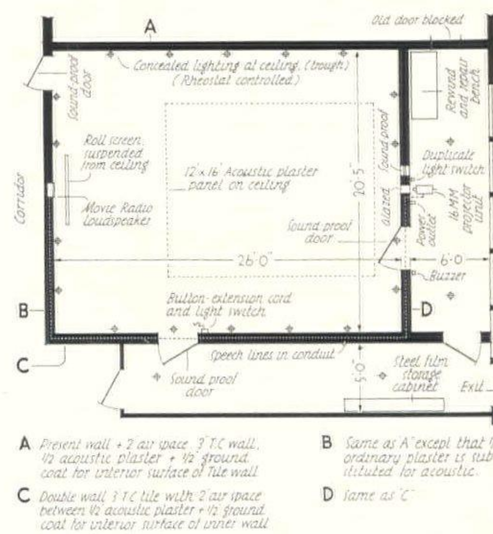


Figure 6. Plan of typical classroom remodeled as an audio-visual studio (special heating-ventilating unit required).

Milton Smith, **The Equipment of the School Theater** (Bureau of Publications, Teachers College, Columbia University, 1930), p. 11.

N. L. and Fred Engelhardt, **Planning School Building Programs** (Bureau of Publications, Teachers College, Columbia University, 1930); G. D. Strayer and N. L. Engelhardt, **Standards for Elementary School Buildings** (rev. ed., 1933; Bureau of Publications, Teachers College, Columbia University); G. D. Strayer and N. L. Engelhardt, **Standards for High School Buildings** (Bureau of Publications, Teachers College, Columbia University, 1924).

4. V. C. Arnspiger, "The Installation of Sound Picture Equipment in Educational Buildings," American School and University, 1931-1932 (American School Publishing Corporation, 470 Fourth Ave., New York City), p. 314.

5. Copies of the report of the Society's Projection Practice Committee devoted to Projection Room Planning, which incorporates much valuable information on the subject, may be had by application to the Secretary, Society of Motion Picture Engineers, Hotel Pennsylvania, New York City.

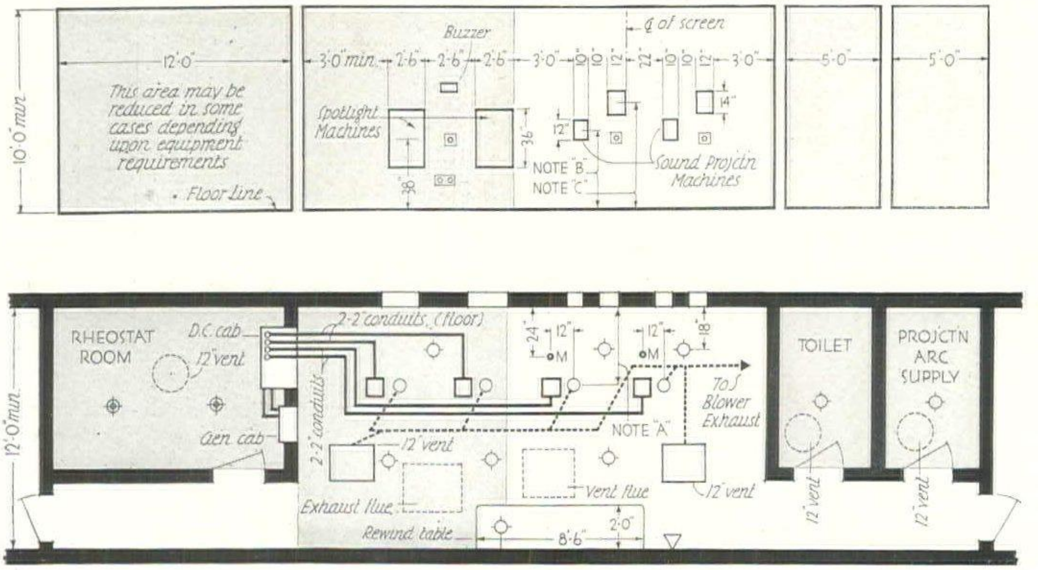


Figure 7. Plan and elevation of a typical projection room. Shaded areas indicate facilities which may be omitted or modified as required.

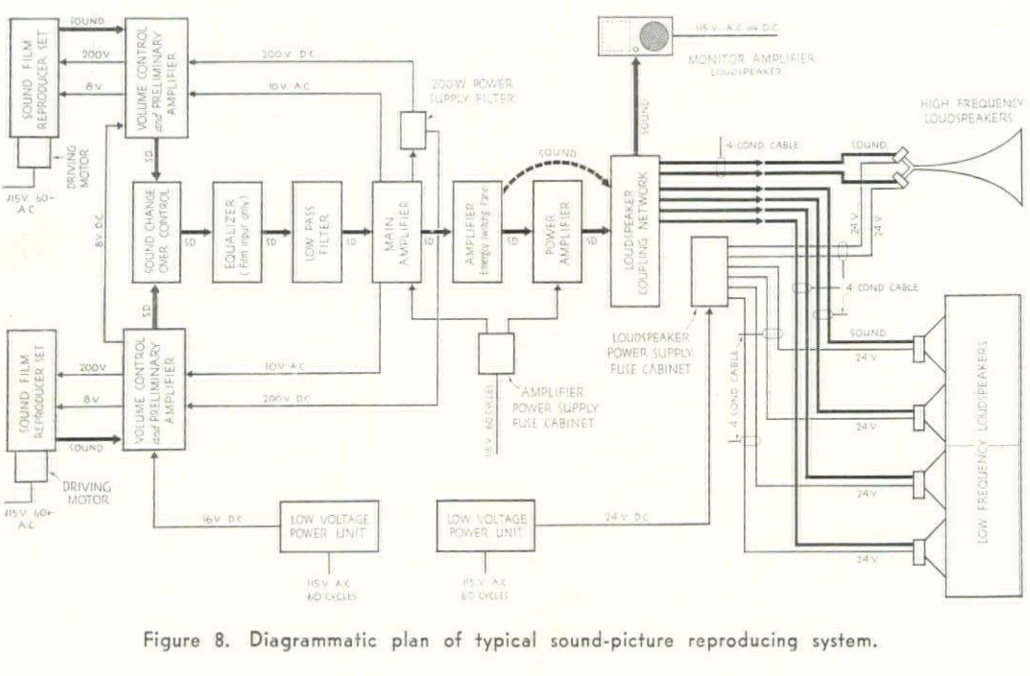


Figure 8. Diagrammatic plan of typical sound-picture reproducing system.

generators and rheostats should not be overlooked.

Figure 7 illustrates a typical room layout[5] for this purpose recently standardized by the Society of Motion Picture Engineers as its recommendation for small theaters. These provisions are advisable for every thirty-five millimeter installation. The shaded areas are to some extent optional for school auditorium purposes.

LOCATION AND CONSTRUCTION: The room in which the projection equipment is placed should be constructed of soundproof and fireproof materials and should be well ventilated. Concrete, brick, tile, gypsum, or other approved fire resisting materials may be employed. All doors, door and window frames, and shutters should likewise be of metal or suitable fireproof material. The projection room floor should be of rigid construction so that there will be no appreciable vibration. Thirty-five millimeter sound projection machines (two projectors) fully equipped for operation, ordinarily weigh approximately 1500 pounds.

LAYOUT: Especial care must be exercised in locating the projection and observation ports in the front wall to insure that they will be right for the projection angle and kind of equipment to be used. Very helpful detailed information in this regard appears in the S. M. P. E. Projection Practice Committee Report. See footnote 5, page

A clear space 3 ft. wide should be av able along the rear wall or along (pre ably the left) side wall for mounting amplifier equipment. Where local o nances require the film rewinding to be d outside the projection room, a space not than 6 ft. by 4 ft. by 7 ft. high should provided immediately adjacent to the p jection room.

VENTILATION: A projection room venti ing system of ample capacity is necess and it should provide as well for any jacent rooms used for projection purpo All projector arc lamp housings should connected into a separate exhaust sys operated by a blower exhaust fan. A sep ate opening is also required in the proj tion room leading directly to the near outside air. These flues should be c structed of incombustible materials and no less than 78 sq. in. in cross section. T projection room should be provided, wh in use, with a change of air at least 50 ft. a minute, or a complete change ev 10 minutes. Whenever the building which it is located is air conditioned, projection room should be connected to system.

FIRE PROTECTION: The shutters to co the ports or openings between the proj tion room and the auditorium in the ev of fire should be suspended by strings other approved devices so that a flash fire would burn the strings or open fusable safety links, permitting the sh ters to drop quickly by gravity and tigh close all openings. All projection ro doors should open outward and close au matically and be kept closed during eve performance.

FILM STORAGE: All films while in the ro but not in the projectors or being rewou should be stored in approved metal film co tainers provided for the purpose.

PROJECTION ARC POWER SUPPLY: Acousti or mechanical insulation or both will be r quired whenever the machinery providi the projection arc special power supp gives off acoustical hum or mechanic vibration. When this equipment is of t rotating type, it should be located as f as possible from the projection room an the auditorium. Other types of arc pow supply equipment may be adjacent to th projection room if it is kept at least fo feet from the sound equipment.

A signal circuit consisting of buttons an buzzers located in both the projection roo and on the stage should be provided fo signalling purposes. An inter-communica ing telephone between the same points is desirable adjunct.

PROJECTORS: The booth should be provide with two professional type thirty-five mi limeter motion picture projectors mounte

pedestals and equipped with arc lamps
propriate to the size of the auditorium.
00 ft. or 3000 ft. magazines should be pro-
ed.

UND SYSTEM: A high quality sound tem engineered as a complete unit is hly desirable. The sound system audio ponse characteristics should insure, when ng sound-on-film records, faithful repro- ction of frequencies from 500 to 8000 cles per second (c.p.s.) with a noise level oughout this range at least 50 decibels b) below the reproduced signal level. The sound system naturally divides into:

PRODUCER UNIT OR SOUND HEAD

This unit should satisfactorily meet the lowing requirements:

Approved to use 35 millimeter nitro- lulose film stock.

Capable of constant film speed of 24 ames per second or 90′ per minute + or — 5% without any audible distortion ("flut- rs") caused by variation in film speed. eed variations at the scanning point should t exceed 0.09″ per second.

96 cycle variation in the speed of the m as it passes the sound sprocket not eater than + or — 0.5% of the normal m speed.

Each reproducer should embrace—

ı) Motor drive to operate from available ower source.

) A mechanism to convert intermittent m motion caused by the projector into iiformly continuous film movement at the producer scanning point.

:) An exciter lamp and calibrated film anning system.

l) A photoelectric cell for converting the ght beam signal into electrical signal nergy.

e) An audio-frequency preliminary ampli- er, or other equivalent apparatus, to amplify ie signal suitably before transmission to ie main amplifier.

OLUME CONTROL

On the front wall of the booth convenient the projectionist a volume control panel ould be located.

MPLIFIER

This equipment should embrace essenti- lly—

. An intermediate or voltage gain ampli- er unit.

. A power output amplifying unit, the ombination of amplifiers to provide from 0 to 90 db total gain.

. It should be capable of amplifying in qual proportions all frequencies between 0 and 10,000 c.p.s.

. The power amplifier output gain should e uniform with frequency within 1 db. be- ween 40 and 10,000 c.p.s.

. An audio output capacity of not less than 5 watts undistorted audio frequency power which ordinarily will suffice for rooms or spaces up to a volume content of 200,000 cubic feet. Larger spaces require propor- tionately larger amounts of amplifier out- put power. Such requirements will be best determined by requesting a reliable sound equipment distributor to specify suitable equipment.

6. The amplifier should furnish at least 15 watts of audio frequency output power free of harmonics greater than 2% of a funda- mental tone (voltage ratio), from 150 to 2,000 c.p.s.

7. The audio frequency power output should reach 10 watts without harmonics larger than 2% of a fundamental tone in the range from 50 to 8,000 c.p.s.

8. The noise level in the signal from 50 to 8,000 c.p.s. should remain at least 50 db below the reproduced signal level.

MONITOR LOUDSPEAKER

The sound equipment installed in the projection booth should be provided with a loudspeaker permitting local monitoring. This unit should be provided with a separ- ate audio frequency power amplifier to drive it independent of the main sound system power amplifier. (Figure 8.)

II—STAGE

On the stage are located the following units:

SCREEN: Motion picture screens used for thirty-five millimeter sound motion picture equipment operation must satisfactorily ac- commodate the placement of the loudspeak- ers directly behind the center of the screen. The necessity of maintaining good illusion, meaning an effective co-ordination of the picture image and sound source, establishes this requirement.

SOUND MOTION PICTURE SCREENS SHOULD BE:

1. Non-inflammable by reason of safety re- quirements.

2. So perforated that audio frequencies from 50 to 8,000 c.p.s. will not be attenuated as components of the signal more than 4 db when passed through them from the loudspeaker to the audience area.

3. One foot wider and one foot higher than the maximum picture size which will be re- quired for a given screen.

4. Lined with grommets on all sides to per- mit lacing it within the supporting frame. The screen tightly stretched in this manner is ready for hanging or bracing in the po- sition where it will be used. Screens made of more than one piece of material should have their seams vertical.

As to screen size, the following approxi- mation will form a general guide. The ratio of screen height to width is approximately 3 to 4, varying with the projection angle.

Audience Capacity	Projection Distance	Screen Image Size Minimum	Maximum
Up to 2000 seats	55′ to 95′	11′6x15′	19′x25′
Above 2000 "	70′ to 150′	15′ x20′	23′x30′

LOUDSPEAKERS

Main loudspeaker equipment should be:

1. Of the exponential multi-cellular type.

2. Capable of a minimum balanced audio frequency response effectively from 50 to 8,000 c.p.s.

3. Multiple speaker units should be pro- vided to insure proportionately equal re- sponse at the very high and very low fre- quencies within the effective range. (Fig- ure 9.)

4. Matched receiver units to insure equal distribution of the sound output over the seating area.

5. Capable of ready removal from the stage as required from time to time without disturbing proper physical and electrical adjustments of loudspeakers.

III—POWER

POWER SUPPLY: The complete system should be capable of operating from the local power supply, preferably 60 cycle alternat- ing current:

Voltages: 105-125—50, 60, 62½ cycles + or — 3%, single phase AC, or, less desirable, 105-25—DC.

Amperage: Variable with equipment types and sizes, but approximately as follows:

Sound equipment only—about 65 amperes maximum normal drain, depending upon system size.

Motion picture projection equipment—de- pending upon style of arc lamp used in pic- ture projection—30 to 80 amperes. Ex- tremely large auditoriums may need high intensity arc lamps demanding a maxi- mum normal drain of over 150 amperes.

POWER EQUIPMENT: Requirements for pow- er equipment are as follows:

1. Low voltage power units to operate va- rious portions of sound system should be driven from 105-125 V., 60-cycles single phase, AC.

2. The low voltage power unit supplying ex- citer lamp energy should have a maximum AC voltage component in the DC output voltage supply not exceding 0.12 V.

3. The power supply for the photoelectric cells of the preliminary audio amplifier plate circuit should be filtered so the maximum AC voltage component of the DC voltage supplied does not exceed 0.0002 V.

4. Variations in voltage, ranging from 100 to 130 in the primary power supply line should cause no material effect upon low voltage power supply delivered to the ex- citer lamps, preliminary amplifier plate cir- cuits and photoelectric cells.

WIRING: All projection equipment and sound system wiring requirements as speci- fied by the suppliers should be carefully ob- served. In general all wiring must be run in metal conduit.

ACCESSORY FACILITIES

A great variety of adjuncts are now avail- able to supplement the sound motion picture

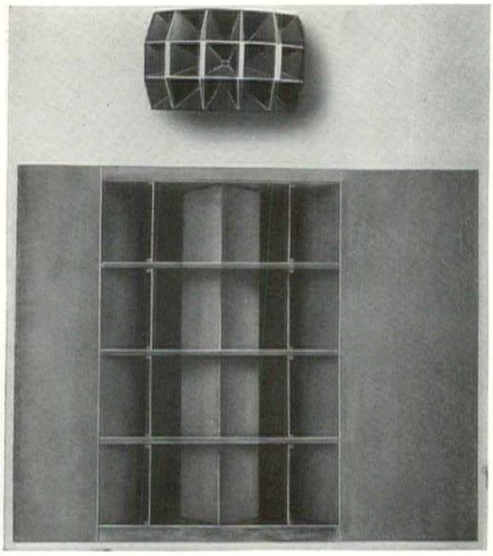


Figure 9. New di-phonic multi-cellular loudspeaker system for stage use.

equipment proper. These attachments are of two general kinds: (1) input devices utilized for picking up sound such as microphones for speech and music reinforcement, non-synchronous disc record reproducers or phonograph "pick-up," radio reception devices and connections to incoming special telephone or other wire lines, (2) output devices used for the conversion of amplified electrical signals into sound waves, such as loudspeakers distributed over a multiplicity of locations and hearing aid devices for persons with impaired hearing. While attachments of these types are used primarily with thirty-five millimeter sound motion picture reproducing equipment, some may be applied to sixteen millimeter equipment.

MICROPHONE PICK-UP ATTACHMENT: This equipment consists of one or more suitable microphones. Special stands adjustable as to height and position and equipped with cords and plugs are employed as mounts for the microphones. An auxiliary apparatus, such as volume controls, preliminary amplifiers, mixers and switching devices may be employed to connect the microphones to the transmission equipment. microphones when so operated should be capable of a substantially uniform response over a frequency range of 40 to 10,000 c.p.s. The operation and response of microphones should be unaffected by temperature, humidity, barometric pressure and by electrical disturbances from nearby non-associated circuits.

Typical locations for microphones in schools are the principal's office, speaker's rostrum in assembly rooms, in footlight troughs and side pockets on stages, in gymnasiums and other key points and places where large groups of persons may gather. The connections should be such that microphones can be stored when not in use.

DISC RECORD REPRODUCER: This device consists of one or more electrically driven, constant speed, turntables capable of playing disc records—12" in diameter. The turntable should have operating speeds of 33 1/3 and 78 RPM. 105-125 Volt, 60 cycle, single phase AC motors are preferable. The associated electrical reproducers should be capable of playing both lateral and vertical cut disc records. The equipment should embrace motor switches, speed change controls, signal volume controls, and "faders" or electrical potentiometers to permit the smooth fading from one turntable to another. It is good practice to protect this equipment by the use of hinged covers Turntable cabinets may be mounted on rubber tired wheels if desired.

The equipment should have electrical characteristics such that a signal will for—(a) Vertical records, have a substantially flat response between 50 and 8,000 c.p.s., and a noise level throughout this range of not less than 50 db. below the reproduced signal level; (b) Lateral records, have a substantially flat characteristic between 60 and 4,000 c.p.s., and a noise level throughout this range of not less than 35 db. below the signal level.

RADIO RECEPTION ATTACHMENT: The output of the radio receiving equipment should possess an audio-frequency response substantially flat between 25 and 7,000 c.p.s., not exceeding 4 db. maximum variation throughout this range. The minimum signal range capacity of the receiver should be 550 to 1500 kc. regardless of such other frequency bands as the receiver may be operable upon. The total gain, output level and output impedance at audio-frequency should be values suitable for use in association with the main amplifier system and the loudspeakers of the distribution system.

All equipment should be capable of "relay rack" mounting and operate from a 105-125 volt, 60 cycle, single phase, AC power supply. The type and design of the radio receiver and associated equipment should conform with the best accepted practices for the art.

SOUND DISTRIBUTION SYSTEM: Electro-dynamic type loudspeakers or their equivalent, having a minimum diameter of 14", should be installed in each classroom. They are connected to the main sound system.

Loudspeakers so used should faithfully reproduce all frequencies between 60 and 7,000 c.p.s. and through individual volume controls be capable of serving the requirements of each room. With all classroom loudspeakers operating simultaneously, there should be no overloading of the amplifier system supplying the loudspeakers, nor should there be any distortion in the signal output of any loudspeaker.

HEARING AID ATTACHMENTS: These dev consist of either acoustic or bone-conduc head receivers for the use of the harc hearing. They have built-in volume trols and require an auxiliary amplifier erated from the main sound system. P in receptacles or "jacks" accommoda one or two hearing aids are located at lected seats in an auditorium or classro

ACOUSTICS

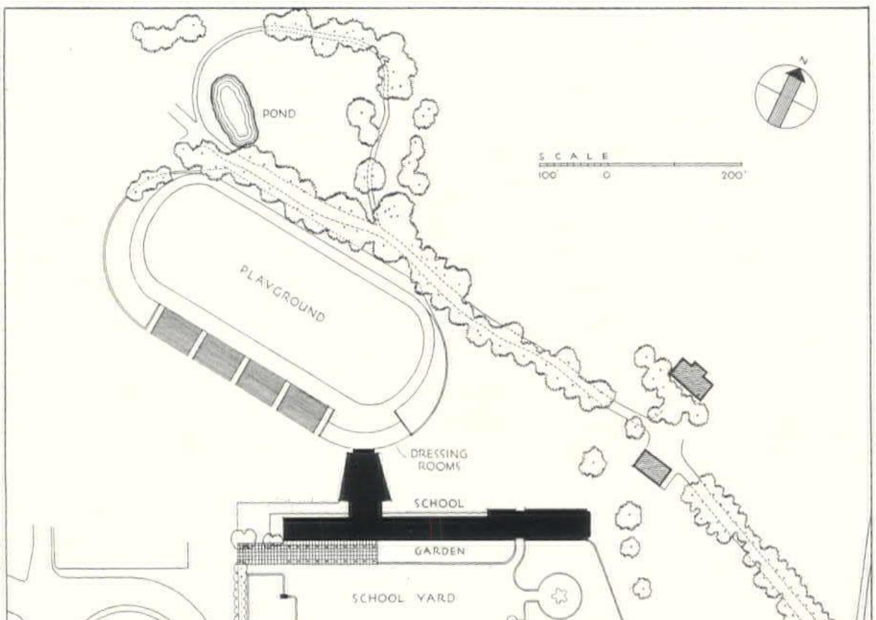
Sound tends to travel in more or straight lines expanding along its front as it radiates. Areas therefore not be shadowed completely as in the of light, but nevertheless relatively la reductions in noise may be obtained shielding or acoustic shadowing. Wher noise disturbance on a proposed school is localized along one side or near point, advantage may be taken of the shie ing effect of existing buildings. In mu structure schools the arrangement of several buildings may be such as to shi the classroom sections from external no

Another plan is the arrangement of internal spaces of the building so that quieter classrooms are located on the s away from the noise source or even in interior of the building. Vocational roo gymnasiums, and similar spaces can placed near the severest disturbance.

A material reduction of noise level m be obtained by the application of acous material within the classroom itself. C should be taken, however, that the requi ments for proper room acoustics are not olated by the addition of too great a qua tity, by the improper distribution or impro type of sound-absorbing material. In cla rooms, particularly in the larger ones, t objective is the efficient transmission sound from point to point. It is genera recognized that an excessive amount of verberation, accompanied by a prolongati of syllables of speech sounds, is destructi to intelligibility. It is likewise true that room can be made too dead for good int ligibility. A treatment which will give o timum acoustic conditions will genera yield an adequate noise reduction unle some local noise source interferes.

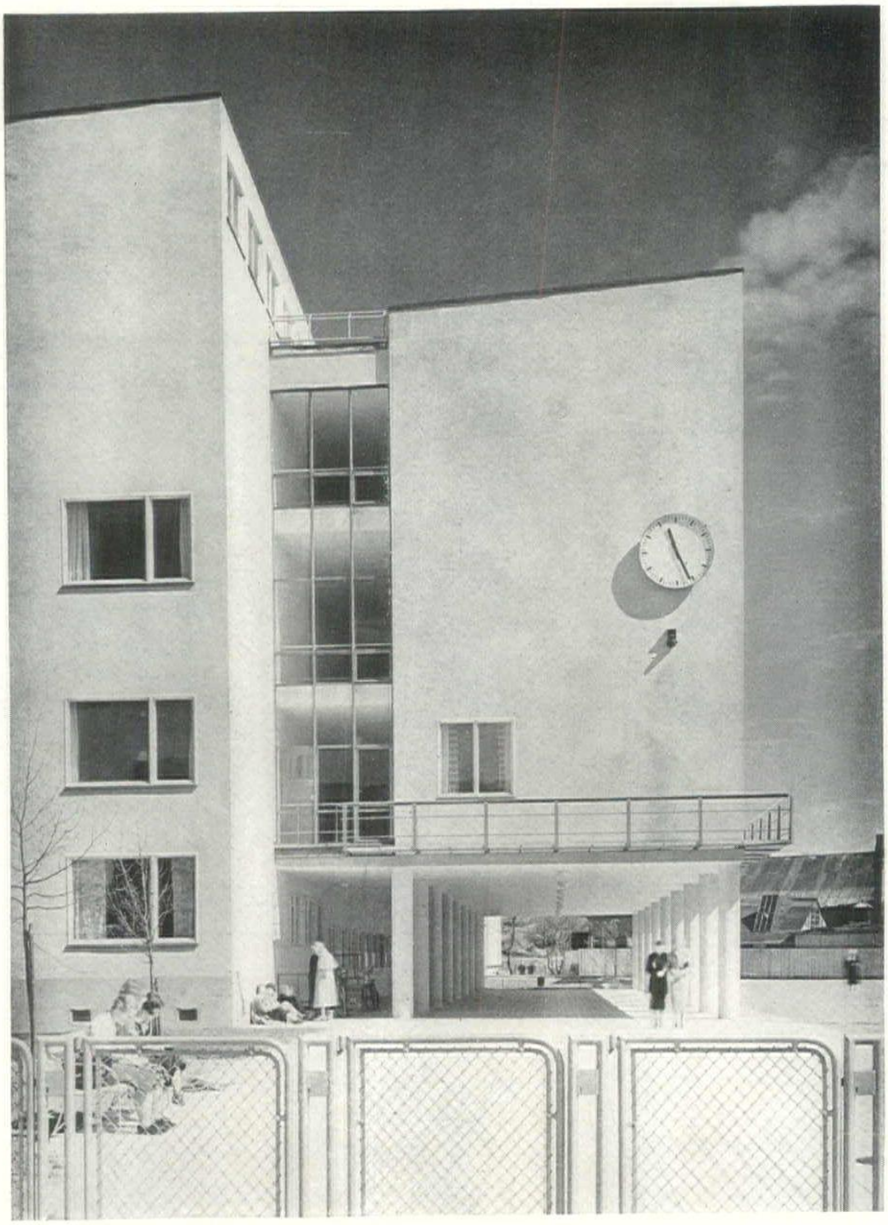
Suitability and distribution of material important in the small classroom but b comes an imperative consideration in t large room, such as the auditorium. Her expert thought must be given to the amou of absorption at various audible frequenci to insure a proper balance of the reverbe ant sound energy. The distribution of m terial about the auditorium must be suc as to permit the maximum enhancement sound from the stage or platform with minimum of discrete reflections. The pri ciples which govern acoustics of theate should be fully applied in considering t school auditorium. In any event, it will an economy to employ a competent acoust consultant.

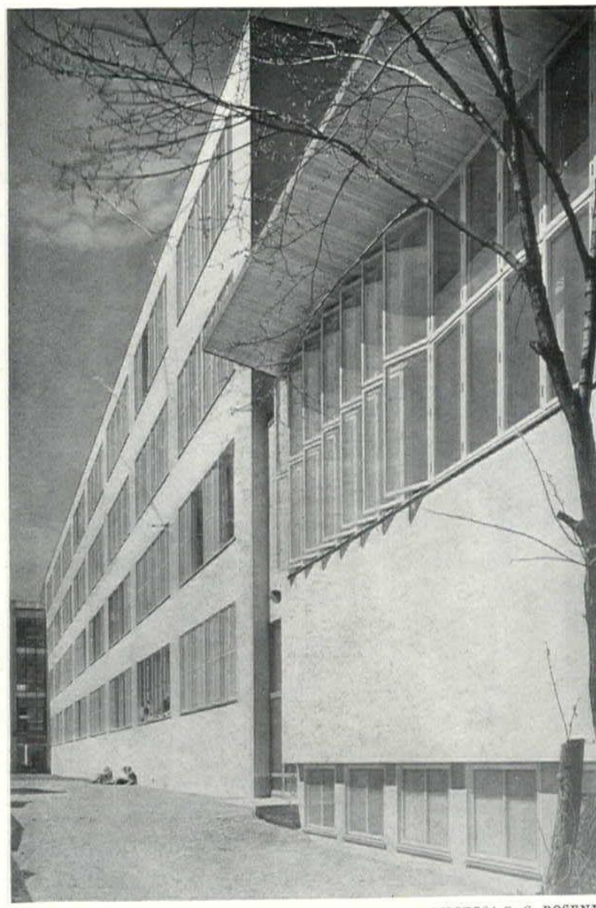
PHOTO: C. G. ROSENBERG



n the past few years the architecture of Scandinavia has been tudied with much interest, chiefly because of the development of a characteristic style, the result of their rational approach o the subject. An outstanding example of this new work is the Stockholm Secondary School for Girls, completed in 1935 from he plans of Ahrbom and Zimdahl. The commission was awarded s the result of a competition between 77 architects in 1932. The site is in a residential quarter of the city. When the mmediate neighborhood is built up, the school will be well ituated in an open area surrounded by parks. North of the building, in a natural depression of the hillside, a stadium is being laid out. Intended for approximately 700 pupils, in two divisions, eight classrooms seating 35 each constitute the lower school; fifteen classrooms seating 30 each, with three reserve classrooms seating 15 each, constitute the upper school. The wo largest elements of the plan—the Auditorium and Gymnasium—are in separate wings, which allowed the architects to give them the special forms suited to their special purposes.

SECONDARY SCHOOL, STOCKHOLM, SWEDEN
AHRBOM AND ZIMDAHL, ARCHITECTS



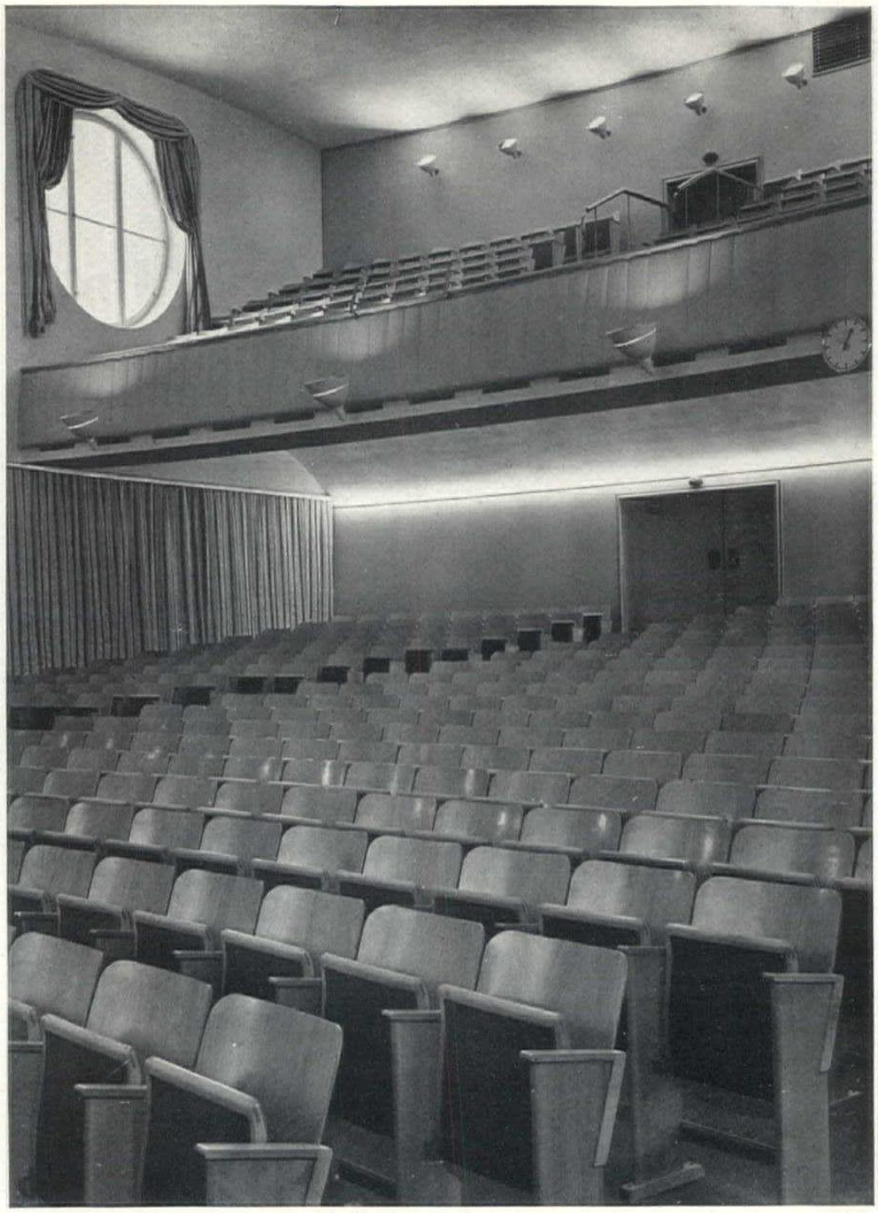


PHOTOS: C. G. ROSENI

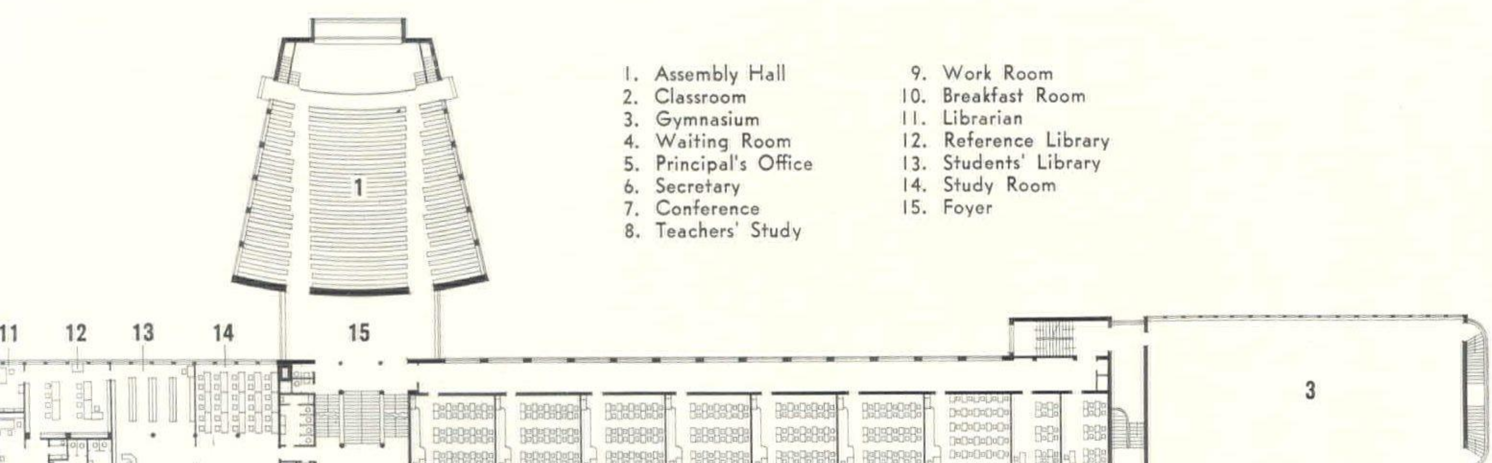
The building is approached at right angles to the main entra
through a wide covered portico used as a play area in incler
weather. The outer walls of the building are of reinfo
concrete, with a continuous outer insulating layer of ten c
meters of aerated concrete block placed in the forms before
concrete was poured. Outer wall surfaces are rough plaste
Exterior woodwork is of teak. An outside balcony opening
the administration rooms surveys the entire school playgro

1. Organ
2. Storage
3. Coal Storage
4. Oil Storage
5. Fan Room
6. Boiler Room
7. Pump Room
8. Cafeteria
9. Kitchen
10. Living Room
11. Bedroom
12. Club Room
13. Showers
14. Dressing Room
15. Teachers' Room
16. Physician
17. Tools

SECONDARY SCHOOL, STOCKHOLM, SWEDE



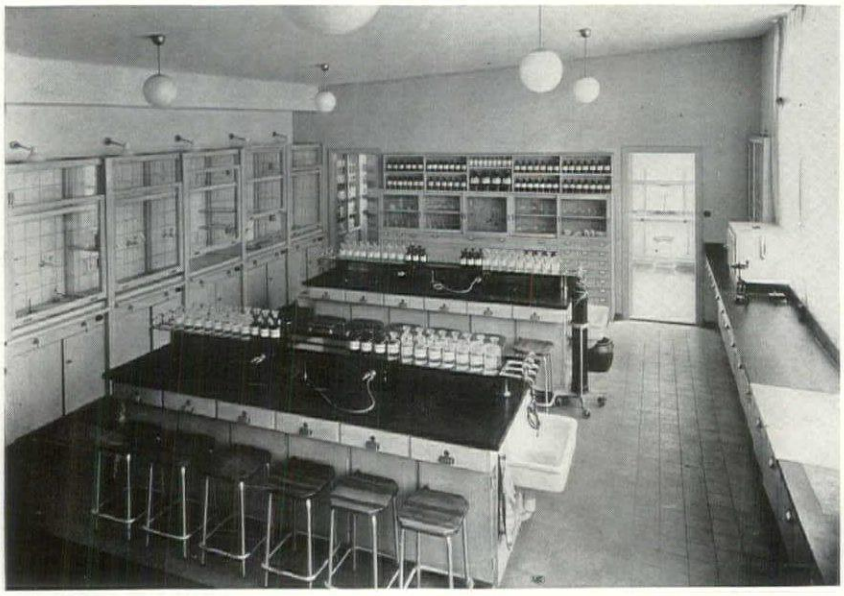
main stairway separates the upper school from the lower ool by the use of the intermediate levels for classrooms. The crete columns are sheathed in metal, enameled a deep blue. ads are of gray limestone. The auditorium, at the head of the half flight of stairs, accommodates 872, including balcony. ceiling is supported by two great arc-girders, half para- c in form, and revealed on the exterior. At the back of the ge the organ pipes are silhouetted against a glass wall.



1. Assembly Hall
2. Classroom
3. Gymnasium
4. Waiting Room
5. Principal's Office
6. Secretary
7. Conference
8. Teachers' Study
9. Work Room
10. Breakfast Room
11. Librarian
12. Reference Library
13. Students' Library
14. Study Room
15. Foyer

SECOND FLOOR

HRBOM AND ZIMDAHL, ARCHITECTS



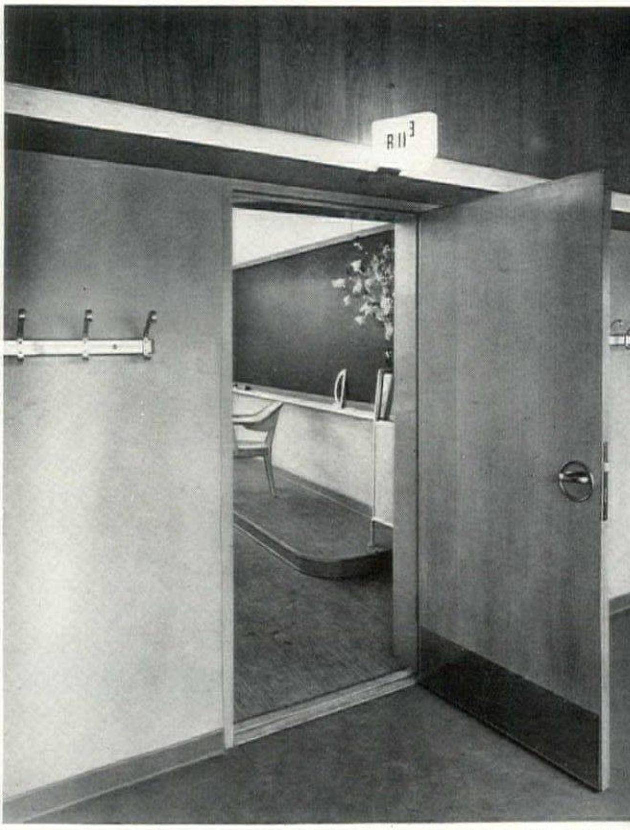
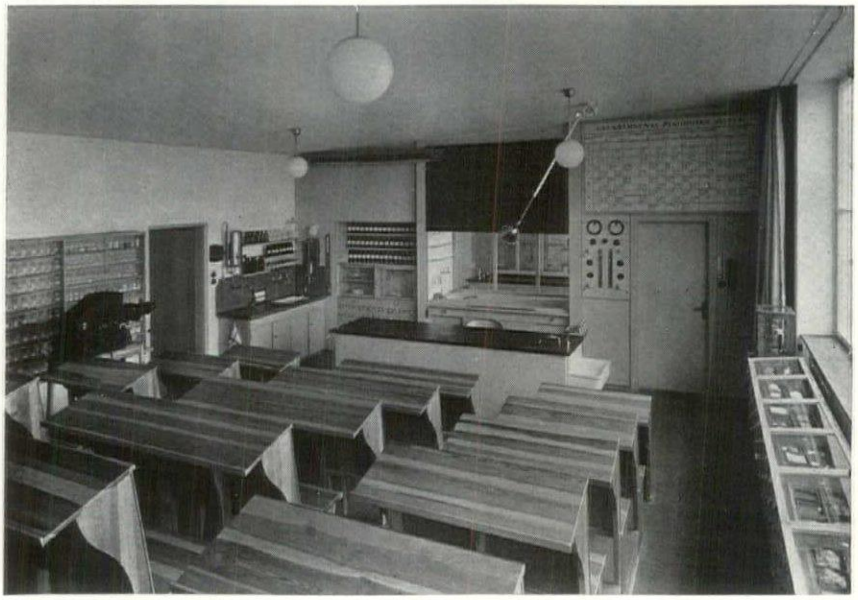


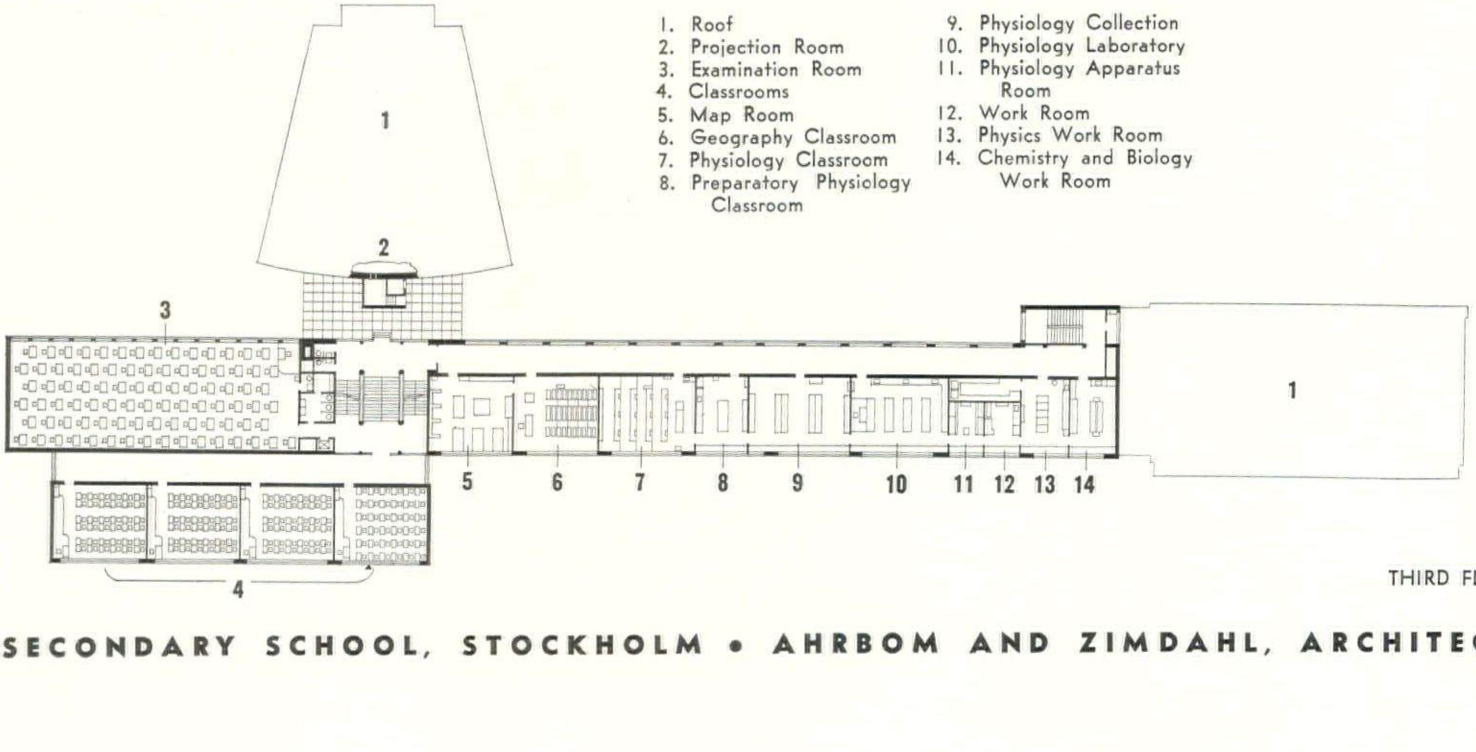
PHOTO: C. G. ROSENBE



PHOTOS: MAGNUSON & SVENSSON

Heating pipes are carried in an accessible housing panel above t corridor doors. The panel is faced with oak plywood, and t corridors of the various floors are differentiated by colors. In t chemical laboratory, the number of fume hoods and storage cal nets is noteworthy. In the chemistry lecture room the blackboa can be raised in its frame so that demonstrations set up in t adjoining laboratory may be discussed in lectures by the instructo The sloping roof of this section of the building is here frankly e pressed on the interior.

1. Roof
2. Projection Room
3. Examination Room
4. Classrooms
5. Map Room
6. Geography Classroom
7. Physiology Classroom
8. Preparatory Physiology Classroom
9. Physiology Collection
10. Physiology Laboratory
11. Physiology Apparatus Room
12. Work Room
13. Physics Work Room
14. Chemistry and Biology Work Room

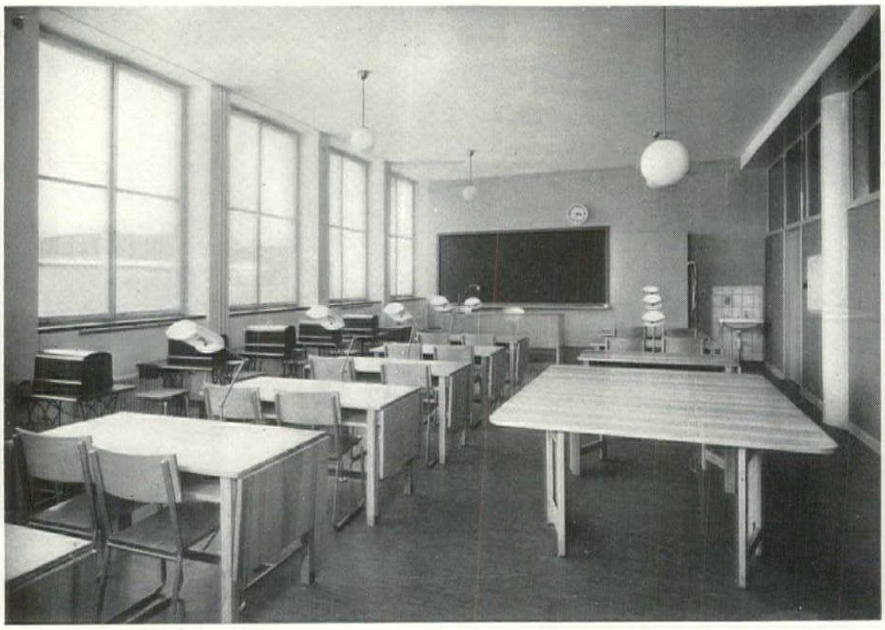


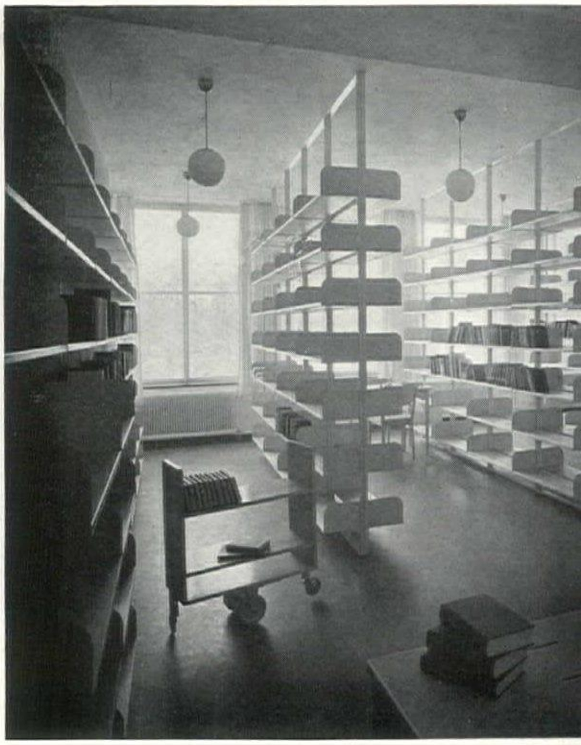
THIRD FLOO

SECONDARY SCHOOL, STOCKHOLM • AHRBOM AND ZIMDAHL, ARCHITECT

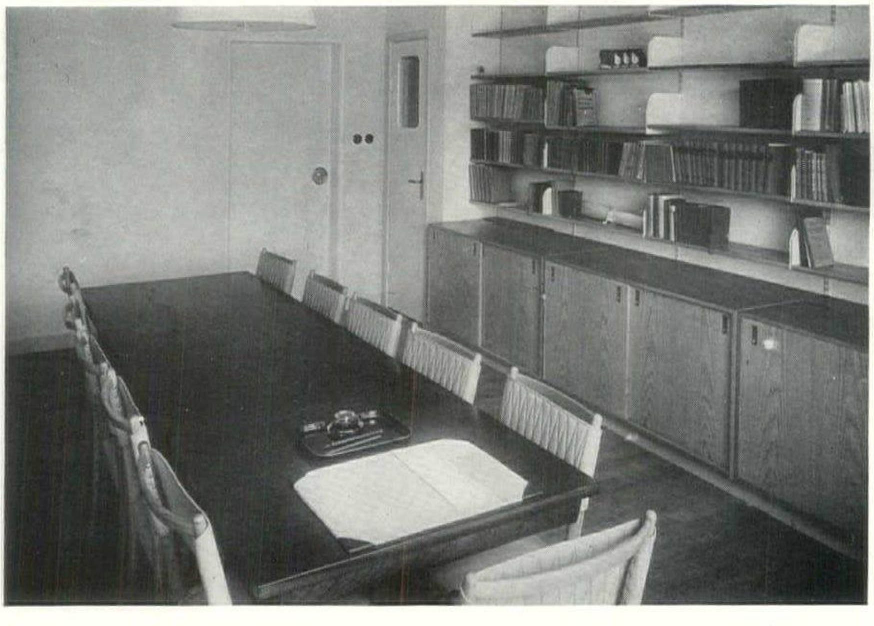
HOTOS: E. HOLMEN

he typical classrooms have continuous unilateral lighting ith the tops of the windows flush with the ceiling. A urtain track allows ease of shading. The detached desks nd chairs are of pine with metal tubing supports. The eacher's desk rests on a small platform, slightly raised bove the rest of the room. The floors in all the class-ooms are covered with linoleum. The biology lecture room of the amphitheater type, and is provided with both ansparent and opaque curtains which allow the use of projector for illustrated lectures.





The sewing and dressmaking room is most complete and af a wide range of activity. The corridor partition is faced cork to allow the exhibition of student work, and includes soms which light the corridor beyond. The physics labora is equipped with furniture of pine, rubbed with a thin coa white lead for preservative purposes. This method allows natural grain of the wood to show through. The teachers' ference room adjoins their meeting room, and is well supp with shelves and cabinets. The furniture, throughout the e building, was designed by the architects. The library stack consists of standard, adjustable shelves. A mahogany sc divides this end of the room from the reading tables, all trolled from the desk in the foreground.



SECONDARY SCHOOL, STOCKHO
AHRBOM AND ZIMDAHL, ARCHITEC

THE DESIGN OF SCHOOL LIGHTING

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HAT CONSTITUTES GOOD LIGHTING?

T is sometimes stated that the efficiency of a lighting system is never adequately ex- essed in the narrow sense of 'so many foot- ndles per watt per square foot,' but should gauged rather by the all-around satis- ctory character of the system. Every re- ement is generally a compromise with iciency in the strict sense, consequently the iciency of a lighting system is often re- ced to gain comfortably diffused light or pleasing appearance. This is an accept- le viewpoint but not an excuse for in- iciency and waste that might be avoided intelligent engineering design. Unless eing requirements are fully met, the major rpose of a lighting system is defeated and amount of refinement can make up for s deficiency.

The presence of direct or reflected glare is e principal offender in the achievement of ecified standards of footcandles and satis- ctory comfort factors. Direct glare is the ost frequent and serious cause of bad hting. It results, among other things, om unshaded or inadequately shaded light urces located within the field of vision, or om too great a contrast between the bright ht source and a dark background. Direct are can be avoided by the proper choice d location of reflecting and diffusing uipment—in classrooms, for example, by e use of indirect or semi-indirect lumin- es.

Reflected glare comes from polished ob- cts, such as encountered in machining etal parts, inspection of flat tinplate and ner shiny surfaces; in the classroom, from ss top or shiny varnished desks or from ossy paper and paint. It is sometimes im- ssible to change the character of work or ture of the seeing task in order to avoid ese potential reflections, but they can be nimized by (1) properly shielding the ht source, (2) specifying a source of such nensions that it is of low brightness or) by locating it in such a manner that ost of the reflection is away from the es.

Every work interior should have the umination throughout the room so propor- ned as to reduce severe brightness con- sts. In this respect proper painting of ling, walls, and columns, as well as the lor and finish of machinery, equipment and rnishings are important allies in producing comfortable seeing conditions. The basis for this is not only the obvious effect of transforming a dingy, gloomy atmosphere into one of cheerfulness and alertness, but concerns a well founded principle of eye comfort. Avoidance of frequent changes in both pupillary and retinal adaptation to changes in brightness minimizes eyestrain which may cause headaches or other manifestations of eye abuse. Furthermore, such changes in brightness are probably even more serious from the psychological viewpoint since they represent powerful factors of distraction. These facts necessitate the specification of a basic general lighting system supplemented by additional localized lighting where seeing tasks are severe.

DESIGN PROCEDURE

The procedure for the proper design of general lighting systems involves five principal steps:

1. A knowledge of the characteristics of the various types of lighting systems available, and the footcandle level required.
2. Selection of the lighting equipment from the standpoint of efficiency, comfort, flexibility, ease of maintenance, etc.
3. Location of outlets to provide substantially uniform illumination throughout the room.
4. Computation of lamp size necessary to provide the footcandles of illumination desired.
5. Provision for adequate wiring to insure future capacity, convenient operation, and control.

FIRST STEP

Lighting Systems — Standards of Illumination

Lighting systems may be grouped into four types: Direct, Semi-Direct, Semi-Indirect, and Indirect. The general characteristics of any system prevail even though details of equipment, design, and installation may vary considerably.

From the standpoint of conservation of vision and general efficiency the illumination in class and other work rooms should not fall below certain minimum values. In halls, stairways, passages to exits, etc., lighting is imperative for safety. Economic and engineering aspects, past practice, and illumination values below which visual tasks definitely affect the eye detrimentally, are

FIGURE 1

INDIRECT

90 to 100% luminaire output upward

Characterized by subdued atmosphere since practically all of the light is diffusely reflected from ceiling areas. Permits a wide range of installation technique from simple suspended or portable luminaires to built-in concealed sources in the form of coves, coffers, and wall boxes.

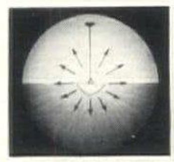


FIGURE 2

SEMI-INDIRECT

60 to 90% luminaire output upward

Defined as any system in which some light is transmitted directly downward but over half of the emitted light is upward, its utilization depending largely upon its reflection from the ceiling. Luminaires of good design should be of such density and diffusion that the surface brightness of the bowl will not exceed 500 foot-lamberts.

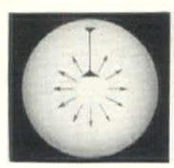


FIGURE 3

SEMI-DIRECT

40 to 90% luminaire output downward

This classification refers to systems where the predominant light on horizontal working surfaces comes from the lighting units but where there is also considerable contribution by reflection from the ceiling. Such units direct light out at all angles and are likely to be too bright for schools unless oversize globes are used and equipped with parchment shades to reduce the brightness toward the eye.

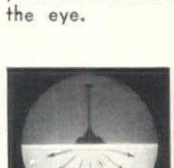


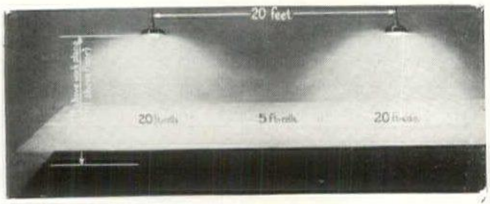
FIGURE 4

DIRECT

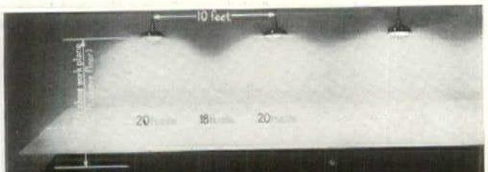
90 to 100% luminaire output downward

Defined as any system in which substantially all of the light on the working surfaces comes directly from the lighting units. Direct lighting methods may range from spotlight types to extended light source areas such as large glass panels and skylights. Though it is most efficient to provide high levels of illumination with open type reflectors, it is difficult to do so without glare unless considerable care is taken in locating and shielding such sources. Large area sources of low brightness and good diffusion approach the characteristics of indirect lighting.

FIGURE 5. LOCATION OF OUTLETS FOR UNIFORM LIGHTING



Units spaced too far apart for their height furnish very uneven illumination, in this case a 4 to 1 variation, and work positions midway between units will be inadequately lighted; harsh shadows will also result. The remedy is to mount the units higher, or, if that is impossible, to space them closer, as illustrated below.



It will be noted that if the permissible ratio between spacing and mounting height is not exceeded, uniform illumination will be produced. Note also the overlapping of light which serves to eliminate shadows as the units are brought closer together.

TABLE I — STANDARDS OF ILLUMINATION FOR SCHOOLS

Location	Footcandles * General Lighting	Footcandles * Supplementary Lighting
Art and Drawing Rooms	30-50	"A"
Auditoriums	10	
Cafeterias	10	
Classrooms	20	20
Corridors - Stairways	5	
Drafting Rooms	30-50	
Gymnasiums	20	
Laboratories	15	30-50
Lecture Rooms	10	20
Libraries	20	30-50
Locker Rooms Toilets	5	
Offices	20	
Manual or Shop Training	20	"B"
Sewing Classrooms	20	"C"
Sight-Saving Classrooms	30-50	30-50
Home or Dormitory Study	20	

"A"— 50 100 footcandles from a concentrating industrial or theatrical spotlight.
"B"— 50 - 100 footcandles from an industrial supplementary lighting unit.
"C"— 50 100 footcandles from a closely mounted supplementary lighting unit.
* — These are average in service values. Initial illuminations should be 70 to 100% higher

factors which have been taken into consideration in the adoption of the values given in Table I as minimum illuminations. Scientific and practical tests indicate that much higher illuminations should be provided for maximum eye benefit.

SECOND STEP

Selection of Lighting Equipment

The selection of a type of lighting is largely a matter of suitability for the particular kind of room involved. For example, indirect lighting is especially desirable for use in classrooms, libraries, study halls, offices, drafting rooms and similar areas; semi-indirect lighting is satisfactory for such areas as laboratories, auditoriums, cafeterias; semi-direct lighting is suitable for kitchens, corridors, stairways, wash rooms, locker rooms, basement storage areas, for supplementary high-lighting on demonstration and laboratory tables, cafeteria counters, etc., and also for gymnasiums to supplement other more general lighting. In the choice of the general type of lighting system, as well as in the selection of competitive equipment of a given type, the following questions are pertinent:

1. Will it be comfortable without annoyance from direct glare?

Direct glare is difficult to appraise quantitatively since acceptable brightness limit depend upon the character of installation an the seeing requirements. With indirect o semi-indirect equipment direct glare is mini mized.

2. Will it minimize reflected glare?

Bright highlights reflected from shiny o polished furniture, desks, or counter-tops, o material worked on, cause discomfort and ar distracting. Indirect and semi-indirect light ing units usually cause little reflected glare Well shielded direct lighting units may b free from direct glare or uncomfortable an distracting reflected glare.

3. Is it reasonably efficient for the pu pose?

Broadly, efficiency is measured by overa satisfactoriness or achievement of effec Competitively, the problem is always th balance between initial cost and operatin expense over a reasonable period and in volves specific and comparative cost an efficiency figures.

4. Will vertical and oblique surfaces b well lighted?

Supplementary lighting will generally b necessary where vertical planes, such a blackboards, need predominant lighting Where dependence is placed on genera lighting, as is unfortunately the case in mos schools, units giving wide angle distributio will produce a much higher illumination o vertical or oblique surfaces than will mor concentrating types.

TABLE II — ALLOWABLE SPACING BETWEEN LIGHT SOURCES*

Ceiling Height (Or Height in the Clear)	Spacing Between Outlets: Usual	Spacing Between Outlets: Maximum (For Units at Ceiling)	Spacing Between Outside Outlets and Wall: Aisles or Storage Next to Wall	Spacing Between Outside Outlets and Wall: Desks, Workbenches, etc., Against Wall	Approximate Area per Outlet (At Usual Spacings)
(Feet)	(Feet)	Not more than		Not more than	(Square Feet)
8	7	7½	Usually	3	50-60
9	8	8		3	60-70
10	9	9	one-half	3½	70-85
11	10	10½		3½	85-100
12	10-12	12	actual	3½-4	100-150
13	10-12	13		3½-4½	100-150
14	10-13	15	spacing	4-5	100-170
15	10-13	17		4-5	100-170
16	10-13	19	between	4-6	100-170
18	10-20	21		4-6	100-400
20 and up	18-24	24	units	5-7	300-500

TABLE II-A — MOUNTING HEIGHT OF LIGHT SOURCES

Direct and Semi-Direct Lighting Units: Actual Spacing Between Units	Distance of Units from Floor Not Less Than	Desirable Mounting Height in Industrial Interiors	Desirable Mounting Height in Commercial Interiors	Semi-Indirect and Indirect Lighting: Actual Spacing Between Units	Recommended Suspension Length (Top of Bowl to Ceiling)
(Feet)	(Feet)			(Feet)	(Feet)
7	8	12 feet above floor if possible—to avoid glare, and still be within reach from stepladder for cleaning.	The actual hanging height should be governed largely by general appearance, but particularly in offices and drafting rooms, the minimum values shown in the second column should not be violated.	7	1-3
8	8½			8	1-3
9	9			9	1-3
10	10			10	1½-3
11	10½			11	2-3
12	11			12	2-3
14	12½	Where units are to be mounted much more than 12 feet it is usually desirable to mount the units at ceiling or on roof trusses.		14	2½-4
16	14			16	3-4
18	15			18	3-4
20	16			20	4-5
22	18			22	4-5
24	20			24	4-6

* **Concentrating Louvered Downlights or Lens Plates** provide varying degrees of concentration. The spacing between units to provide uniformity over a general area, or lengthwise of a counter or work table should be regulated by the actual distribution characteristics of the unit. In general, the usual purpose is fulfilled by a spacing about one-third to one-half the values given in Table 2.

Semi-indirect and Indirect Systems diffuse the light widely from the ceiling as a secondary source of large area and the spacing between units may be about two feet greater than indicated in Table 2.

Will there be harsh shadows?

adows are an important consideration in afting rooms, shops and laboratories ere equipment is likely to cast concealing confusing shadows. Shadows can be nimized by indirect lighting, by large area fusing sources, or by proper location of its so that the illumination at any given int is contributed to by several sources.

Is it easy to clean and maintain?

ghting systems depreciate quickly due to t and dust, and lamp replacements are evitable. An extremely important con- leration is that the waste of electric energy e to depreciation is often greater than the st of maintenance that would prevent the ste. Types of systems vary widely. Be- een competitive equipments, ease of main- ance should receive high ranking.

IRD STEP

cation of Outlets for Uniform Lighting

In planning a general lighting system the n is to provide a substantially uniform vel of illumination throughout the room. is eliminates spottiness, and dark corners, d makes the entire area equally suitable as work space.

The number of outlets to provide for any ven area is determined by the maximum owable spacing between lighting units ich is in turn regulated by their height ove the floor.

Strictly speaking, the spacing for uniform umination on the work depends upon the ight of the light source above the surface be illuminated. The spacing may, how- er, for practical purposes be considered a nction of the mounting height of the lamps ove the floor, since the work plane (sur- ce to be illuminated) is usually of the order 30″ above the floor and so may be con- lered a constant for the great majority of ses. In general, for direct and semi-direct hting, a spacing in feet which does not bstantially exceed this mounting height eight of lamps above the floor) will result reasonably uniform illumination. Since r indirect and semi-indirect lighting the iling serves as the effective light source, r these types of lighting uniform illumina- on should result as long as the spacing does t exceed the ceiling height.

The proper spacing of lighting units is not fluenced by the size or type of lamp used, t is regulated by the distribution char- teristics of the reflector.

Table II gives the allowable spacing ap- icable to all common types of reflecting and ffusing equipment employed for general umination purposes. Where less than the aximum permissible spacing is employed, e units may be mounted lower if desired t in no case should the mounting height less than given in Table IIA for the tual spacing used.

TABLE III — ROOM INDEX

(Classification of rooms according to their proportions)

		CEILING HEIGHT—FEET										
For Indirect Lighting		9 and 9½	10 to 11½	12 to 13½	14 to 16½	17 to 20	21 to 24	25 to 30	31 to 36	37 to 50		
		MOUNTING HEIGHT ABOVE FLOOR—FEET										
For Direct Lighting		7 and 7½	8 and 8½	9 and 9½	10 to 11½	12 to 13½	14 to 16½	17 to 20	21 to 24	25 to 30	31 to 36	37 to 50
Room Width (Feet)	Room Length (Feet)	ROOM INDEX										
9 (8½–9)	8-10	H	I	J	J							
	10-14	H	I	I	J							
	14-20	G	H	I	J	J						
	20-30	G	G	H	I	J	J					
	30-42	F	G	H	I	J	J	J				
	42-up	E	F	G	H	I	J	J				
10 (9½–10½)	10-14	G	H	I	J	J						
	14-20	G	H	I	J	J	J					
	20-30	F	G	H	I	J	J					
	30-42	F	G	G	H	I	J	J				
	42-60	E	F	G	H	I	J	J				
	60-up	E	F	F	H	H	I	J				
12 (11–12½)	10-14	G	H	I	I	J	J					
	14-20	F	G	H	I	J	J					
	20-30	F	G	G	H	I	J	J				
	30-42	E	F	G	H	I	J	J				
	42-60	E	F	F	G	H	I	J				
	60-up	E	E	F	G	H	I	J				
14 (13–15½)	14-20	F	G	H	H	I	J	J				
	20-30	E	F	G	H	I	J	J				
	30-42	E	F	F	G	H	I	J	J			
	42-60	E	E	F	F	H	I	J	J	J		
	60-90	D	E	E	F	G	H	J	J	J		
	90-up	D	E	E	F	F	G	I	J	J		
17 (16–18½)	14-20	E	F	G	H	I	J	J				
	20-30	E	F	F	G	H	I	J				
	30-42	D	E	F	G	H	H	J	J	J		
	42-60	D	E	E	F	G	G	I	J	J	J	
	60-110	D	E	E	F	G	G	I	J	J	J	
	110-up	C	D	E	E	F	G	H	I	J	J	
20 (19–21½)	20-30	D	E	F	G	H	I	J	J			
	30-42	D	E	E	F	G	H	I	J	J		
	42-60	D	D	E	E	F	G	I	J	J	J	
	60-90	C	D	E	E	F	G	H	J	J	J	
	90-140	C	D	D	E	F	F	H	I	I	J	J
	140-up	C	D	D	E	F	F	H	H	I	J	J
24 (22–26)	20-30	D	E	E	F	G	H	I	J	J		
	30-42	C	D	E	F	G	G	I	J	J		
	42-60	C	D	D	E	F	G	H	I	J	J	
	60-90	C	D	D	E	F	F	H	I	J	J	J
	90-140	C	C	D	E	E	F	G	H	I	J	J
	140-up	C	C	D	E	E	F	G	H	I	I	J
30 (27–33)	30-42	C	D	D	E	F	G	H	I	J	J	
	42-60	C	C	D	D	F	F	H	H	I	J	
	60-90	B	C	C	D	E	F	G	H	I	J	J
	90-140	B	C	C	D	E	E	F	G	H	I	J
	140-180	B	C	C	D	E	E	F	G	H	I	J
	180-up	B	C	C	D	E	E	F	G	H	I	J
36 (34–39)	30-42	B	C	D	E	F	F	H	I	I	J	
	42-60	B	C	C	D	E	F	G	H	I	J	J
	60-90	A	C	C	C	E	E	F	H	H	J	J
	90-140	A	B	C	C	D	E	F	G	H	I	J
	140-200	A	B	C	C	D	E	F	F	G	H	I
	200-up	A	B	C	C	D	E	F	F	G	H	I
42 (40–45)	42-60	A	B	C	C	E	F	G	H	I	I	J
	60-90	A	B	B	C	D	E	F	G	H	I	J
	90-140	A	B	B	C	D	D	E	F	G	H	J
	140-200	A	A	B	C	D	D	E	F	G	H	I
	200-up	A	A	B	C	D	D	E	F	F	G	I
50 (46–55)	42-60	A	A	B	C	D	E	F	G	H	I	J
	60-90	A	A	B	C	C	D	F	F	G	H	J
	90-140	A	A	A	C	C	D	E	F	F	G	I
	140-200	A	A	A	C	C	D	E	E	F	G	I
	200-up	A	A	A	C	C	D	E	E	F	G	H
60 (56–67)	60-90	A	A	A	B	C	D	E	F	G	H	I
	90-140	A	A	A	B	C	C	D	E	F	G	H
	140-200	A	A	A	B	C	C	D	E	E	F	H
	200-up	A	A	A	B	C	C	D	E	E	F	H
75 (68–90)	60-90	A	A	A	A	B	C	D	E	F	G	I
	90-140	A	A	A	A	B	C	D	E	F	F	H
	140-200	A	A	A	A	B	B	C	D	E	F	G
	200-up	A	A	A	A	B	B	C	D	E	F	G
90 or more	60-90	A	A	A	A	B	C	D	E	F	G	H
	90-140	A	A	A	A	A	B	C	D	E	F	G
	140-200	A	A	A	A	A	B	C	D	E	F	G
	200-up	A	A	A	A	A	B	C	C	D	E	F

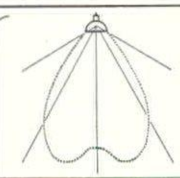
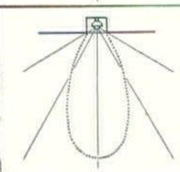
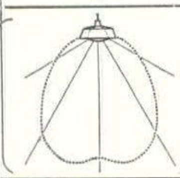
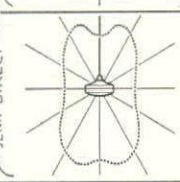
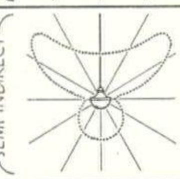
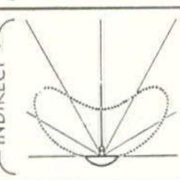
FOURTH STEP

Computation of Lamp Size

In order to specify the lamp size required to provide the footcandles desired, it is necessary to determine the percentage of light emitted by the lamp that is useful on the working level. This percentage is called the "Coefficient of Utilization." A simple "watts per square foot" specification is unreliable unless applied with the benefit of experienced judgment of all the various factors which affect the result. The principal variables are discussed briefly below and each is taken into account in arriving at the Coefficient of Utilizaiton.

ROOM INDEX: Table III classifies room proportions into ten classes as indicated by letters A to J. This serves merely as a reference index to be applied in Table IV for the particular type of reflecting equipment used. This factor of room size and proportion may influence the Coefficient of Utilization from 100 to nearly 300 per cent, depending on the type of reflecting equipment.

TABLE IV — COEFFICIENTS OF UTILIZATION

TYPICAL EQUIPMENT TYPE OF DISTRIBUTION, AND EFFICIENCY CLASSIFICATION	Ceiling	75%			50%			30%		Depreciation Factor Average Conditions	Factors Influencing the Selection of the Lighting Equipment
	Walls	50%	30%	10%	50%	30%	10%	30%	10%		
	Room Index	COEFFICIENTS OF UTILIZATION									
 HIGH BAY OPEN REFLECTORS Distribution Downward -70%	J	.40	.38	.36	.39	.38	.36	.39	.36	.70	**Light output range**—68 to 75% **Source brightness**—low normal angles of view because of large shielding angl **F.C. on Vertical**—fair. **Reflected glare**—likely to be seve because of reflected source brightness. ¶ Enameled reflecto of this shape do not produce a concentrated distribution ar should not be confused with high bay reflectors.
	I	.48	.46	.46	.47	.46	.45	.46	.43		
	H	.51	.51	.50	.50	.50	.49	.50	.48		
	G	.55	.54	.54	.54	.52	.52	.52	.51		
	F	.58	.56	.55	.55	.55	.54	.55	.53		
	E	.60	.59	.58	.59	.58	.57	.57	.56		
	D	.64	.61	.60	.62	.60	.60	.60	.59		
	C	.65	.63	.61	.63	.62	.60	.60	.60		
	B	.65	.64	.63	.64	.62	.62	.62	.61		
	A	.66	.65	.64	.64	.63	.62	.62	.62		
DIRECT  PRISMATIC GLASS OR POLISHED METAL REFLECTORS Distribution Downward-30%	J	.17	.16	.16	.17	.16	.16	.17	.15	.70	**Light output range**—27 to 35%—depending on adjustment type of louver used. Specular surface parabolic reflecto are essential. **Source brightness**—low. **F.C. on Vertical**—e tremely low. Care must be taken in location of units avoid reflected glare from polished surfaces. ¶ Adaptab to many applications in combination with a fair proporti of indirect lighting. Lens plate units designed for wid distribution will have a higher output and fall in Group
	I	.21	.20	.20	.20	.20	.19	.20	.19		
	H	.22	.22	.21	.22	.21	.21	.21	.21		
	G	.24	.23	.23	.23	.22	.22	.22	.22		
	F	.25	.24	.24	.24	.23	.23	.23	.23		
	E	.26	.25	.25	.25	.25	.24	.25	.24		
	D	.27	.26	.26	.26	.26	.26	.26	.25		
	C	.28	.27	.26	.27	.26	.26	.26	.26		
	B	.28	.27	.27	.27	.27	.26	.26	.26		
	A	.28	.28	.27	.28	.27	.27	.27	.26		
 LARGE AREA DIFFUSING REFLECTORS Distribution Downward-60%	J	.29	.24	.21	.28	.24	.21	.23	.21	.70	**Light output range**—The standard Glassteel 60% down, 7 up; the silvered bowl lamp and reflector 60 to 65% dow no upward light; the shaded enclosing globe 50% down, 20 up, coefficients of utilization all about the same. **Sour brightness**—relatively low. **F.C. on Vertical**—moderately hig **Reflected glare**—suitably low for most industrial requir ments. ¶ A group of equipment essential to high quality i dustrial lighting.
	I	.36	.32	.29	.35	.31	.28	.30	.28		
	H	.39	.36	.33	.38	.35	.33	.34	.32		
	G	.43	.39	.36	.41	.38	.36	.37	.35		
	F	.45	.42	.39	.43	.40	.38	.39	.38		
	E	.49	.46	.44	.47	.45	.43	.43	.42		
	D	.53	.50	.47	.51	.48	.46	.47	.46		
	C	.54	.52	.49	.52	.50	.48	.48	.47		
	B	.57	.55	.53	.55	.52	.51	.51	.50		
	A	.59	.56	.54	.56	.54	.52	.52	.51		
SEMI-DIRECT  WHITE GLASS ENCLOSING GLOBE Distribution Upward 35% Downward 45%	J	.24	.20	.17	.22	.18	.16	.16	.14	.75	**Light output range**—80 to 85% for the best quality diffusi glass; 65 or 70% for dense molded glass. **Source brightn**—moderate, controllable within limits by globe size or lu inous area. **F.C. on Vertical**—fairly high. **Reflected glare** fairly low. ¶ This group typifies many different contours white glass enclosing globes. Elongated or stalactite glob give better illumination on vertical surfaces but with mo glare and 10% lower coefficients of utilization.
	I	.30	.25	.23	.27	.23	.20	.21	.19		
	H	.34	.29	.26	.30	.26	.24	.24	.22		
	G	.37	.33	.30	.33	.29	.27	.27	.25		
	F	.41	.36	.32	.36	.32	.29	.29	.27		
	E	.45	.41	.37	.40	.36	.33	.32	.30		
	D	.49	.44	.40	.43	.39	.36	.35	.33		
	C	.52	.47	.43	.45	.41	.38	.37	.35		
	B	.55	.51	.47	.48	.44	.42	.40	.38		
	A	.57	.53	.50	.50	.46	.44	.41	.40		
SEMI-INDIRECT  ENCLOSED TRANSLUCENT BOWLS Distribution Upward - 60% Downward - 20%	J	.16	.12	.09	.12	.09	.07	.06	05	.70	**Light output range**—75 to 85%—downward light 15 to 30 **Source brightness**—usually satisfactory, should not exce 500 foot-lamberts for office and school applications. **F.C. Vertical**—somewhat less than semi-direct units. **Reflect glare**—inherently low. ¶ Enclosed units have the obvic advantage of slower depreciation and ease of maintenanc
	I	.20	.16	.13	.16	.12	.10	.09	.07		
	H	.24	19	.16	.18	.14	.12	.11	.08		
	G	.27	.23	.19	.21	.17	.14	.12	.10		
	F	.30	.25	.21	.23	.19	16	.14	.12		
	E	.35	.30	.26	.27	.22	.20	.17	.14		
	D	.38	.33	.29	.29	.25	.22	.19	.17		
	C	.41	.36	.32	.31	.27	.24	.21	.19		
	B	.46	.41	.37	.34	.31	.29	.23	.21		
	A	.48	.44	.40	.37	.33	.31	.25	.23		
INDIRECT  SHALLOW BOWL REFLECTORS AND SHIELDS Distribution Upward -75% Downward - 0%	J	.15	.12	.10	.10	.08	.07	.04	.04	.65	**Light output range**—70 to 80%. Indirect lighting inheren receives superior ranking from the standpoint of sour brightness, reflected glare, shadows and other quality consi erations. Wide angle distribution makes for a more unifor ceiling brightness but results in a slightly lower utilizati in small rooms than units of equal output whose distributi is strongly upward.
	I	.19	.15	.14	.13	.10	.09	.06	.05		
	H	.22	.18	.16	.14	.12	.10	.08	.06		
	G	.25	.21	.18	.17	.14	.13	.08	.08		
	F	.27	.24	.21	.19	.16	.14	.09	.08		
	E	.31	.27	.25	.21	.18	.16	.10	.10		
	D	.34	.30	.28	.22	.20	.19	.12	.11		
	C	.36	.33	.30	.24	.22	.20	.13	.12		
	B	.40	.37	.34	.26	.25	.23	.14	.14		
	A	.42	.39	.37	.28	.26	.25	.16	.14		

REFLECTOR CHARACTERISTICS: The selection of reflecting equipment depends not only upon its efficiency but also upon suitable distribution of light. Coefficients of Utilization are computed from the candlepower distribution curves in accordance with basic experimental data. It will be quite evident that a narrow or concentrating distribution will direct the light strongly downward, keeping less of it from striking the walls and ceiling than will a broad distribution. In the former case the influence of the size of the room or the color of the walls and ceiling on the utilization is much less than for the broad distribution where a large proportion of light strikes the walls and ceiling from which only a part is reflected to working surfaces.

INTERIOR FINISHES: Coefficients of Utilization also co-ordinate the effect of interior finish on lighting results, and the table embraces a range of general ceiling and wall reflection conditions. The influence of the interior finish is least important with direct reflectors, becoming increasingly influential with semi-direct lighting and a major factor in lighting efficiency with semi-indirect and indirect lighting. The net reflection value of even light walls seldom exceeds 50% when allowance is made for wall furnishings and door and window openings. In glass enclosed rooms or buildings, the effective wall reflection is practically negligible. For school areas generally, classrooms and other rooms where indirect and semi-indirect lighting is to be used particularly, the ceiling should reflect at least 75% of the light which strikes it; higher values are obtainable and desirable. The walls, however, are directly in the line of vision and a tint with a reflection factor of not over 60% should be used. There is a tendency to use cool colors for the classroom walls.

MAINTENANCE FACTOR: Allowance must a ways be made for depreciation of lamp reflectors, and reflecting surfaces so th desired footcandle levels may be maintaine in service as compared with initial value Lamps average about 85 to 90% of the initial lumen output and the inevitable fil of dust that collects quickly on reflectin surfaces accounts for another 10 to 20 normal depreciation even with a reasonab cleaning schedule. The average illuminatio maintained in service will, under averag conditions, be of the order of 70% of th initial value, or .70 when expressed as maintenance factor. In some instances, pa ticularly with direct lighting equipme where there is little dust and smoke in th atmosphere, a higher maintenance value ma be obtained, but in the case of open indire equipment, cove lighting, skylights and sim lar types of installations hard to reach an likely to be neglected, a lower maintenanc ctor should be assumed, as indicated in ble IV.

Calculations:

a. Determine the Room Index (Table III)

b. Knowing the reflection factor of the ling and walls, determine the Coefficient Utilization (Table IV) corresponding to e Room Index for the type of luminaire osen.

c. Determine what depreciation factor to e (Table IV).

d. Determine area in sq. ft. per outlet.

e. Substitute in formula found at top of ble V to determine lamp lumens required r outlet.

f. Select lamp giving necessary lumens om Table VI.

g. Check, if desired, by using formula at ttom of Table V to determine footcandles ich will be obtained with lamp chosen.

FTH STEP

iring Recommendations

The National Electrical Code merely speies wiring conditions with regard to fire zard, with little consideration for economy operation. The size of wire for a lighting stallation may conform strictly to the Code d yet, because of lengths of circuit, proce excessive voltage drop with consequent efficient lamp performance and unsatisfacry lighting. Table VII gives wire sizes ich should be used to assure not more an a 2 volt drop for the indicated runs d currents.

On new or remodeling jobs where actual attage to be installed is known, wiring ecifications should be based on this watge with capacity allowed for the next rger size lamps to be used in the future. general, double the capacity can be inalled initially at about one-third extra cost.

RANCH CIRCUITS FOR GENERAL ILLUMINAON (2 VOLTS MAXIMUM DROP PANELBOARD) OUTLETS): For 15-ampere circuits, the itial load per circuit should not exceed 000 watts with No. 12 minimum wire size to e used where length of run does not exceed) feet; No. 10 wire for runs between 50 nd 100 feet; No. 8 wire for runs between 00 and 150 feet.

For heavy duty lamp circuits (the Naonal Electrical Code permits 8 mogul socks, 40 amperes per circuit) 3000 watts with o. 8 wire for runs not exceeding 50 feet; o. 6 wire for runs of 50 to 100 feet; No. wire for runs from 100 to 150 feet. It recommended that panelboards be so loited that the length of run does not exceed 00 feet, if practical to do so.

ANELBOARDS: One spare circuit should be rovided for each five circuits used in the itial installation. Concealed branch ciruit conduit should be large enough for one dditional circuit for every five or less ciruits it contains.

PHOTO-ELECTRIC CELL CONTROL: For automatic photo-electric cell control of lighting, the inner and outer rows of outlets should be on separate circuits, with the manual switches installed in the classroom to control the circuits in the usual manner. Space provision for installation of remotely-controlled switches of suitable rating to carry the load involved should be made at or near the distribution panel. Provision should also be made for the required number of conductors running from the location of the light-sensitive element to the remotely-controlled switches.

If more than one room is to be controlled by the same light-sensitive element, the remotely-controlled switch may control the feeders supplying the branch circuits to the rooms. An alternative plan is to have a multiple-pole remotely-operated switch, each pole of which may control a branch circuit of a room, making is unnecessary to segregate any part of the distribution panel.

SERVICE AND FEEDERS (MAXIMUM FEEDER DROP—2 VOLTS): The carrying capacity of service wiring and feeders should be sufficient for the normal branch circuit load with no more than a 2-volt drop. Normal diversity of branch circuit load in many cases

TABLE V — COMPUTED ILLUMINATION VALUES

$$\text{Lamp Lumens Required per Outlet} = \frac{\text{Footcandles} \times \text{Area in Square Feet per Outlet}}{\text{Coefficient of Utilization} \times \text{Maintenance Factor}}$$

Or, computing as below, for lamps of various sizes:

$$\text{Footcandles} = \frac{\text{Lamp Lumens}^{*} \times \text{Coef. of Util.} \times \text{Maintenance Factor}}{\text{Area in Sq. Ft. per Lamp}}$$

*See Table VI

TABLE VI — LUMEN OUTPUT OF VARIOUS LAMP TYPES AND SIZES

The lumen outputs shown below apply only to lamps burned at rated voltage.

110-120-Volt Mazda Lamps			110-120-Volt Mazda Daylight
15 Watts.... 140 Lumens	1000 Watts. . 20700 Lumens		60 Watts..... 495 Lumens
25 Watts ... 260 Lumens	1500 Watts. . 33000 Lumens		100 Watts..... 990 Lumens
40 Watts... 440 Lumens	**220-240-Volt Mazda Lamps**		150 Watts..... 1650 Lumens
60 Watts.... 760 Lumens	25 Watts.... 215 Lumens		200 Watts..... 2210 Lumens
75 Watts.... 1065 Lumens	50 Watts.... 475 Lumens		300 Watts..... 3590 Lumens
100 Watts.... 1530 Lumens	100 Watts.... 1100 Lumens		500 Watts..... 6370 Lumens
150 Watts.... 2535 Lumens	200 Watts . . 2920 Lumens		**Mercury Lamps (Type H)**
200 Watts.... 3400 Lumens	300 Watts. . 4560 Lumens		85 Watts.... 3000 Lumens
300 Watts.... 5520 Lumens	500 Watts.... 8350 Lumens		250 Watts.... 7500 Lumens
500 Watts.. 9800 Lumens	750 Watts ... 13125 Lumens		400 Watts.... 16000 Lumens
750 Watts.. 14550 Lumens	1000 Watts 19000 Lumens		

TABLE VII — WIRE SIZE REQUIRED

Computed for Maximum of 2-Volt Drop on Two-wire, 120-Volt Circuits

Load per Circuit	Current 120-Volt Circuit	LENGTH OF RUN (Panel Box to Load Center)—Feet																	
Watts	Amps.	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200
500	4.2	14	14	14	14	14	14	12	12	12	12	12	12	10	10	10	10	10	10
600	5.0	14	14	14	14	14	12	12	12	12	10	10	10	10	10	10	10	8	8
700	5.8	14	14	14	14	12	12	12	10	10	10	10	10	10	8	8	8	8	8
800	6.7	14	14	14	12	12	12	16	10	10	10	10	8	8	8	8	8	8	8
900	7.5	14	14	12	12	12	10	10	10	10	8	8	8	8	8	8	8	8	6
1000	8.3	14	14	12	12	10	10	10	10	10	8	8	8	8	8	8	6	6	6
1200	10.0	14	12	12	10	10	10	10	8	8	8	8	8	6	6	6	6	6	6
1400	11.7	14	12	10	10	10	8	8	8	8	8	6	6	6	6	6	6	6	6
1600	13.3	12	12	10	10	8	8	8	8	6	6	6	6	6	6	6	6	4	4
1800	15.0	12	10	10	10	8	8	8	6	6	6	6	6	6	4	4	4	4	4
2000	16.7	12	10	10	8	8	8	6	6	6	6	6	6	4	4	4	4	4	4
2200	18.3	12	10	10	8	8	8	6	6	6	6	6	4	4	4	4	4	4	2
2400	20.0	10	10	8	8	8	6	6	6	6	6	4	4	4	4	4	4	2	2
2600	21.7	10	10	8	8	6	6	6	6	4	4	4	4	4	4	4	4	2	2
2800	23.3	10	8	8	8	6	6	6	6	4	4	4	4	4	4	4	2	2	2
3000	25.0	10	8	8	6	6	6	6	6	4	4	4	4	4	4	2	2	2	2
3500	29.2	10	8	8	6	6	6	4	4	4	4	2	2	2	2	2	2	2	2
4000	33.3	8	8	6	6	6	4	4	4	4	2	2	2	2	2	2	1	1	1
4500	37.5	8	6	6	6	4	4	4	2	2	2	2	2	2	1	1	1	1	1

Lighting System	Lamp Watts	Room Size (12' Ceiling)		
		18' x 27'	20' x 30'*	24' x 36'
Indirect	300	12	10	8
	500	21	18	14
	750	32	27	20
	1000	45	38	29
Semi-direct	200	12	10	7
	300	19	16	12

TABLE VIII — AVERAGE IN SERVICE FOOTCANDLES FOR CLASSROOMS

* Coefficient by interpolation

reduces required feeder capacity below the actual total branch circuit load; the National Electrical Code allowances for this demand factor should govern. Provision should be made for increasing feeder capacity to take care of next larger lamp size (50% increase) than installed initially.

CONVENIENCE OUTLETS: Convenience outlets should not be connected to branch circuits which supply outlets used for the general illumination system.

SAMPLE COMPUTATION:

1. In a classroom, the illumination should be not less than 20 footcandles, Table

2. For classrooms where the pupil is co fined to one position for relatively lo periods indirect lighting is recommend because a brightness or contrast which mig not be harmful if encountered for a sh time, might become a serious matter whe children are subjected to it for hours. F this reason, classification No. 6, Table I is chosen as representative of the lumina to be used.

3. Assuming the classroom to be 24' x with a 12' ceiling, the maximum allowa spacing between units is 14', see Table and footnote indicated thereby. A spaci no greater than the ceiling height is pref able. Since the room is greater than and less than 28' wide, two rows of un are required crosswise, and since the ro is greater than 28' and less than 42' lo three rows of units are required lengthwi thus six units are called for. For ro appearance and to assure an even illumi tion in all parts of the room, the units located on 12' x 12' centers, leaving 6' tween the unit and the wall (Table fourth column "Aisles . . . next to wall")

4. Room Index (Table III): Indirect lig ing and room 24' x 36' x 12'—Index "E"

Coefficient of Utilization (Table IV, No. 6 75% ceiling, 50% walls—Coefficient .31

Depreciation Factor (Table IV, No. 6 Average conditions—Probable average .6

Square feet per outlet: $\frac{24 \times 36}{6} = 144$

Lamp lumens required per outlet (Ta V, top formula): $\frac{20 \times 144}{.31 \times .65} = 14{,}300$ lumens.

Nearest Lamp size (Table VI): 750-w Mazda lamp @ 14,550 lumens.

Footcandles (Table V, bottom formula $\frac{14{,}550 \times .31 \times .65}{144} = 20.4$ footcandles.

For the results of further calculations co ering the room size assumed, refer to Ta VIII.

5. The inner and outer rows of lighti units in the classroom are to be controll separately; to provide photo-electric contr initially or later, separate circuits should run from each row to the panelboards.

Three 750-watt Mazda lamps on a 115-v supply draw about 20 amperes. Allowi about 50% additional for future needs, 30 amperes per circuit, and assuming a run, No. 8 wire is required, Table VII.

Figure 6. A typical classroom equipped with six 500-watt Mazda lamps in totally-indirect luminaires. Under average service conditions an illumination of the order of 20 footcandles will be received on the desks throughout the room.

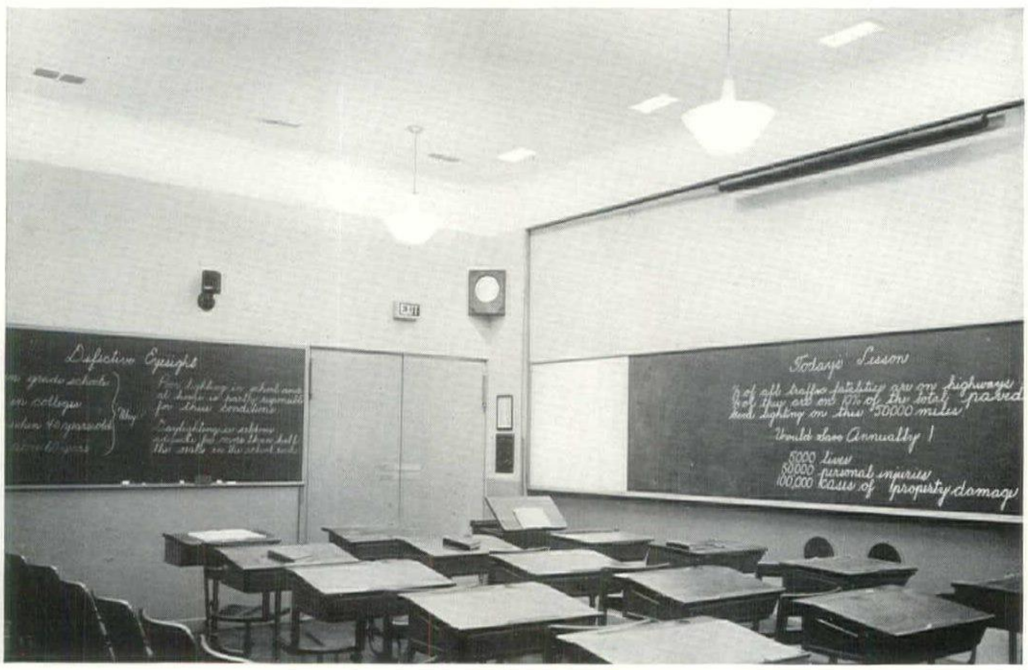
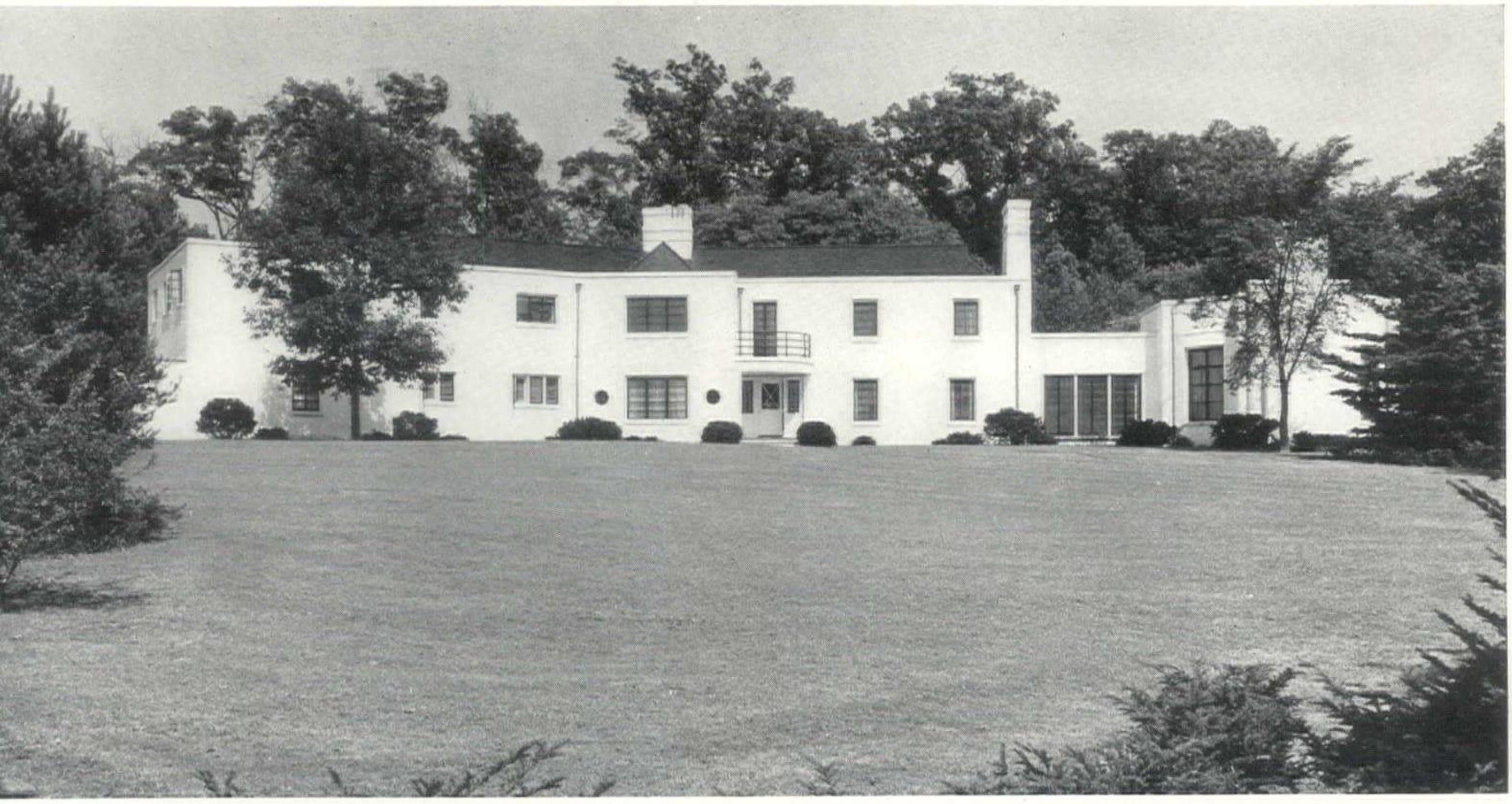


Figure 7. Approximately 20 footcandles average in service are provided in this classroom by six indirect luminaires made of Plaskon. Note the effect of blackboard lighting which illuminates the board on the right. Also note the photo-electric cell on the front wall.



AFTER

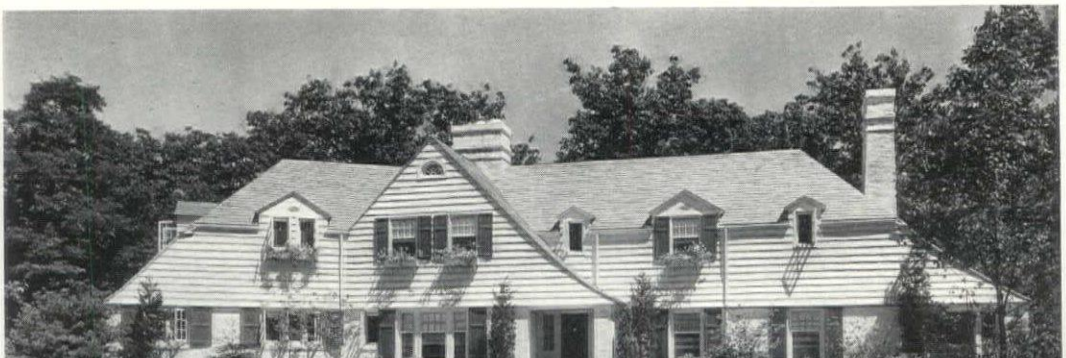
OUSE OF GEORGE R. DYER, BROOKVILLE, NEW YORK
ORMERLY THE HOUSE OF ELISHA DYER

RADLEY DELEHANTY, ARCHITECT OF RENOVATION

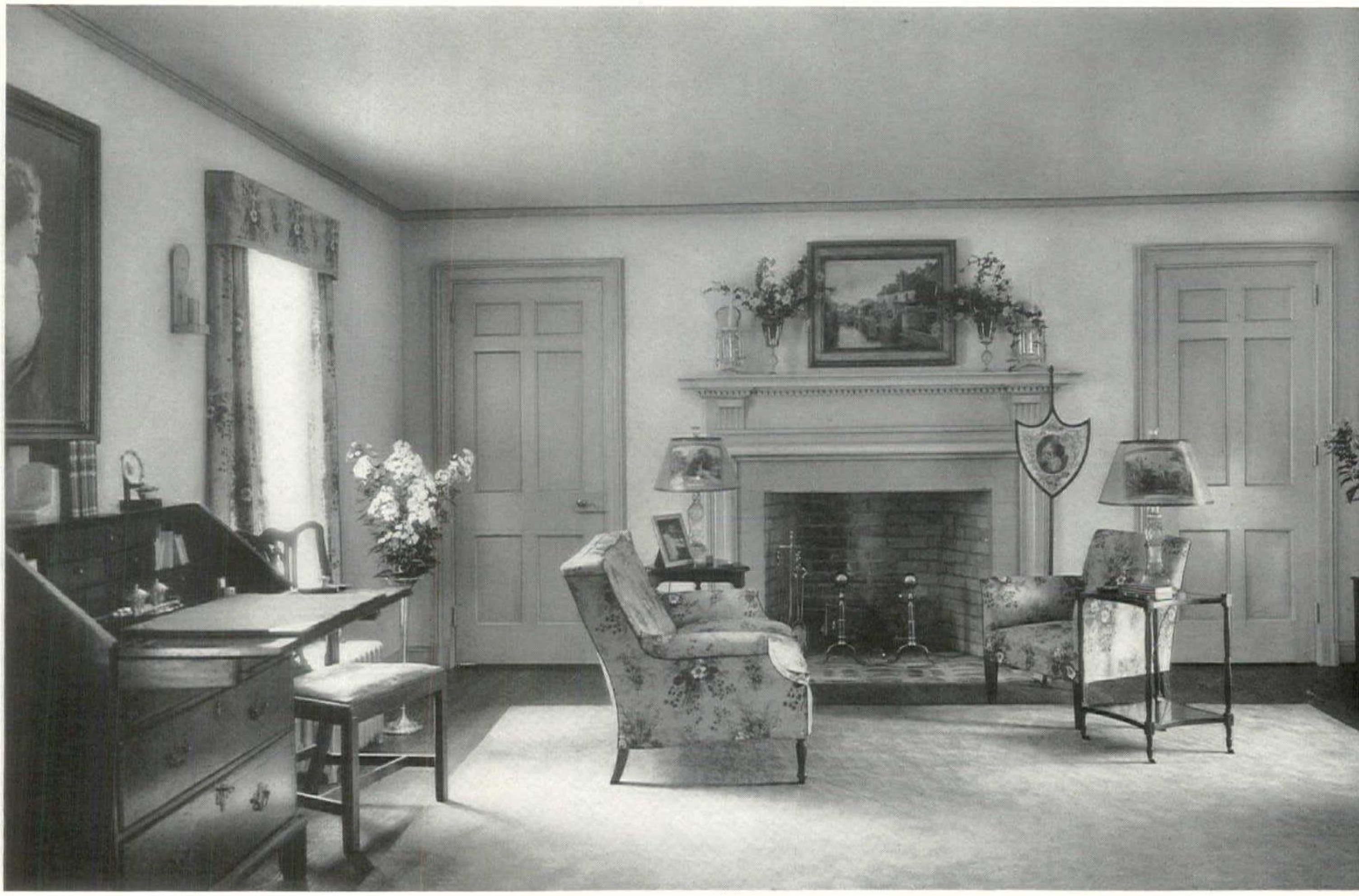
RUNDELL-CLARKE, LTD., DECORATOR OF RENOVATION

DWIN L. HOWARD, ARCHITECT OF ORIGINAL HOUSE

BEFORE



omparisons of the relative merits of odern and traditional domestic architecre have previously been purely conjectural d concerned primarily with that nebulous uality, aesthetics. Thanks to the fortunate rcumstance that Samuel Gottscho was ble to photograph the original house and e modernization from almost identical cations, excellent comparative results have een obtained. Originally the house was white-washed brick veneer and shingle n frame construction. In modernizing hite-washed brick veneer was used for all terior surfaces. The original shingle roof as retained and the additions have Barrett ecification roofing. New windows are all eel sash.



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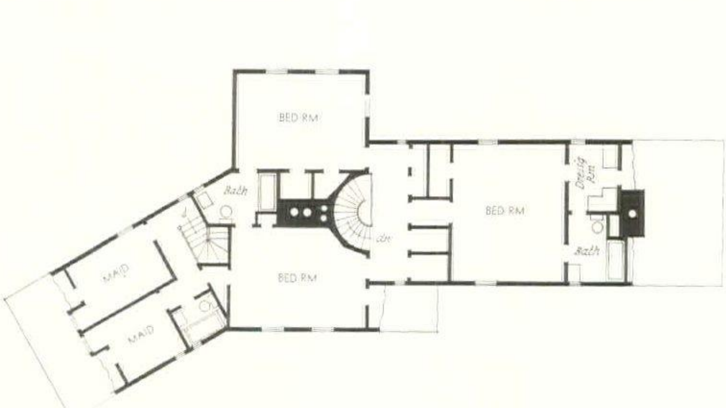
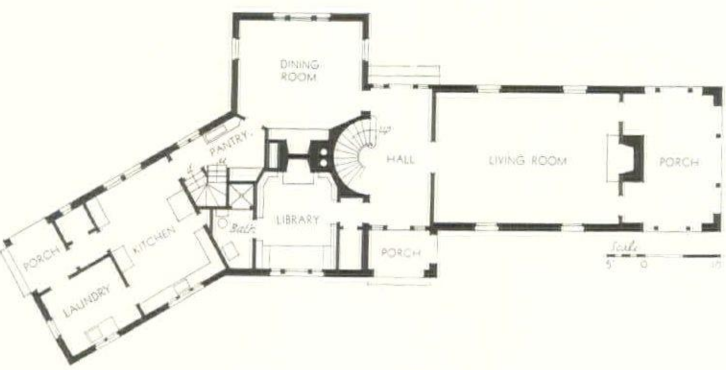
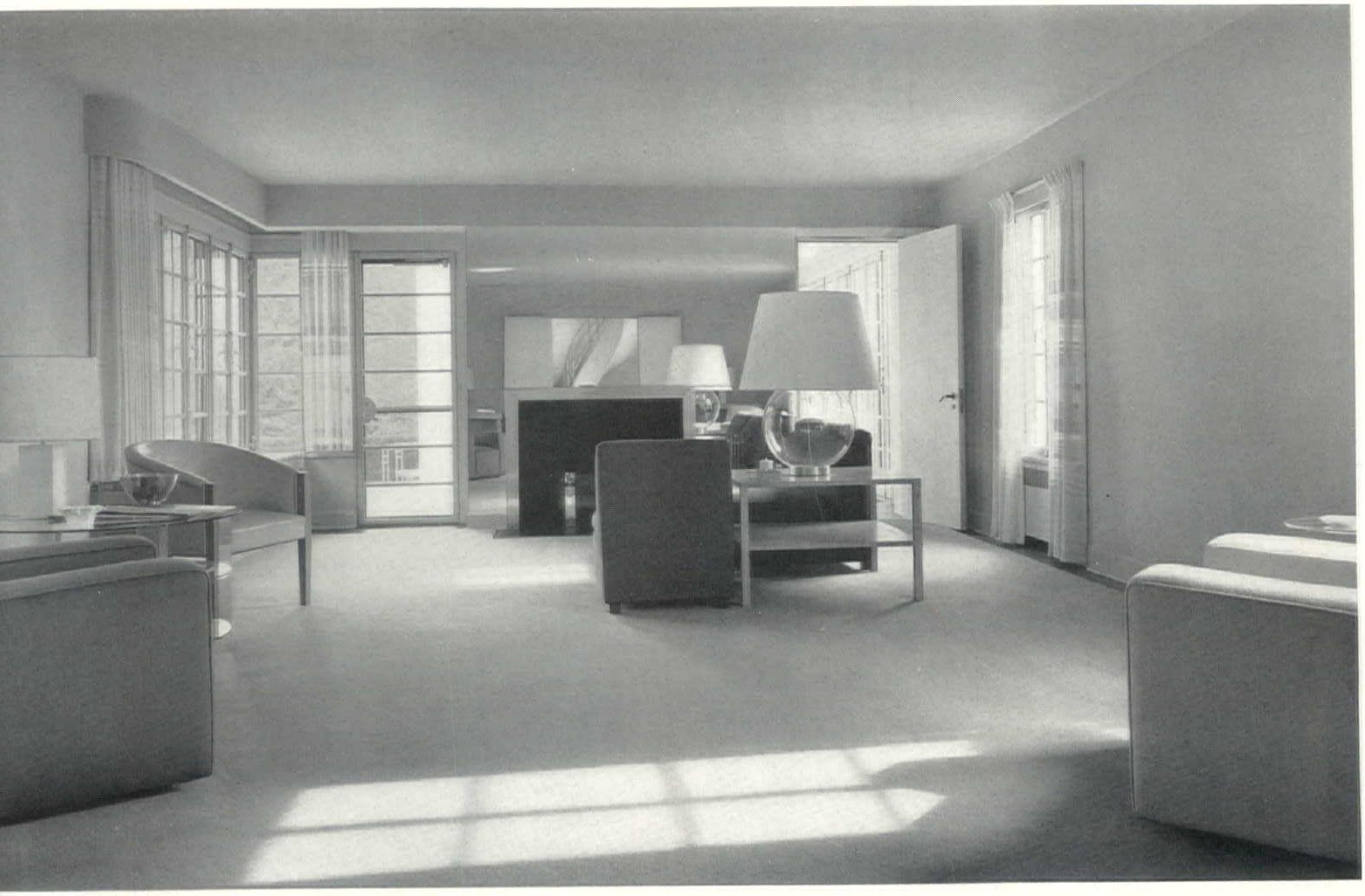




Despite the stylistic metamorphosis of the house, relatively
plan changes were required. Those made are in the nature
additions such as the garage and study, and the extension
the dining room. Even the fenestration required little relocat
A startling optical illusion is offered by the apparent cha
in size of the fireplace wall of the living room (this page
opposite). When the room bore the imprint of an earlier t
there was an air of dignity, serenity and somewhat staid c
fort. The precise symmetry of doors flanking the mantel se
static in relation to the asymmetrical vitality of the modernizat
A large window logically turned around the corner, the
mirror surface of the mantel breast and the continuous cur
box combine to give the room a feeling of spaciousness and
harmony with the lovely country setting which surrounds the hou

HOUSE OF ELISHA DYER, BROOKVILLE, N. Y. • EDWIN L. HOWARD, ARCHITE



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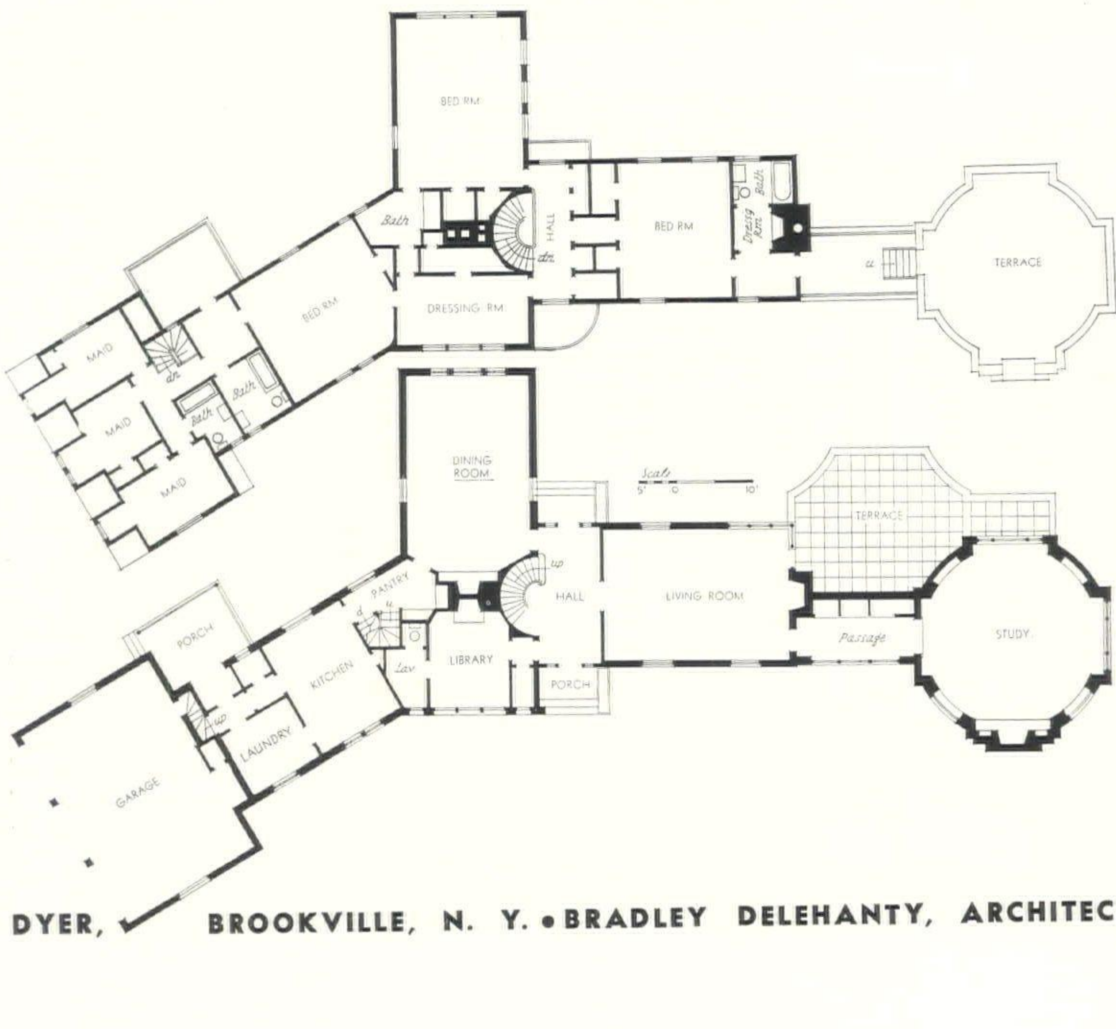
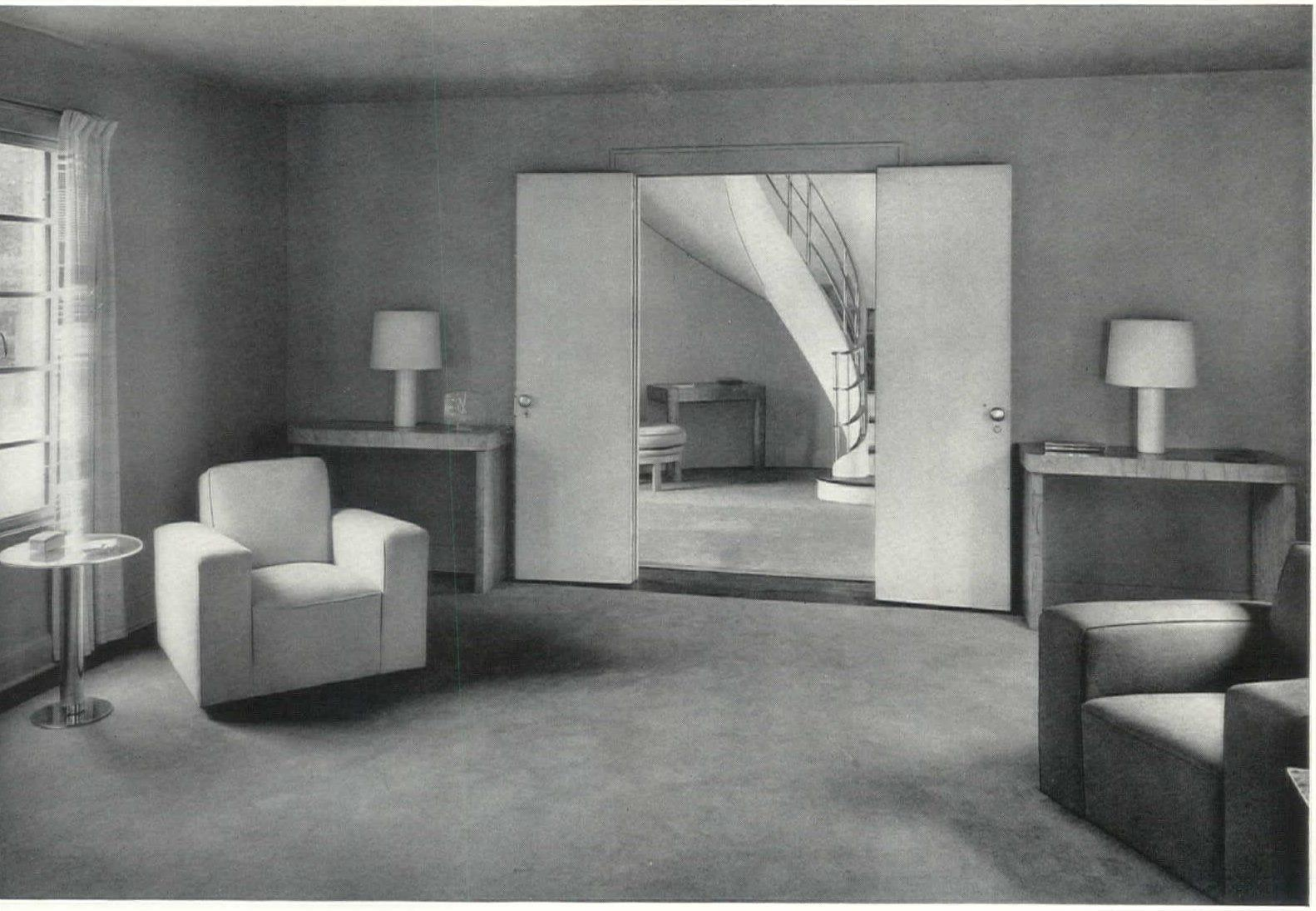


HOUSE OF GEORGE R. DYER, BROOKVILLE, N. Y. • BRADLEY DELEHANTY, ARCHITECT

BEFO

Many rooms that at first glance seem t
be based on tradition give that impressio
only because they are furnished with tr
ditional pieces. In other words, if such rel
tively small changes as simplified trim, flus
doors, the removal of picture moldings an
a redesigned mantel can make such a re
markable change in the character of
room, those who do not like the contempo
rary setting must find their differences i
modern furniture design and not in the in
creasing simplicity of domestic architectur



FTER

harp accents of clear strong colors against neutral background are typical of the modn technique of apparently increasing room ces. Light gray walls, platinum gray rug and oney-colored Hungarian ash furniture are ed in the new living room (above) with harp notes furnished by deep blue and ear yellow upholstered pieces. A natural ool rug, off-white walls, natural colored draeries and white English oak furniture in the ning room (right) contrast with the table p and leather upholstering in sage green.

BEFORE

The basic form of the beautifully-planned circular stairway is felt despite any change in surface treatment. Vertical balusters and delicate paneling, however, result in an air of restfulness and refinement of scale. Replacing the paneled surface with a flush one, accenting the horizontal elements of the railing, substituting light gray paint for the vertical motif of the traditional wallpaper, and using a chair which recalls the circular theme result in a somewhat grandiose and theatrical effect that is in harmony with our time

HOUSE OF GEORGE R. DYER, BROOKVILLE, NEW YORK
FORMERLY THE HOUSE OF ELISHA DYER
BRADLEY DELEHANTY, ARCHITECT OF RENOVATION
ARUNDELL-CLARKE, LTD., DECORATOR OF RENOVATION
EDWIN L. HOWARD, ARCHITECT OF ORIGINAL HOUSE

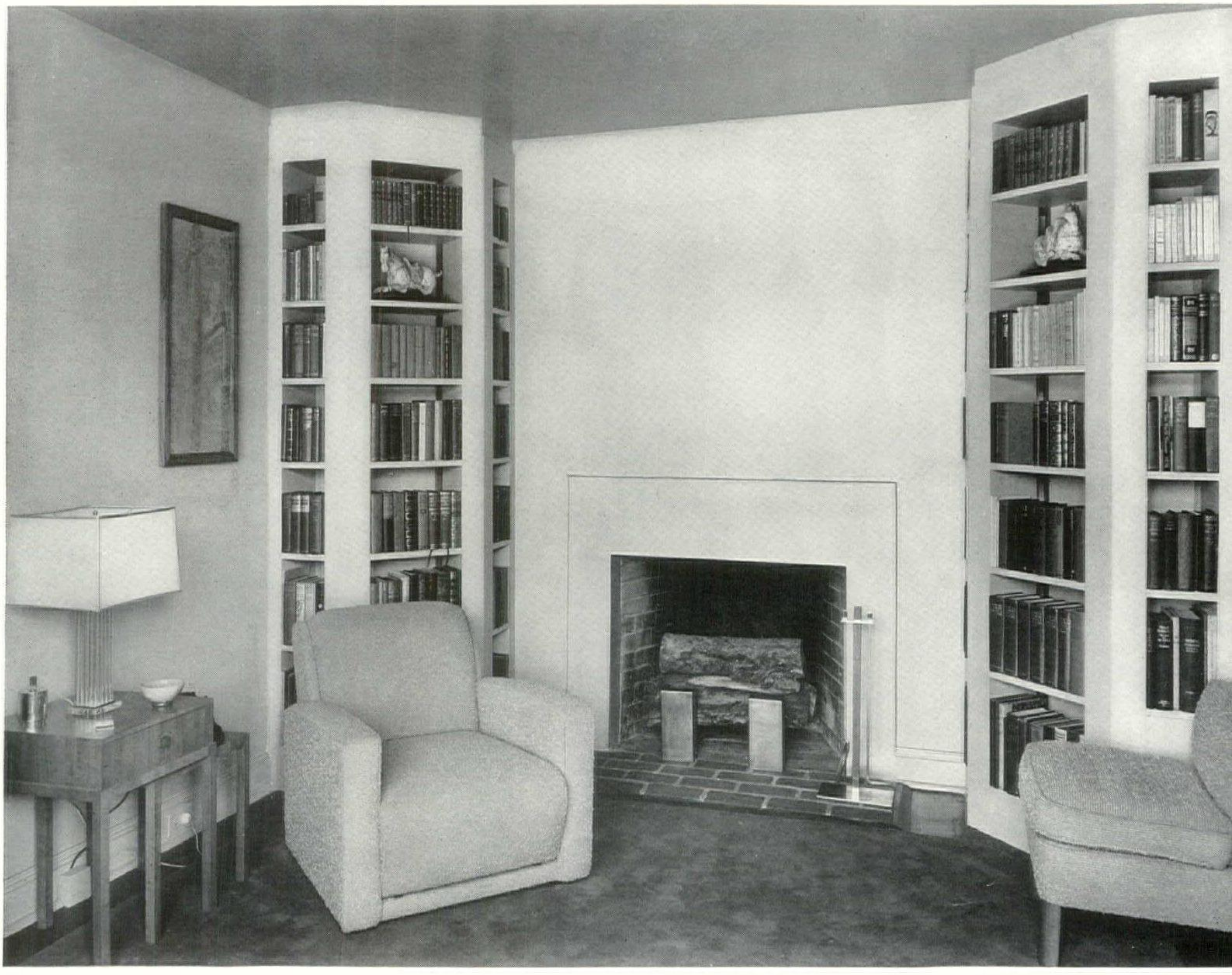
AFT

BEFORE

HOUSE OF GEORGE R. DYER, BROOKVILLE, N. Y.
FORMERLY THE HOUSE OF ELISHA DYER
BRADLEY DELEHANTY, ARCHITECT OF RENOVATION
ARUNDELL-CLARKE, LTD., DECORATOR OF RENOVATION
EDWIN L. HOWARD, ARCHITECT OF ORIGINAL HOUSE

Honey-colored vertical pine paneling, a rich red brick mantel facing and leather upholstered furniture have a masculine and studious quality usually associated with residential libraries. The color scheme of the renovation takes an entirely different course. Here the walls are bone white, the rug a cedar brown and the chairs are covered in a knubby wool fabric of yellow and green.

AFTER



HOUSING and PLANNING · IV

BY SIR RAYMOND UNWIN

The last installment of excerpts from Sir Raymond's series of lectures at the Town Planning Studio, Columbia University

SOME ECONOMIC ASPECTS OF PLANNING

A POINT about planning must be stressed, namely, that planning must redistribute land values. What will be the effect of taking the diagram of a town and assessing the lands which will be wanted for building purposes in the next five years, if a large section of this land is set aside for parks? An area equivalent to the park land will be needed for the buildings, and will thus acquire building value. It may mean also that because of the park, land on the park side of the town will be worth more than on other sides. The land values have been redistributed as the result of the plan. Now if the public when purchasing land for a park has to buy up the building value—which is not used or destroyed, but simply moved to another piece of land—building value will be paid twice over by the public; once on the land for the park, then on the land which is occupied by the buildings which would have been built on the park area. That is what town planners have been trying to avoid. Obviously it is not a reasonable arrangement.

You have a method in this country which has been practiced extensively in Kansas. There they take land for open spaces and reckon to apportion the building value of that by assessing it according to degree of benefit on the surrounding areas. They assume that the planning scheme will make land generally more valuable. They call together a committee to assess the value of the open space on surrounding land, and collect from that assessment what would pay the greater part needed for open space. This scheme is based on the fact that planning redistributes land values, and the belief that it is not right that the public should pay for building value twice over. Clearly, when the planning stipulates where building development may take place and where the land must not be so developed, when it lays down the pattern of urban developments on the background of open land, it must redistribute land values; and this is essential if you are to design towns or town extensions.

There is one other point in regard to economics which should be mentioned. This relates to low cost housing and rents.

One reason why we are always in difficulty with housing for the low income groups of people arises from the fact that in civilized communities there has been a steady rise in the standard of living. The power of production has increased and the power of consumption too, which means that wages have risen and that the cost of dwellings has increased in consequence, for dwellings are chiefly built by labor and with materials produced by labor. There are few parts which have been subject to much reduction of price owing to mass production. This means a constant rise in the cost of houses. People seldom pay for a house outright, but pay for it over a long period in rent. Rents for a house must be at least enough to pay for interest and other outgoings and to amortize the cost. The result of this is that the rents of all low cost houses tend to rise with the cost of production. This applies not only to new houses as built, but to all houses, even old ones. A person will not pay quite as much for an old house as he will for a new one, but he must pay almost as much, and considerably more than he would have paid when the house was new. It is obvious, then, that the rent earning capacity of these houses tends to increase with age. This is why it is so difficult to house the lower paid groups of workers, for their wages do not rise in proportion to the rise in rents.

We need a reservoir of dwellings to be let at rents which those who lag behind in the wages increase can afford to pay. When starting, the only way to help matters is to reduce artificially the rent of the new houses and take a loss, until such time as wages rise in proportion to the rise in rents.

INCREASE IN LAND VALUES—4% BASIS
$13.00 PER YEAR GROUND RENT PER FAMILY

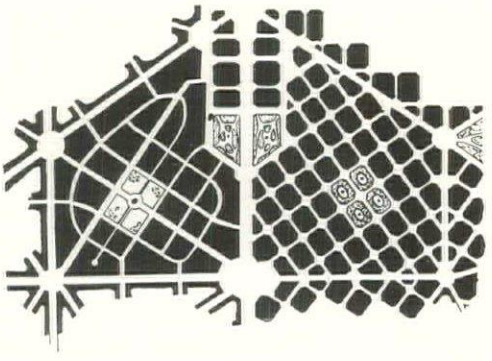
10 houses per acre	$ 3,250 per acre
12 houses per acre	3,900 per acre
20 houses per acre	6,500 per acre
40 houses per acre	13,000 per acre
60 houses per acre	19,500 per acre
120 houses per acre	39,000 per acre

With higher buildings the amount which the increased number of families can afford to pay for land is greater, but the amount of land available per family, in addition to site of flat and road, diminishes very rapidly.

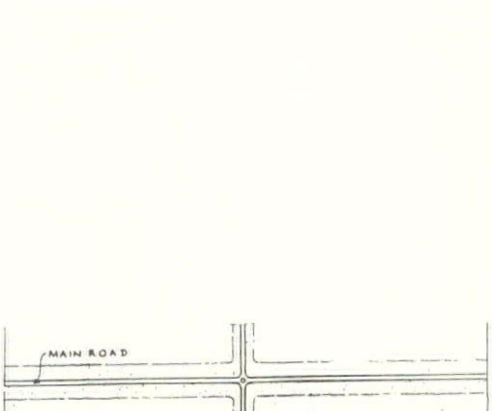
COST OF FIVE-ROOM COTTAGES—ENGLAND
ANNUAL RENTS ON BASIS OF 7½% OF COST

Cost	Monthly Rent
$ 600 (75 years ago)	$ 3.75
750 (50 years ago)	4.69
1000 (25 years ago)	6.25
1800 (today)	11.25

If houses were owned by public authorities, they could be let at the rents originally sufficient to meet the outgoings. Private owners can let them at some figure between the original one and eight or twelve dollars per month.



. . . The proper planning of subsidiary streets in relation to the main roads prevents the traffic from being disturbed and the facades of the buildings unduly broken. Compare the few breaks and crossing points of the area on the left with those on the right . . .



. . Planned on the Radburn principle, there are only a small number of through communication streets, but they are quite free from interruption. This type of plan enables a child to go to school, and old ladies to go shopping, in safety . . .

Some day the lower income groups may earn enough to pay rents which will wipe off the loss sustained at the beginning. In 30 years they may be able to pay a rent based on today's cost, and make up in the latter years of the life of the house the loss taken at the beginning. This is a method of forestalling by subsidy the lag between cost of housing and wages in the lower paid groups.

PLANNING AND MODERN TRAFFIC

The point to emphasize, from the pedestrian's point of view, is the great importance of having a central division between the tracks, or plenty of islands. The island or dividing strip means that the pedestrian has only one direction in which he needs to look, and only half the distance which need be clear. The island or dividing strip, therefore, reduces the pedestrian's difficulty to about one quarter. With a sixty foot road divided into two 30-foot tracks you bring down the distance you have to see from 280 to 140 feet; moreover, the pedestrian need look only in one direction.

The relation of high buildings to traffic is very important owing to the large number of people occupying very small areas. The New York traffic presents very difficult problems because of the high buildings and the nature of the plan which presents the maximum number of crossings, each of which is a point of delay. It is indeed doubtful whether any improvements made can now greatly ease the traffic congestion. Not until the volume of building is greatly restricted by zoning regulations will there be any chance to solve this problem. The reason is that a large reserve of unsatisfied need for street use exists. This is restrained by congestion and inconvenience. Those who have cars leave them outside; and those who would take a journey from place to place if it were easy and would take little time, stay at home. The new capacity resulting from each improvement tends to be occupied and swamped by this reserve of unsatisfied need until it is again restricted by congestion, delay, and general inconvenience.

The difference between building along the frontage of main highways and providing separate roads of lighter construction such as service roads separated from the highways is so small as to be negligible. The extra costs incurred in laying services in main roads, with the longer connections to buildings, about suffice to pay for the share of a service road complete.

The next point I want to stress is the importance of places where roads join. In many plans where there are certain main roads, the minor roads, instead of being planned in normal relation to the main roads, have been planned with some other idea or other orientation. This is the case in Washington, where you have a gridiron pattern of smaller streets laid on a good radial pattern of main streets. There must result in such a case a large number of very awkward junctions, difficult and dangerous for traffic, and not easy for securing good design or groupings in the buildings. Fairmount Parkway in Philadelphia affords another example. The town was founded on a square or gridiron basis, with the result that important diagonals cut across every street at awkward angles.

M. Eugene Henard long ago suggested that the best way to handle a difficult crossing where dense traffic exists, would be by a circulatory system. This circulatory system is one alternative of the bridge, or bridge and clover leaf systems of handling traffic adopted so much in this country, as for example on the Bronx River Parkway in Westchester, and at the New Jersey end of the George Washington Bridge.

PLANNING FOR THE EXPANSION OF CITIES

Planning town extension differs from planning a new town, for in town extension your location is already fixed for you, as is the general distribution of the various component parts. Also, the general frame of intercommunications will have been already determined. Many of the things we must take into consideration in planning a new town would no longer be possible in planning the extension of an existing town.

We have stressed the importance of thinking of a city as a whole community, not merely as a crowd of people, and not in parts as a residential section or as a business section, etc. Secondly, we have found that there is really plenty of open space available in and outside of all towns; that there is actually no need to crowd; no need to allow congestion to grow up. All forms of crowding and congestion have a very great element of inefficiency; there are delays and losses involved to set against what appears to be gained.

A third point refers to land values. It is important to remember that we should not allow existing land values to dictate our plan; for we have found that land values follow the use to which the land is put; they must not dictate that use. Of course, a low density of buildings gives lower land value; but at the same time it spreads the value over a larger area. This makes property values much healthier in the long run. The spreading of population over a wider area may well produce a greater volume of land values than a more highly concentrated plan. In many types of development the occupier can afford to pay the same price for land of low density as for land of high density; we have seen that there are economies in development costs and better values in the plots which affect the land items. There is not the difference there sometimes appears to be.

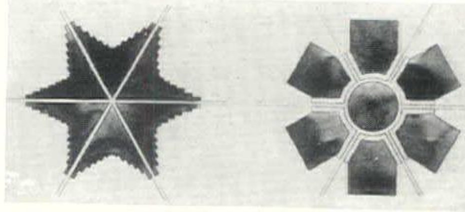
We must plan town extension as a growth all over; for a town, just as a human being, grows in all its parts. In planning towns it is important to bear in mind that space should be left for all the different parts to expand proportionately to the limit. There must, of course, be a certain limit up to which the expansion of the town can be provided for. A certain stage must be reached when the spaces reserved for the growth of the several parts are all occupied. Thereafter either there must be the confusion of parts expanding at the expense of other parts, or the town must expand by the addition of fresh and complete units. Sir Ebenezer Howard first drew our attention to the possibility of providing for the growth of a city according to the unit plan; this was an essential part of the Garden City idea. We are now trying to organize further the expansion of towns in more self-contained units. The large shops and big industries, or other full grown institutions, will not be needed at the beginning, but areas can be planned and reserved for them until the town grows to sufficient size to warrant large stores, industries, residential neighborhoods, etc. In planning new towns and in planning for expanding towns, it is needful to provide for secondary shops, for small beginnings and for the larger ones which will be needed later.

A time will come, however, when organization of the growth into new and more or less self-contained units will be needed. Then belts of open space may be planned to define the units and to meet their needs for recreation.

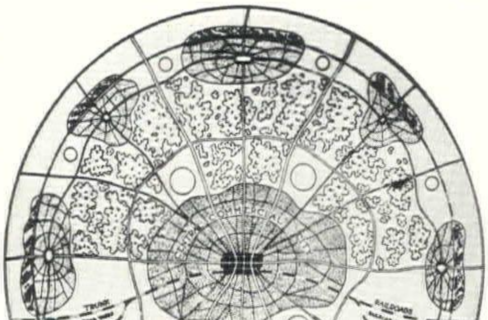
The good planner does not sacrifice comfort to beauty. In planning a town he must have these two elements in mind, working at both all the time. He must be able to picture the people going about their daily lives, and to think constantly how to provide for this life, so that the city may be both a pleasant and convenient place in which to live.

REGIONAL AND STATE PLANNING

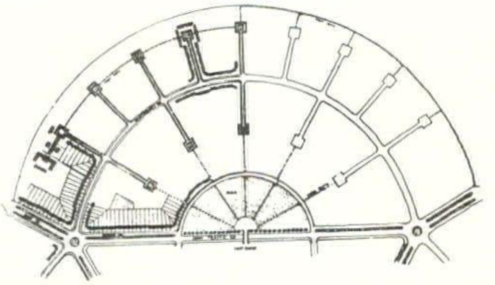
All planning must be largely a co-operative activity. The number of basic spheres of knowledge upon which good planning must be founded is so great that no one person can acquire more than a fraction of them; and it is clear that the wider the range of the planning the more must this become true. It is indeed true enough in regard to city planning, but when to the city is added the whole of the region, and to that the whole of a state or nation, it is clear that planning must be based on contributions from many experts. One may mention particularly the spheres associated with the architect, the landscape architect, engineers of various branches, geographers, geologists, economists and sociologists, and even psychologists, for after all the behavior of human beings in response to certain influences, and the effect on human beings of certain conditions, are the foundations upon which good planning can be based. Nevertheless, in spite of this, and indeed because of this wide extent of contributions, there must be some one brain to conceive the new order of relations and the new plan in which they should be expressed and realized: for without this conception any planning must be of the nature of repairing that which is, or adding to it patches of what is fresh.



. . . In both of our countries, stores and so forth have been strung along the main traffic routes—ribbon development it is called—causing serious obstruction and danger. There have been many schemes to get rid of this, so that through traffic will not be held up. On the left is a typical unplanned town; on the right, a town planned for free flow of main road traffic . . .



. . . The late Robert Whitten prepared a scheme for town expansion on these lines, using a very low density zone as a means of reserving nearly open areas . . .



. . . This traffic diagram illustrates the type of development that separates streets used for residential purposes from those used for main through traffic . . .

The word planning is used to cover a wide sphere of activity in which the importance must shift from the visual conception, towards the known material conception, as the range dealt with passes from site planning through suburban, city, and regional planning to state or national planning.

We have still to find the best methods for training men whose particular function shall be to sum up the contributions of the various experts and to embody them in a coherent new plan based on a mental conception. This is work analogous to that of a designer, and it seems clear that an important part of the training should consist in practicing the formation of these conceptions of new relations, and of plans and arrangements of them; and as regards the physical aspect of planning, it is essential to practice such a clear mental visualization of them that they can be expressed in the form of plans on paper. Where planning consists mainly in the formation of new economic or social policy, the visualization is a much less important element, and indeed may be absent. The wider the area to be covered, the more extensive becomes the field in which a reliable basis of facts must be accumulated, since it is on these alone that any sound design can be based.

In regard to population the census of returns may contain a whole volume of information, but may easily omit, and often does, two of the items most important to the planner; namely, the proportion of increase or decrease in local population which is attributed to migration, in or out of the area, and the number of family units, whether they are increasing more rapidly than the population or not. The importance of knowing the increase or decrease in family units arises from the fact that the need for dwellings depends on the number of families rather than the number of people.

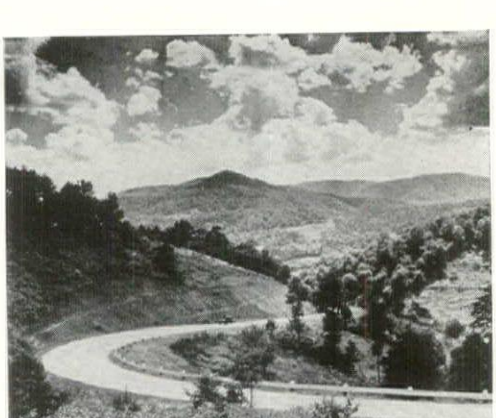
The word region as applied to planning is generally used as indicating an area within which certain natural factors, particularly of a physical character, indicate the distribution that any planning should consider and be based upon for the whole of the region. Such a physical characteristic, for example, is afforded by a large river valley, where the precautions against flood, the use of the water for power purposes, the navigation of the river and the distribution of cultivation and forestation, should be considered in relation to the whole valley. The area within which coal or other minerals can be found and are likely to be worked, may also be the basis of a region. The distribution of population in the neighborhood of a large town may be another indication.

While regions do not coincide with areas of local or national government administration, these areas must be noted and their importance may at times overtop even the natural regional areas. Where the national or state boundary is one which for political or economic reasons it is difficult to overpass, state or national planning must be accepted as the unit.

In England we have had an interesting regional distribution of architecture which may usefully form an example of regionalism on the aesthetic side. Owing to the fact that nearly all the main geological strata pass diagonally across our small country, and that the country was developed quite evenly all over at a time when transportation was expensive, there have developed in the geological regions styles of architecture, particularly in regard to domestic buildings, based upon the most effective and attractive use of the building materials which were available in each region.

It is indeed a matter of great interest and of some surprise to those living in modern conditions to see the high degree of quality and beauty which our forefathers were able to attain in buildings so admirably developed from, and adapted to the particular local materials which were most ready to their hands. They indicate an appreciation of quality rather than quantity which has been very absent from our civilization during the last century.

May we not venture to hope that the lessons which were learned during our recent period of depression indicate that we are reaching the limit of the time when emphasis has rested on the quantity of goods which could be produced, and that we are approaching a time when we may be able to take quantity for granted, and lay more emphasis and devote more time and labor to the securing once more of a much higher average of quality both in the design and the character of all that we build or make.



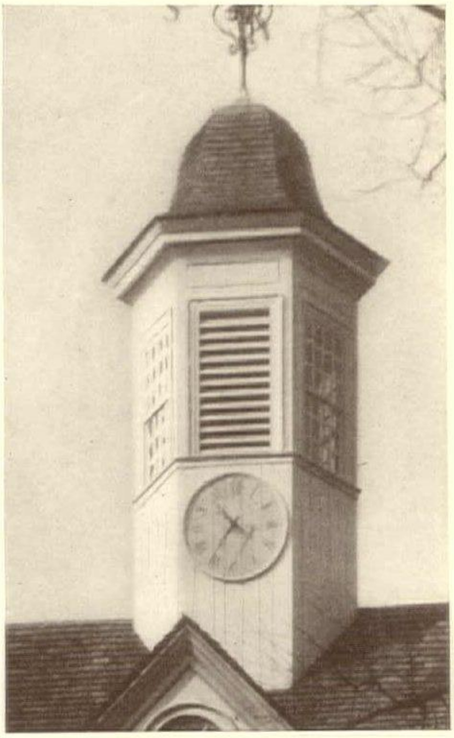
. . . State or national planning is naturally concerned with the development or conservation of natural resources, the promotion of convenient means of intercommunication or distribution, and other similar large scale matters. The Tennessee Valley is a good example of the need of navigation and flood protection . . .

FAVORITE FEATURES

Common problems of design in everyday practice—how the results look and how the drafting-room detailed them

Tower Clocks

In view of a similarity between some of these clock faces, due perhaps to the use of stock patterns, our detail drawings include variations in the dials and hands.



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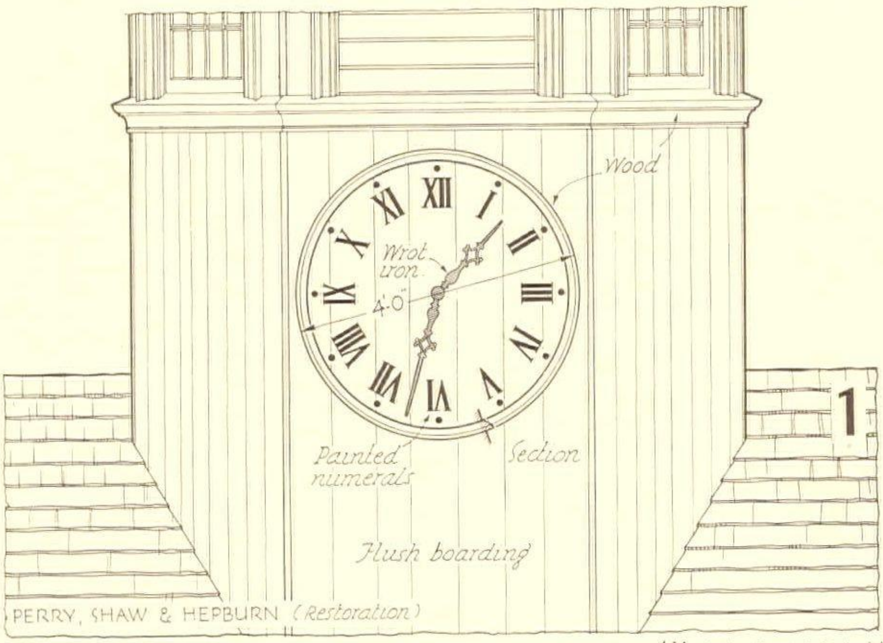
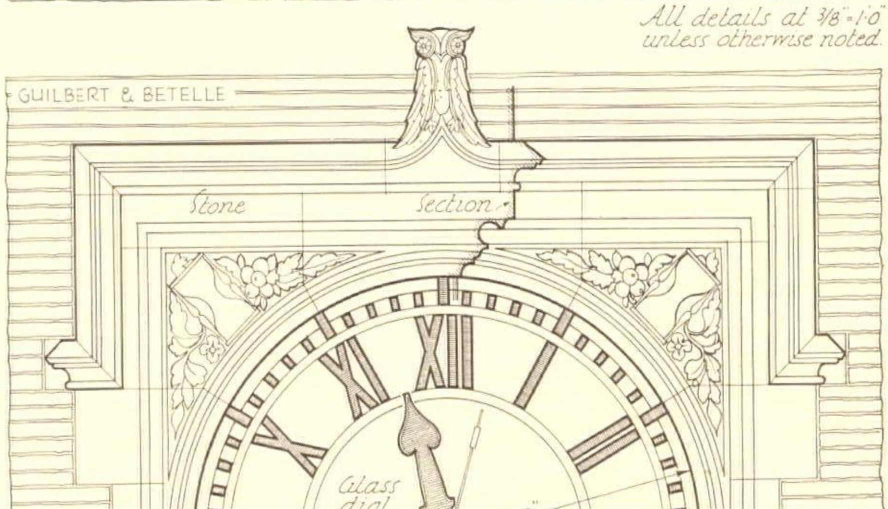
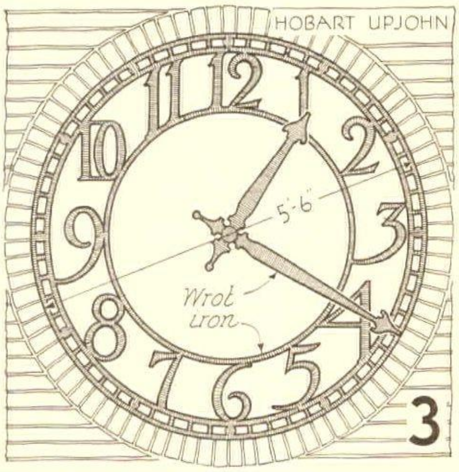


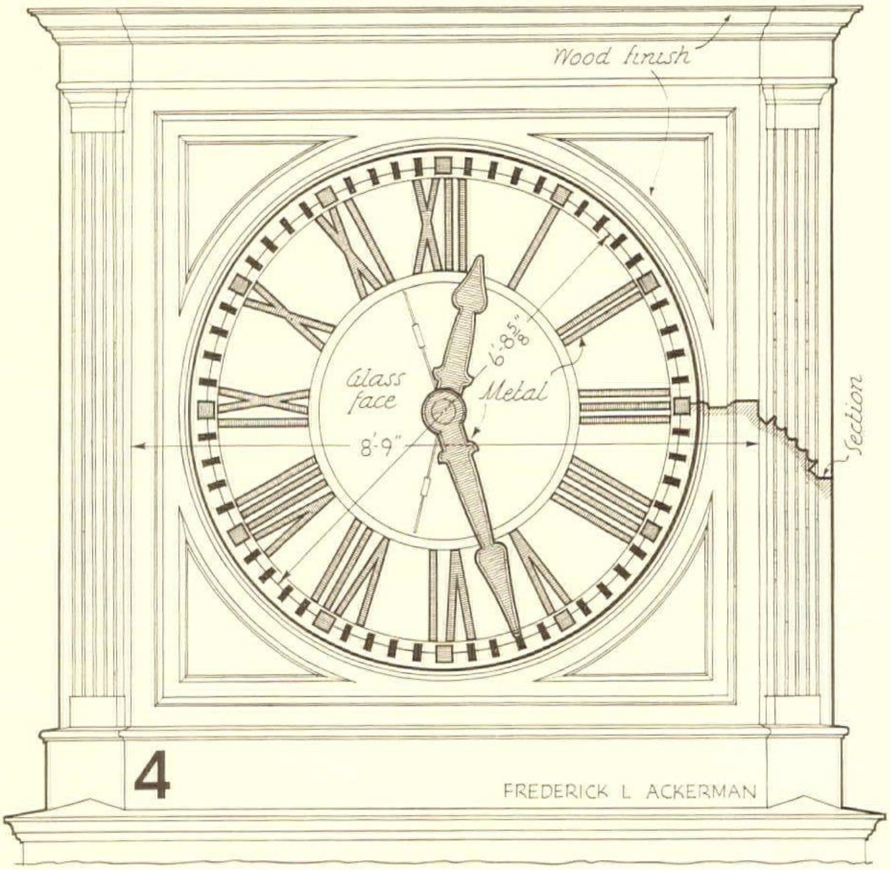
All details at 3/8"=1'-0" unless otherwise noted

2




HOBART UPJOHN
5'-6"
Wrot iron

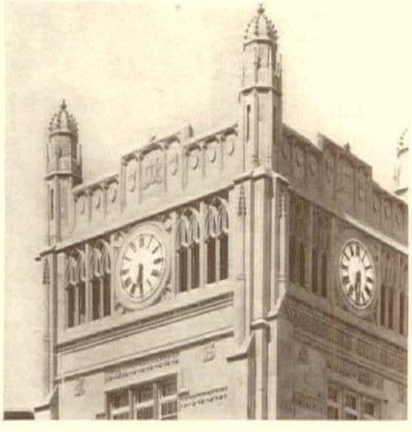
3


Wood finish
Glass face
Metal
6'-8 5/8"
8'-9"
Section
FREDERICK L ACKERMAN

4

3

4



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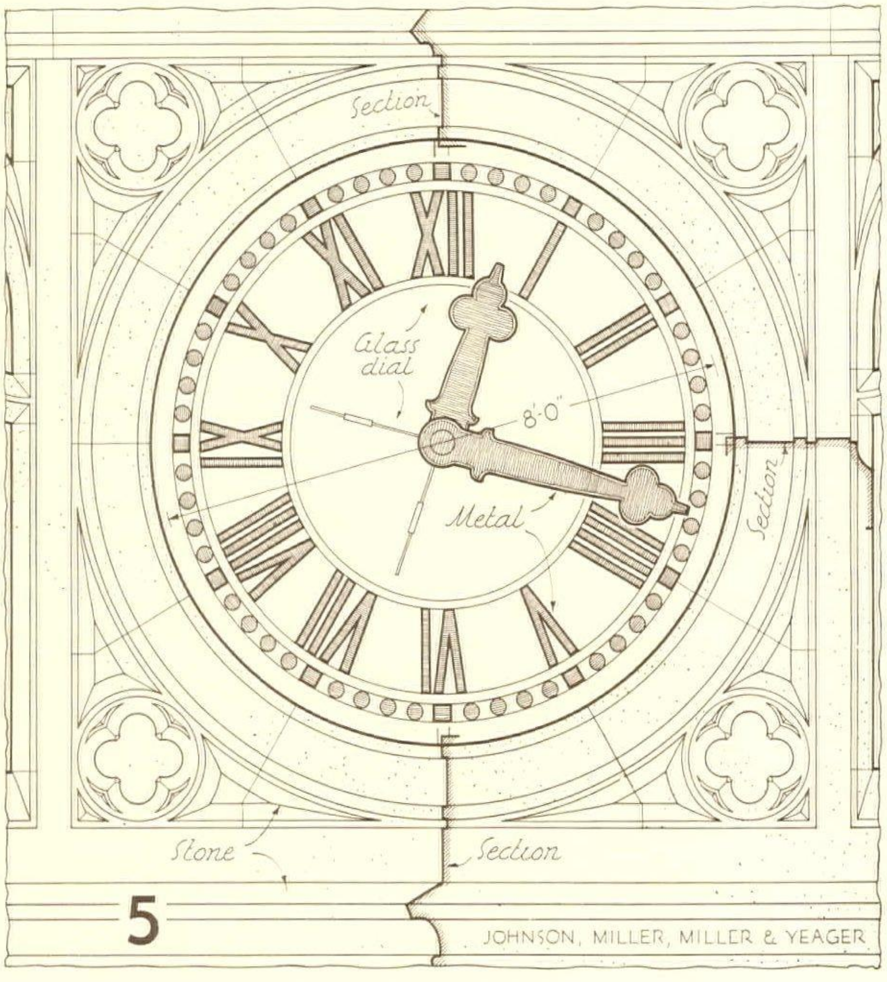
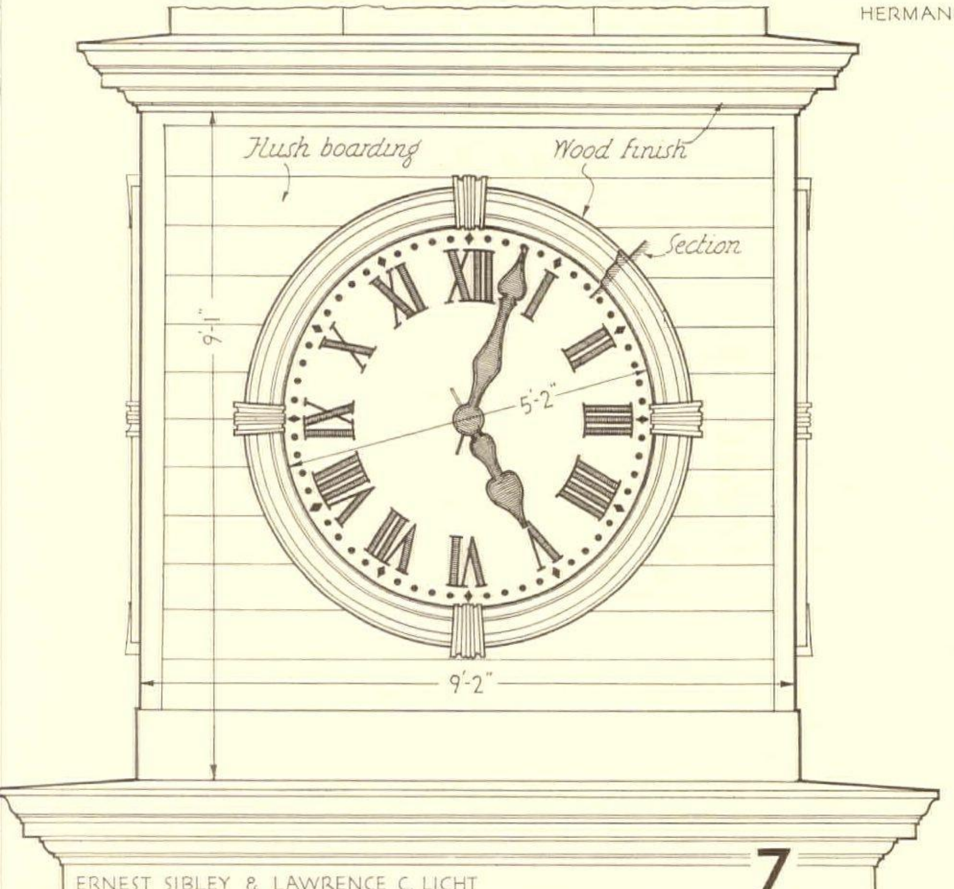

Section
Glass dial
8'-0"
Metal
Section
Stone
Section
JOHNSON, MILLER, MILLER & YEAGER

5



ERNEST SIBLEY & LAWRENCE C. LICHT

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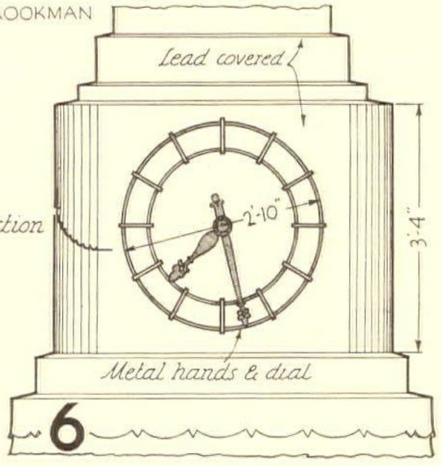
HERMAN BROOKMAN



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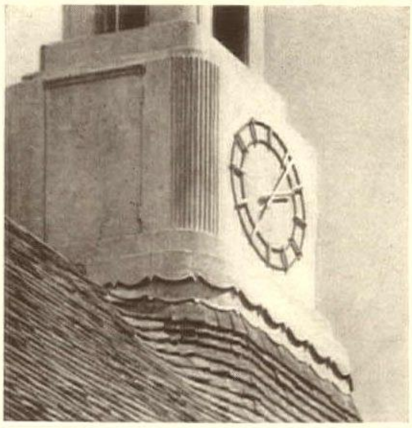

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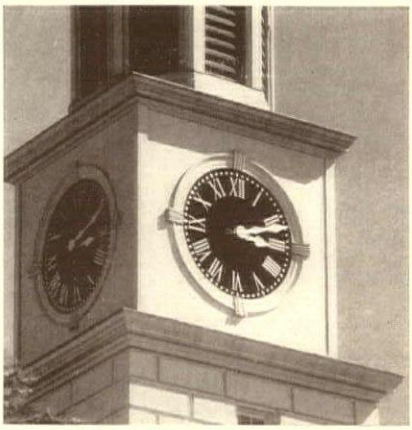

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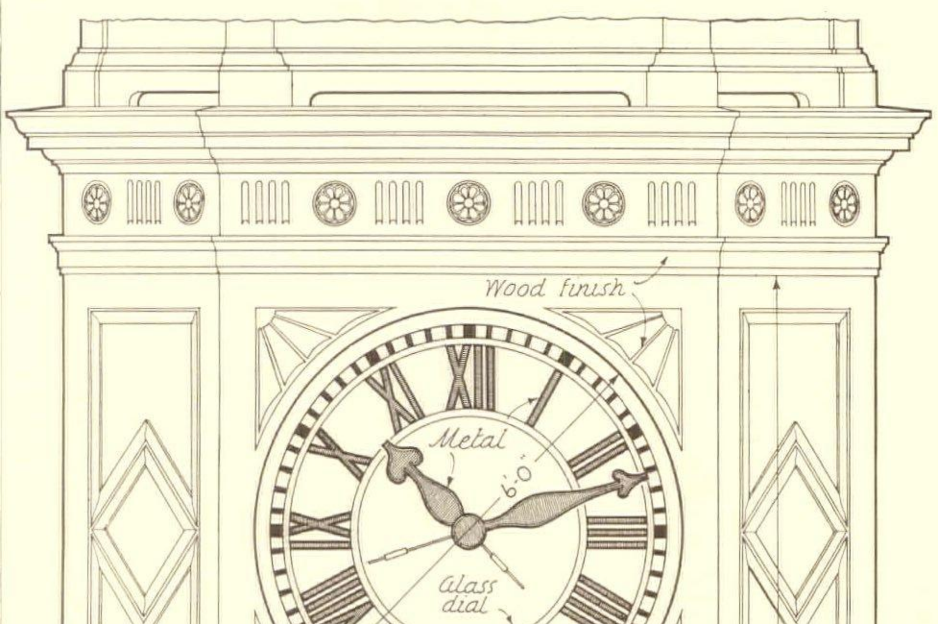

GUILBERT & BETELLE

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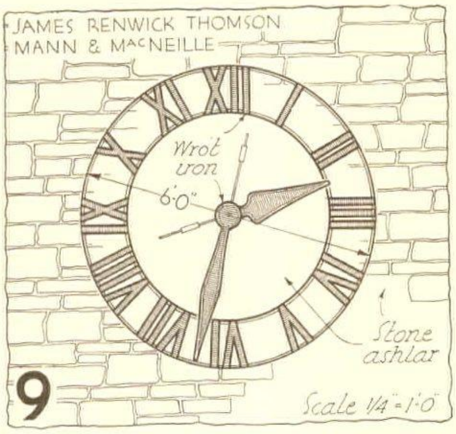
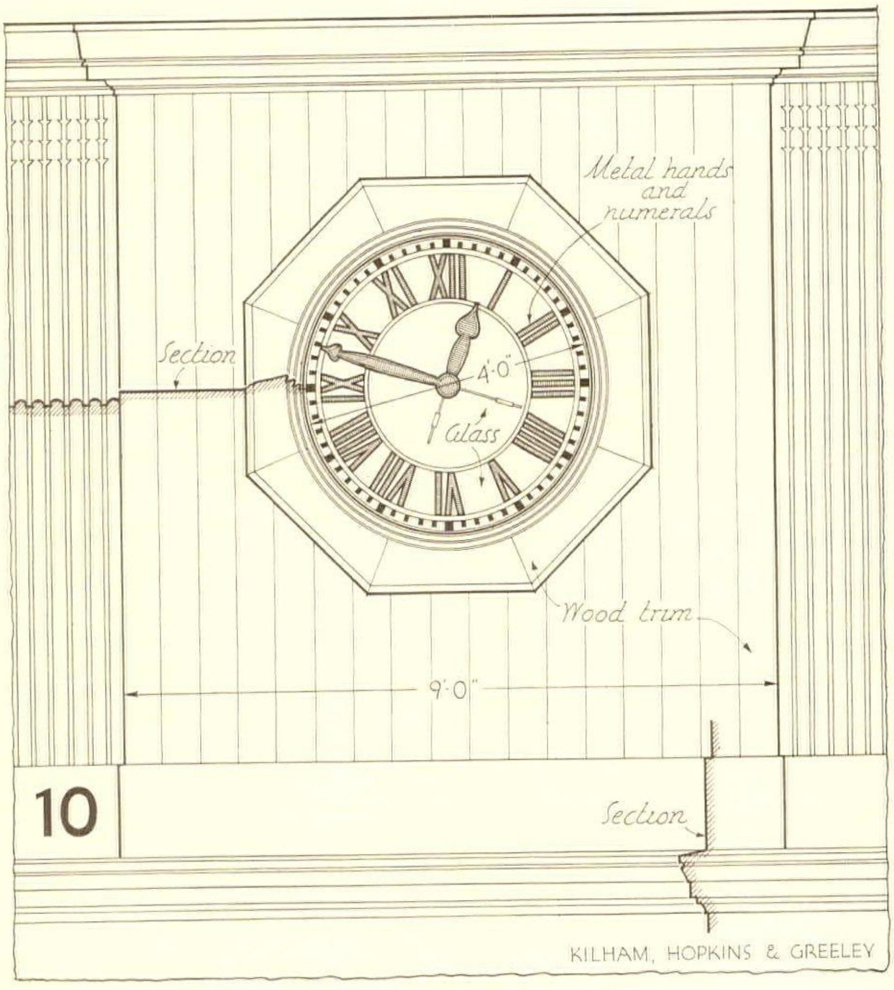
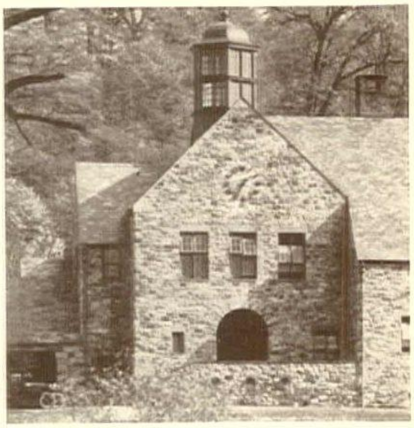

JAMES RENWICK THOMSON
MANN & MacNEILLE
Wrot iron
6'-0"
Stone ashlar
9
Scale 1/4"=1'-0"


Metal hands and numerals
Section
4'-0"
Glass
Wood trim
9'-0"
10
Section
KILHAM, HOPKINS & GREELEY



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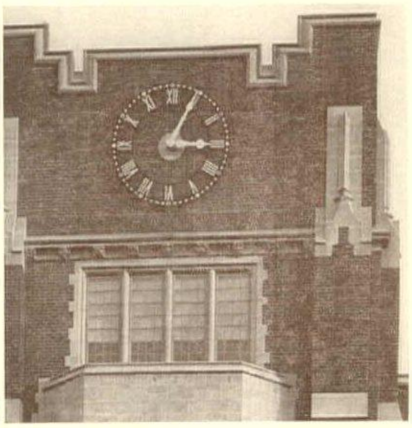

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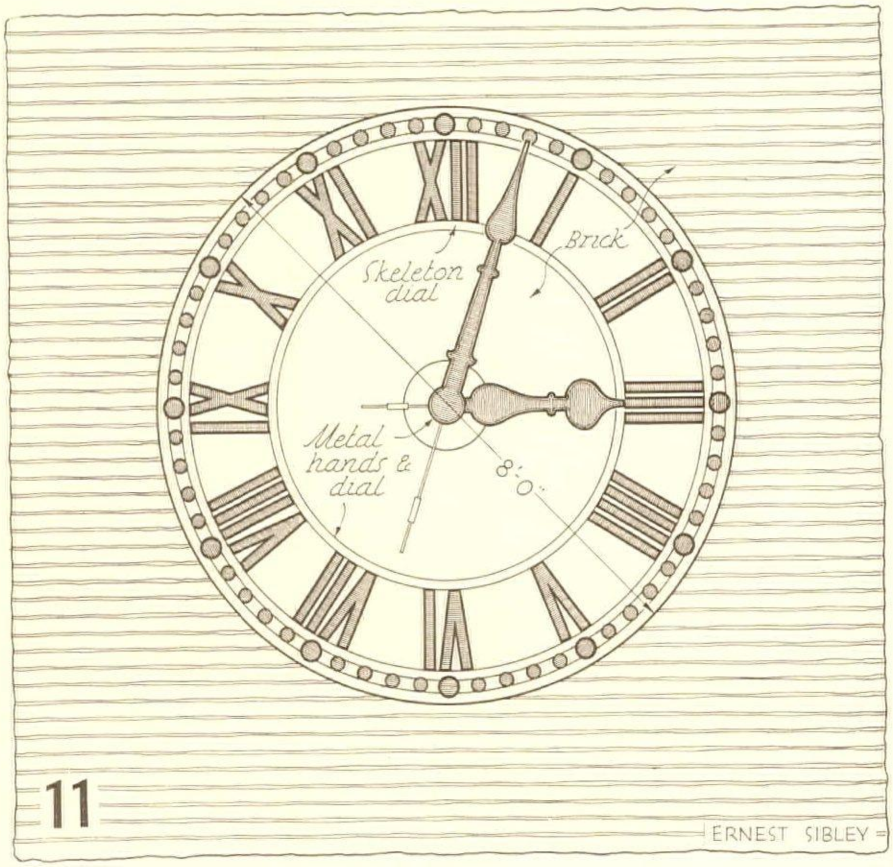

Skeleton dial
Brick
Metal hands & dial
8'-0"
11
ERNEST SIBLEY

THE DIARY

Henry Saylor

Monday, March 1.—Paul Revere should be on the job today to take another ride. The nation, and particularly the architects, need arousing. The "fixers" are at the Capitol again, and would rebuild the east front.

I thought we had gotten well over this itch to improve upon the work of our betters, and would not soon again seek to retouch a possible mole on the face of Mona Lisa or alter the substructure beneath what is generally conceded to be one of the finest domes in the world.

Those who would rebuild the east front of the Capitol—one of the few architectural monuments that goes back to the days of Washington, Jefferson, and the founding of the nation—offer four reasons for so doing:

1. *To correct the overhang of the skirt of the dome.* The American people have been looking at this for one hundred forty years, and either do not know that the overhang exists or else like it that way. Let's leave it alone.

2. *To give needed additional space in the building.* We have been adding additional space all over Washington for the Government almost yearly since it was founded. Why not continue to do so without marring an irreplaceable monument?

3. *To replace the sandstone with a more permanent material—marble.* In that case we should have a marble base and a painted iron dome. At present they are both painted. Why not leave them alone?

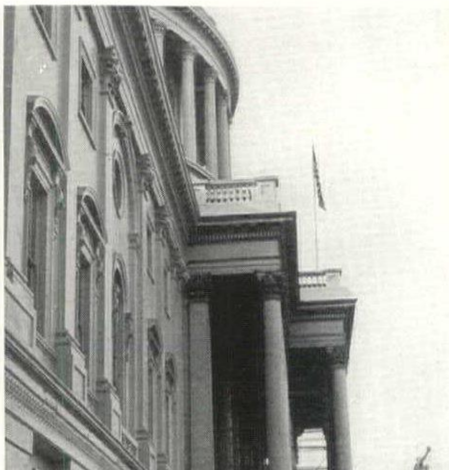
4. *To bring the central part into harmony with the wings.* Since it is the general opinion that the stereotyped classicism of the wings is unquestionably inferior to the central part, why debase the central part?

This matter of rebuilding the east front has been discussed for seventy years, but reason has heretofore prevailed, and saved us the Capitol. Nevertheless, those who would fix it are active and vociferous. I understand that the Chapters of the A. I. A. are being informed as to the present movement in Congress with a request for their opinions. Here then is a chance for all those to be heard who believe that, if architecture is in truth a record of civilization, there is not much sense in altering the record after a century or two and still calling it a true record.

Wednesday, March 3.—New York's new building code, which has been on the fire at least since 1935, if not before, is practically completed. I suppose the number of hearings and words spent in argument would fill an encyclopaedia. The trouble with a job of this kind is that it takes so long to complete it that by the time it is in force, another one should be started. However, there seems to be some prospect of getting it adopted within two or three months. There are many other municipalities waiting to copy it intact or to use it as a basis of their simpler requirements.

Thursday, March 4.—Frank Crowninshield told us today at luncheon some of his thoughts concerning the present trend of art. The prospect was not particularly encouraging. Crowninshield feels that the present era, through its manifestations of surrealism and other extreme forms of expression, indicates the raveled ends of a period of art—a period now in its decadence. He thinks that possibly the race is so strongly marked by immorality, or unmorality, as to lack inward spiritual forces that have always produced great art. Incidentally, he regards Picasso as a painter who has already influenced and probably will continue to influence painting more deeply than any artist of the past.

Friday, March 5.—Stephen Frank Voorhees, chairman of the Board of Design, New York World's Fair 1939, mentioned to some of us today the desirability of making provision now for an adequate history of the processes of design followed in this great work. So far as any of us knows, there has never been an adequate record of an exposition aside from the usual superficial book of photographs and captions. How a fair took its form, what alternatives were discarded, what items were thought of significance—these things are usually lost in the fog, and are never again recovered by the historian. It is a particularly attractive job for someone. I can imagine few occupations of greater benefit or stimulus to some architectural student just out of college, than to live with the Board of Design, hear their discussions, record the kaleidoscopic movements of the design, and incidentally, learn how some of our most eminent architects think and draw and get things built. What a chance for a fellowship from one of the foundations!



Here's your chance to see that much discussed overhang of the dome on the east front of the Capitol. It worries a few people

Monday, March 8.—The Committee on Architecture for the forthcoming League Show met today to consider the material submitted. It is a good deal like seating oneself in front of a pile of Christmas gifts, and opening one after another in the expectation—or at least the hope—of finding something beautiful. Occasionally the contents of a package goes beyond one's expectations, but not often. Considering the arid years that have just passed, one should not expect too large a harvest. Each annual committee, I suppose, is faced with the alternative of selecting only what the members admire or, on the other hand, attempting to secure a representative showing whether they like it or not. The second alternative seems the logical one to follow.

Wednesday, March 10.—Of the small house architectural groups, Boston's seems to be particularly active. This group is working in conjunction with the Co-operative Bank League, and they are not only publishing a monthly magazine, the *Massachusetts Home Owner*, but are now planning to build a house from a design of the late Bruce Elwell.

Thursday, March 11.—Eugene Savage, who has been appointed to the National Commission of Fine Arts under two administrations, told some of us at lunch today of his experiences with W. P. A. mural painting. Speeding up the pace to include many more painters has had the effect of soft-pedaling the usually accepted traditions and conventions of mural art, and has brought, besides, a new vigor and perhaps a more accurate reflection of our times.

Savage made the point that, in our new

buildings, we are using far more extensively the bright polished surfaces that the machine age gives us for our walls and trim. As a result, bone fresco, with its non-reflecting and porous surface is out. The two kinds of surfaces have nothing in common.

Saturday, March 13.—Everett O. Fontaine, of the American Library Association, says that reports from the libraries indicate that certain books are frequently asked for by readers, and are at present not available. Here are some chances for the architectural author: a Biographical Dictionary of Ancient and Modern Architects; a Modern Who's Who of Architects; Biographical Sketches of Modern Designers.

Monday, March 15.—Good news about the Bulfinch Church at Pittsfield, Mass., which we reported last month was being offered to anyone who would take it away. Word comes that the building is to be removed to a nearby location, and restored to use as a church—All Souls and All Saints Church.

Boston, Tuesday, March 16.—Boston, it must be admitted, has not apparently felt the full lift of building activity that has been stirring most of the country. The architects seem to be engaged for the most part in some residential work of moderate size, and minor alterations. This may be to the benefit of the profession generally in that the Boston architects have more time to give to the prospective role as hosts to the A. I. A. Convention in early June. One encouraging detail of their plans is that the business sessions are scheduled to occupy mornings only, with each afternoon of the four-day session open for seeing what there is to see about Boston and its architecturally interesting environs.

Boston, March 17.—Spent an hour or so with Henry R. Shepley, whose office is studying several projects in their preliminary stages in model and perspective rather than merely in plan and elevation. Having determined the proper plan, a series of cardboard models are made for the study of volume. This study is carried farther by means of rough perspectives which deal largely with the interrelation of volumes and with fenestration. The surprising thing is that when an accepted scheme in perspective is translated back into elevations, it seems difficult to justify these in their appearance as pure elevations. In other words, if one were satisfied to accept a final result on the basis of elevation alone, the result in perspective would be utterly different and probably disappointing.

Friday, March 19.—Walter Gropius received a welcome at a League luncheon today that must have impressed him not only with the interest of the profession in architectural education, but also as to its confidence in his personal ability to bring some order out of the present haze. Gropius, perhaps because of his recent two years' work in England, has no handicap in the language. He speaks English well and understandingly. Fundamentally, of course, Gropius would be the last man to attempt the imposition of another "style" upon architecture. Rather would he free the student of the habit of attempting to express himself automatically in any style. Gropius believes in a close correlation of the hand and brain. In the Bauhaus he precedes the teaching of design by a training of the hand in actual contact with building materials and the crafts. It is only through this complete familiarity with materials and how they can be formed to our purposes that a sense of design can be inculcated. What Gropius does at Harvard will most certainly be worth watching.

Monday, March 22.—There is a provocative page in *The Architects' Journal* (London) for January 21, entitled, "Custard-Pie Comedy." Slapstick, and some of its more sophisticated successors, make us laugh because of the misapplication of human effort. There is a side-splitting case of this in the way we build things. "A meandering road through a country town, which citizens have strolled or toddled across for centuries, is straightened, smoothed and widened to help motor traffic to travel easily. And is the result of this road space considered ludicrous? Not a bit. It is called a grave national problem, the toll of the roads, today's slaughter and a social menace.

"Sometimes, of course, we have thought of another way—a new road, around the existing town, expressly designed for easy and fast motor travelling. And naturally, the former use of a road (as a surface on which the local population, the aged, perambulators, mothers and children can move to and fro without danger) is prevented from establishing itself on these new roads. Naturally. No such thing! Why, it would be an outrage to the most primary conception of individual freedom and individual rights. Having created the modern road for modern uses, nothing remains but to let the ancient uses of a road add themselves to the new uses."

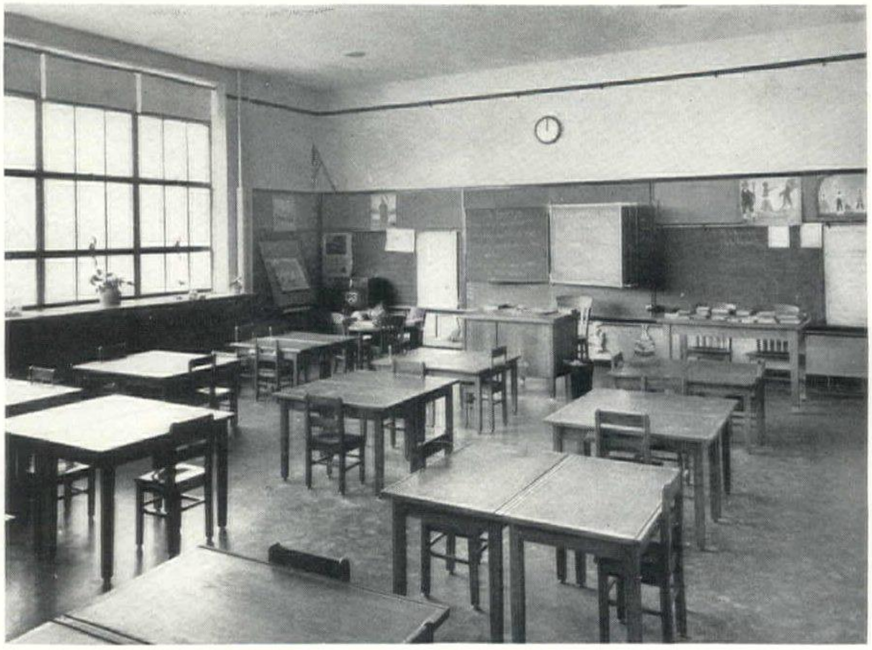
Wednesday, March 24.—The new bridge spanning San Francisco Bay between San Francisco and Oakland reveals a new balance among the materials used for its construction. Neither steel nor concrete has seized the spotlight as in so many modern bridges. With these favorites there is a wide use of clay products. Clay is used in the form of a new lightweight aggregate for concrete and also in the tile paving on the traffic lanes.

Friday, March 26.—It is an interesting fact that, as we look back over recent architectural history, it is the administrative type of architect who stands out with the bulk records of achievement. Daniel H. Burnham was certainly not a designing architect, but he left an enduring mark on American building. Ernest R. Graham, his disciple, who died late last year, set a stupendous record of building achievement. From just after the World's Columbian Exposition to the day of his death, he was actively associated with the design and erection of five hundred buildings which cost over five hundred million dollars. Sir Christopher Wren, whose services to London after the great fire, set a bulk record, built, according to Thomas E. Tallmadge, one hundred and three buildings costing at present valuation about twenty-eight million dollars. And this work of Wren's extended over a practice of about fifty-five years.

Monday, March 29.—It has not fallen to my good fortune to buy very much furniture lately, so that I am rather startled by a new term used in the patter of the furniture salesmen. They speak of "distressed" furniture, and by this mean furniture that has been hammered about, punched with worm holes, artificially rounded on the wearing edges, and otherwise lowered from its pristine estate as craftsmanlike woodworking. "Distressed" is a good word for it, and the term applies with even more fitness to those who quail before such an obvious abuse of clean craftsmanship.

Wednesday, March 31.—Alexander C. Guth of Milwaukee, in his work as head of the Historic American Building Survey in Wisconsin, discovered an interesting example of Greek Revival work in the Iowa County Court House in Dodgeville. It is a simple enough structure—with four columns along the east front and a cupola. The startling fact, however, is that the builders of the early 'forties deliberately tipped their corner columns inward at the top in imitation of the Greeks' efforts at visual refinements. Considering the fact that Professor Goodyear uncovered these refinements for most of us within the present generation, how did these backwoods builders happen to know the trick?

Much thought has been given to the built-in equipment in this well planned elementary school classroom. Note the sunboard under the windows, and the pupil cubicals below; also the multiple-leaf chalkboard on the front wall. On the window wall at the front of the room is a reversible chalk and corkboard showing the paint tray in operation. Tack strips above the chalkboard and map rails above and below the chalkboard are provided.



UNIT PLANNING · IV CLASSROOMS

Subjects already presented include closets, stairs, and kitchens. Contemplated subjects include the unit planning of bathrooms, hospital wards and operating units, and apartments.

BY N. L. ENGELHARDT, JR.

EDUCATIONAL VALUES of modern schools are of necessity largely dependent upon the design and equipment of elements which go to make up the school building. Of these elements the classroom exists as the basic unit. Depending upon its size, layout and equipment it serves fundamentally as a measure of the building's physical efficiency. Therefore, the school classroom is properly regarded by educator and architect alike as a planning unit of controlling importance.

Because of the wide variance in curricular demands, school classrooms are subject to standardization only within limits of certain essential factors. But within these limits can be established standards of area and volume, space utilization and adaptable equipment which, with minor variations, will meet requirements common to most school buildings.

The following paragraphs, together with the Time-Saver Standards that accompany them, present these standards. Information has been compiled from a wide range of official sources and has been carefully checked and edited. As presented it represents, not a series of recommendations for any specific problem, but a distillation of practices deemed essential by educational authorities to achieve the greatest possible educational values consistent with an economical and efficient plant.

SIZE OF CLASSROOMS

The problem of determining the optimum size of classrooms has been divided into five divisions, namely, width, length, height, area per pupil, and cubage per pupil.

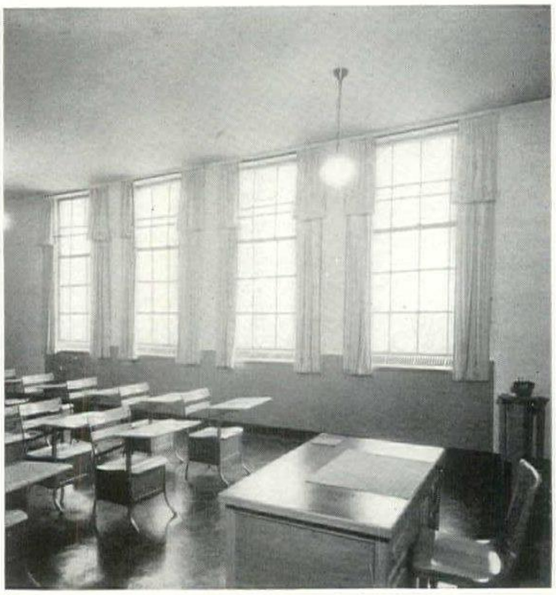
Width of Classrooms

Width is determined by the amount of natural light reaching all pupil stations in the room. The number of rows of desks which a given width will accommodate is of no importance in the modern school utilizing movable furniture in informal groupings.

To express width in terms of the height of the room without giving supplementary window specifications is of little value. Assuming that windows meet the requirements given in a later paragraph, then width may be expressed as follows:

Width $= 2 \times$ Distance from Floor to Top Sash of Windows

If windows do not have a square head, then the height measurement must be taken only to the point where the curvature begins. Classrooms



Left: the divided shading of upper and lower parts of the windows is provided for in this instance by the use of draperies. The proximity of the window heads to the ceiling, and the movable desk and chair units, are also noteworthy. Right: desirable divided shading is here taken care of by window shades. Window seats, flower boxes, and storage cabinets have also been provided

which are bilaterally lighted (windows on the two opposite, long sides of the room) may be considered as two separate rooms in applying the formula. In other words, width may be four times the height of the windows and still provide sufficient natural lighting.

Although the multiplying factor of 2 is quite commonly used, it is well to bear in mind that this is not entirely satisfactory. Repeated tests have indicated that even where room width does not exceed twice the window height, the intensity of natural light on the side opposite the windows is frequently insufficient for comfortable vision. Therefore, whenever possible the width should be less than twice the window height.

Length of Classrooms

The length of the classroom governs seating capacity. Seating capacity is in turn determined by the number of pupils and the number of square feet to be allowed each pupil. It would therefore appear that standards for minimal length should be expressed in terms of the number of square feet desired in the room;

$$\text{or, Length} = \frac{\text{No. of Sq. Ft. per pupil} \times \text{Class Size}}{\text{Width of Room}}$$

The number of square feet per pupil may vary from 16 to 50, depending on the type of activity to be carried on in the room. Therefore, standardized lengths may not fit the educational program. It is reasonable to assume, however, that regardless of the number of pupils using the room, the length should never be less than the width.

Height of Classrooms

Basically there are two factors involved in determining the desirable heights of classrooms:

a. The number of cubic feet of air space pe[r] pupil required to sustain a comfortabl[e] working condition.

b. Sufficient height to permit installation o[f] adequate window area.

If the height of rooms is to be determined in th[e] light of the first factor the formula may be:

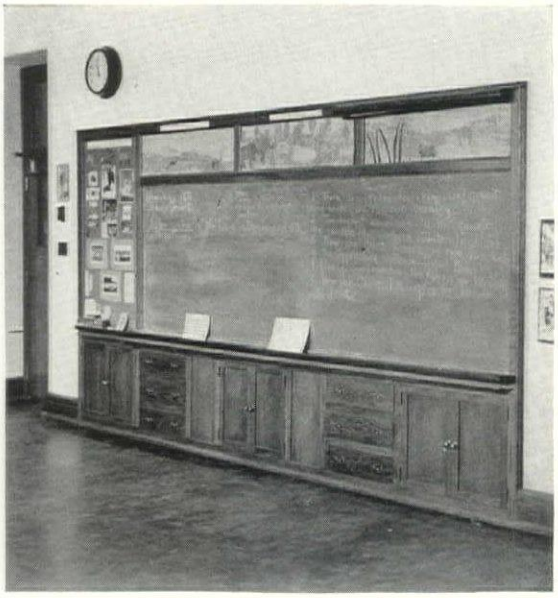
$$\text{Height} = \frac{\text{No. of cubic feet per pupil require[d]}}{\text{No. of square feet per pupil require[d]}}$$

Influence of the second factor will be considere[d] under the subject of required window areas.

Space Requirements

The number of square feet per pupil is almos[t] entirely dependent on the type of activity in whic[h] the pupil is engaged. Shop work and fine arts re[-]quire almost twice as much space as informa[l] discussion groups such as might be found in [a] senior high school English course. For recita[-]tion and discussion rooms 16 square feet per pup[il] is satisfactory. However, the modern educationa[l] program includes much pupil activity in the class[-]room. Model building, plays, and group discus[-]sions demand more room. For rooms in whic[h] such a program of instruction is to be carried ou[t] 18 square feet per pupil is not too much space[.] Kindergartens should provide at least 30 squar[e] feet per pupil. Special classrooms in high school[s] will require from 25 to 50 square feet per pupil[.]

The number of cubic feet to be allowed pe[r] pupil is largely dependent on the desirable ai[r] capacity of the room. With mechanical ventilat[-]ing methods this factor is of little importance[.] However, with sufficient air capacity the cost o[f] forced ventilation may be reduced. The range o[f] 200 to 500 cubic feet should be considered in re[-]lation to the method of ventilation. Below 20[0] cubic feet per pupil is unsatisfactory in any case[.]

Left: high school biology laboratory illustrating use of corridor windows. Note also the radio loud-speaker, clock, and storage cabinets at front of room. Right: corridor wall side of elementary school classroom. Cabinets and drawers below the chalkboard are very useful. Tackstrip above chalkboard, and corkboard adjacent to the door, are used extensively. Note clock and thermostat locations

CLASSROOM DOORS

Doors 3 feet by 7 feet are satisfactory. Thresh-olds should be eliminated to facilitate easy clean-ing. Installation of transoms should depend on ocal conditions. If sound-motion pictures are used extensively as part of the modern educa-tional program, transoms should be omitted to nsure proper sound insulation. If such is not the case, they are desirable for ventilation and to light corridors. Locks on all classroom doors should be operable from the corridor side only.

Doors should open outward in the direction of exit travel and be so hung as not to interfere with corridor traffic. For elementary schools one door to a classroom is sufficient; for high schools two doors are desirable. The matter of glass panels n the door is entirely one of local taste. In many cases teachers will cover them with cardboard or paper, resulting in a disorderly appearance.

CLASSROOM WINDOWS

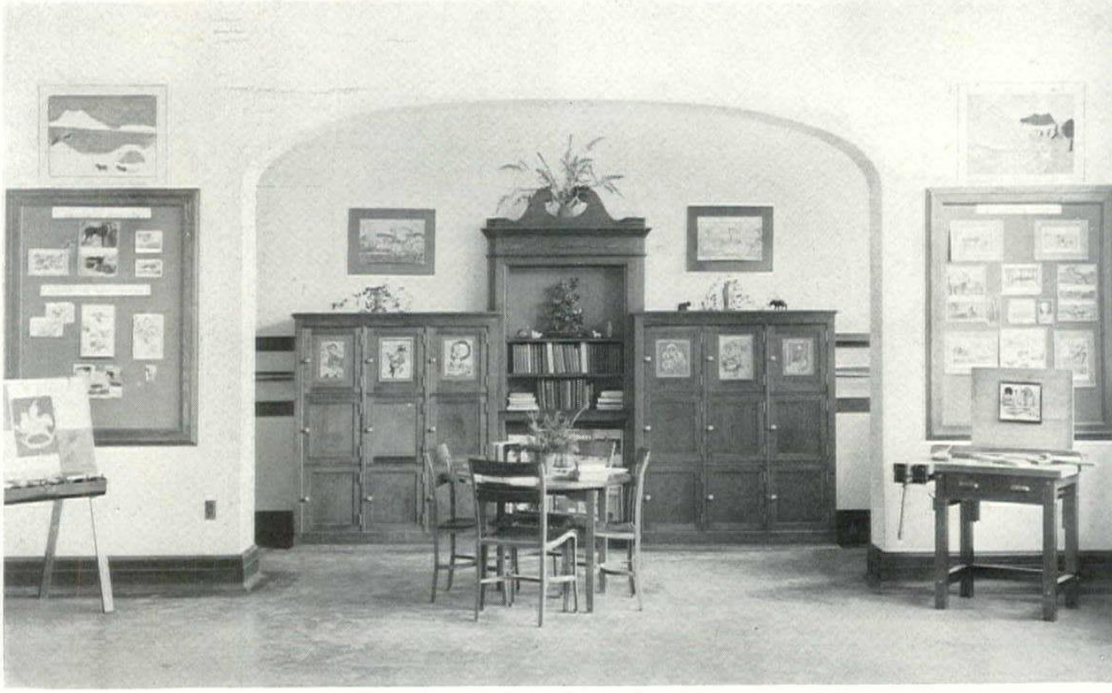
A maximum of window area should be provided. At least 1 square foot of glass area to each 5 square feet of floor area is essential. Mullions should be as narrow as possible, and preferably not more than 12 inches. Sill heights of from 34 to 38 inches will insure that no glaring light reaches the eye from below eye level when pupils are seated. Windows should never be more than 6 inches below the ceiling, and preferably flush in order to admit the greatest amount of natural light.

If movable partitions are to be used between rooms, it is particularly desirable to extend the window area the full length of a room. There seems to be little justification for the solid wall near the front of the room, provided shades or blinds, or draperies are installed for use when needed.

RECOMMENDED MINIMUMS FOR GENERAL CLASSROOMS

Recommendations are conclusions drawn from comparative analysis of 25 state codes, standards of the National Council on Schoolhouse Construction, and from the published works of N. L. Engelhardt and G. D. Strayer.

1. **Width:** The width of classrooms should never be more than twice the height of the windows.
2. **Area:** There should be allowed at least 16 square feet per pupil.
3. **Volume** At least 200 cubic feet per pupil should be allowed.
4. **Windows:** The total glass area should never be less than one-sixth the floor area.



Space at the rear of this elementary school classroom provides pupils' cubicals and library in addition to serving as a coatroom. Note the work bench, corkboard, and painting easel

The recommendation for single-wall day lighting to the left of pupils is open to considerable argument. In the days when writing and desk work took up most of the pupils' time, there may have been some justification for lighting from the left. The primary purpose was to eliminate shadows on the writing paper. Today, however, much classroom activity requires arrangements of desks in groups rather than in rows. There is much greater freedom in adjusting positions of chairs to suit individual tastes of pupils. Under such conditions basic assumptions regarding unilateral lighting no longer hold. It is believed that the more light that can be secured the better for the pupils. Except in limited cases two-wall or even three-wall day lighting is satisfactory.

CLASSROOM EQUIPMENT

The greater part of classroom equipment, with the exception of tables, desks, and chairs, is an integral part of the room and is usually fixed securely to either walls or floors or both.

Chalkboards

Chalkboards should be low enough to permit the shortest pupils to write with ease and high enough for the tallest pupil to write without bending down. A table of chalkboard heights is given on Time-Saver Standards Serial No. 78, "Classroom Units—Recommended Standards."

A desirable width of chalkboard is 36 inches. The maximum width is 42 inches. Lengths will vary from room to room. Chalkboard on front and side walls should be considered a maximum amount in any case. A large number of rooms in the upper grades will require chalkboard on the front wall only. Chalkboard on side walls absorbs light where it is most needed and should, therefore, be avoided whenever possible. Use of multiple-leaf type boards, and reversible chalk and cork boards should be considered as a desirable means of increasing flexibility.

Bulletin Boards

A maximum of bulletin board space is desirable. Space not devoted to chalkboards, cabinets, etc., should be utilized for bulletin or display boards. A tacking strip above chalkboards is desirable in most cases. In the lower grades cork board panels below the chalkboard are desirable since pupils are unable to reach above the board. A combination map rail and tack strip is very useful both above and below chalkboards.

Wardrobes and Coatrooms

Storage space for pupils' outer garments may be planned in one of three ways. For elementary school classrooms, space at the rear of the room may be added as a coat room; or ventilated wardrobes may be placed along the rear wall. A coat room should never be less than 5 feet wide. Window area to floor area should be of the ratio of 1 to 12. In the case of wardrobes, less space is needed and the unit is under direct teacher control. A method of storing clothes in high schools provides for lockers installed in the corridor alcoves or along corridor walls.

It is generally agreed that shades should be translucent and operate in both directions from the center of the window. In some cases curtains or draperies may be useful and decorative. Opaque shades are becoming more necessary with the introduction of motion pictures in the classroom.

In this instance the additional space at the rear of the room is used as a coat room only, and is separated from the classroom by doors containing ventilating grilles

A combination of translucent shades and opaque draperies is one answer to the problem of darkening the room for showing pictures.

Classroom Finishes

Walls should be of a finish with a light reflecting value of not less than 50 per cent nor more than 70 per cent. Ceilings should have a light reflecting value of at least 75 per cent, and preferably 80 to 90 per cent. The reflective factors of desk surfaces, wood trim, and floors, should not be more than 30 per cent. Glossy finishes should be avoided because of eye strain from specular reflection of light rays.

Classroom Furniture

Individual desks and chairs are essential, and should either be of the adjustable type or in such sizes and quantities as the pupil capacity demands. (See T-S.S. Serial No. 78, April, 1937). If desks and chairs are fixed to the floor, it is necessary to allow aisles adjacent to all walls and between rows. Under such conditions 2 feet 6 inches near walls, and 1 foot 6 inches intermediate aisles are satisfactory. From 6 to 8 feet should be maintained at the front of the room. Modern teaching methods, however, demand that desks and chairs be movable to permit grouping in any arrangement which may best fit the need of the moment. Under such conditions any definition of aisle spaces immediately loses all meaning.

In addition to pupils' desks and chairs, there will be need for a teacher's desk and chair, bookcase, magazine rack, display case, storage cabinets, sunboard, files, and chart cases. The teacher's desk should be approximately 52 inches by 32 inches. The bookcase, magazine rack, and storage cabinets may be 4 feet to 6 feet wide. Their height may be equal to the height of the chalkboards. The depth of bookcases and magazine racks may be 8 inches. Chart cases, student lockers, and files should be built into the walls below the chalk trough. Other equipment should include a clock, loud-speaker on the front wall, inter-phone connections, and service system connections.

UNIT PLANNING DATA

In the accompanying Time-Saver Standards are compiled data which are pertinent to the planning and equipment of school classrooms.

T-S.S. Serial No. 77 lists a representative number of State regulations controlling the layout and essential equipment of school classrooms. Although valuable as a guide to minimum legal provisions, this tabulation does not represent—except in isolated instances—recommended standards from either the educational or architectural standpoint. These standards are outlined in T-S.S. Serial No. 78.

Drawings, tabular material and text on this sheet present detailed recommendations for various types of classroom units considered as an average minimum. They deal only with arrangements of space and equipment regarded as essential by most progressive educators; and thus can be considered as generally applicable in the basic solution to modern school planning problems. It is obvious, however, that no set formula can be derived that will work equally well in all cases. Therefore, the Time-Saver Standards planning units should be regarded as a desirable basis for preliminary planning, susceptible to adjustment in all details as warranted by limitations of the building requirements and the projected program of educational activity.

AMERICAN ARCHITECT
TIME-SAVER STANDARDS

Serial No. 77
APRIL 1937

SCHOOL CLASSROOMS—STATE REQUIREMENTS

PURPOSE

Tabular material herewith presents an analysis of classroom requirements of 32 states. The survey was made by N. L. Engelhardt, Jr., assisted by W. D. Stratford and R. C. Dailard.

This sheet is intended as a guide to minimum legal provisions. It should be used in conjunction with T-S.S. Serial No. 78, "School Classroom - Recommended Standards", which should be consulted for a more complete explanation of terms and for the inclusion in classrooms of certain factors not covered by state regulations.

No regulations are published by the following states, but consult Board of Education: Col., Nev., Miss., Utah, Neb., N. H., Oregon. States marked ● have suggested, not mandatory standards.

NOTES

SIZE:

- 2H 2 × height of room.
- HW Window height.
- # Opt. length, high school only = 26'-0".
- * For high school. L (min.) = 21'-0", (max.) = 30'-0".
- X W may never exceed 2HW.
- Y For high schools: Max. width = 2H.
- Z For primary rooms: L = 40' to 45', W = 21' to 22'.

DOORS:

- a Solid door with breeze window from clg. down.
- b No thresholds.
- c Transom required. Door glass: 1 pane cl., remainder translucent.
- d Swing in unless alcoved (recessed), then swing out but not to protrude. Max. size 3'×8'.
- p Cl. glass.
- w Cl. wire glass.

CHALKBOARDS: F = front; S = side opposite windows.

- a Grades 1-2:24"; 3-4:26"; 5-6:28".
- b Grades 1-2:26"; 3-4:28"; 5-6:30".
- c Grades 1-4:36"; 5-6:36" to 42"; H. S. 42".
- d Grades 1-2:24" to 26"; 3-4:26" to 28"; 5-6:28" to 30".
- e Prim. 12' to 18': Elem. and H. S. 30' to 39'.
- f Grades 1-2:24"; 3-4:26" to 30"; 5-6:28" to 32".
- g Grades 1-2:26"; 3-4:28"; 5-7:31".
- h 3' in Elem. and Jr. H. S.; 4' in H. S.
- i Grades 1-2:24" to 28"; 3-4:26" to 30"; 5-6:28" to 32".

WINDOWS: Location depends on direction pupils face. L = left; R = rear; LA = long axis of room; Close = close as construction permits.

- a If ceiling is 13' - 14', windows may be 18" from ceiling.
- b Prefer 1:5 or 1:4.
- c If windows face north 1:4 is required.
- d Top of window 12'-3" from floor.
- e Double hung windows specified.
- f Rear windows and windows above chalkboards acceptable. Unilateral pref.
- g Larger ratio required if windows face north.
- h Top of sill must be above plane of vision.
- i Elem. schools 36" to 42"; H. S. 42" to 48".
- j If unilaterally lighted 4'; if bilaterally lighted 8'.

ARTIFICIAL LIGHT: * Parallel to windows.

HEATING & VENT.:

- BP At breathing level.
- ■ Cu. ft. per min. per pupil.
- * Minimum
- a Above floor.
- b Or 6 changes per hr.

AISLES: * Depends on seat size

COLORS & SHADES:

- * Percent = reflectivity
- C Cream, T Tan
- I Ivory, G Gray
- W White, Gn Green
- B Buff, Bn Brown

EQUIPMENT:

- a Elem. 8'-12'; H.S. 4'.
- b Same width as chalkboard.
- c Elem. 24 sq. ft.; H.S. 24 - 80 sq. ft.
- d 2'-8" back to back, 19" wide.

	Ala.	Del.	Fla.●	Idaho	Ill.●	Kan.●	Ky.	Md.	Mass.	Mich.	Minn.	Mo.●	N. J.	N. Y.	N. Car.●	Okla.	S. Dak.	Tenn.●	Tex.	Va.	Wash.●	W. Va.	Wis.	Wyo.	Ind.●
SIZES — Length "L" — Minimum	28'-0"		30'-0"							Y 20'-0"	* 24'-0"				30'-0"										
SIZES — Length "L" — Maximum										Y 32'-0"	* 32'-0"				Z										
SIZES — Length "L" — Opt.	30'-0"	31'-0"			30'-0"	30'-0"		# 29'-0"		32'-0"					32'-0"					30'-0"	30'-0"	32'-0"	32'-0"		32'-0"
SIZES — Width "W" — Minimum	20'-0"		21'-0"							Y 15'-0"	21'-0"	21'-6"			21'-0"			21'-0"			22'-0"				
SIZES — Width "W" — Maximum			2H			2H	2H	23'-0"	2-1/2 HW	24'-0" Y	23'-0"	24'-0"			2H			23'-0"	2HW	2HW	24'-0"				23'-0"
SIZES — Width "W" — Opt.	22'-0"	23'-0"			23'-0"	26'-0"				24'-0"		2H			Z					22'-0"	X	24'-0"	23'-0"		23'-0"
SIZES — Height "H" — Minimum	11'-0"			11'-0"			11'-0"			12'-0"			12'-0"				12'-0"			12'-0"	11'-6"		12'-0"		
SIZES — Height "H" — Maximum				14'-0"																	12'-0"				
SIZES — Height "H" — Opt.	12'-0"		12'-0"		12'-0"	13'-0"						12'-0"			12'-0"			12'-0"				12'-0"			12'-0"
SIZES — Sq. Ft. per Pupil		18	15	15	16		15			15		16	18		16	15	18	16		15	16	15	16		
SIZES — Cu. Ft. per Pupil		200	200	225	192	200	175			200-250		192	200			200	216			175	200				
AISLES — Width Aisle — Window Side					2'-6"					2'-6"				Aisles must run long way of room	2'-6"			2'-6"							
AISLES — Width Aisle — Corridor Side			3'-0"	2'-6"	2'-6"						2'-6"-3'-0"				2'-6"			2'-6"					2'-4"		
AISLES — Width Aisle — Intermediate			18"	18"	18"					* 18"-21"	18"-24"				18"			18"					18"		
AISLES — Front Wall to 1st. Row			6'-0"		6'–8'										6'-0"										
AISLES — Rear Wall to Back Row			2'-0"		2'-6"										2'-0"										
COLORS & WINDOW SHADES — Shades Operate from Center					Yes	Yes				Yes								Yes						Bottom or Center	
COLORS & WINDOW SHADES — Translucent Shades		Color ecru	Yes	Yes	Yes	Yes				Yes	Optional	Yes			Yes		Yes	Yes					Yes		Yes
COLORS & WINDOW SHADES — Colors — Ceiling*		W-C	60%		C-I					I	C-I	60%			C-I 60%			C-I			I-C-W 60%				I-C-W
COLORS & WINDOW SHADES — Colors — Wall*		B-C-G	50%	C-G-Gn	C-B-T					B-C	G-T	Light			B-T 50%			C-B-T			30-50%				B-T-C
COLORS & WINDOW SHADES — Colors — Dado		Bn	Dark		T-Bn													T-Bn							Dark
COLORS & WINDOW SHADES — Glossy Finish			No	No								No			No						No				
EQUIPMENT — Bulletin Board	Elem. 8'-12' H.S. 4'		Yes		15 Sq. ft.							Yes b			Yes			24-80 Sq. ft. c		20 Sq. ft.	20 Sq. ft.				Yes
EQUIPMENT — Tack Strip Above Chalk Board	Yes																			12" Wide					
EQUIPMENT — Book Case	100 Books		Yes		Yes		Yes					Yes			Yes					For 100 Books					
EQUIPMENT — Teacher's Locker	Yes						Yes																		
EQUIPMENT — Storage Closet		Yes	Yes		Yes		Yes								Yes										Yes
EQUIPMENT — Individual Seats				Yes		Yes											Yes			Yes d				Yes	

AMERICAN ARCHITECT
TIME-SAVER STANDARDS

SCHOOL CLASSROOMS—STATE REQUIREMENTS

Serial No. 77
APRIL 1937

State	DOORS: Width	Height	Thickness	Location	Direction of Opening	Number	Locks Inside	Glass Panels: Area	Glass Panels: Location	CHALKBOARDS: Height from Floor: Primary	Elementary	Junior High School	Senior High School	Width Top to Bottom	Area or Length	Position	Material	Color
Ala.					Out		No			26"	26"	30"	32"	42"	8' Front 20' Side		Slate or Compo.	
Del.	3'	7'						W Upper ½ Door			a	30"	32"	48"		F & S	Slate	
Fla.•	3' a	7'	1¼"		Out		No	W 6"x8"	5' High		a	30"-36"	30"-36"	36"-42"	1' per Pupil	F & S		
Idaho					Out					26"	30"	36"	36"			F & S	Slate	Black or Green
Ill.•	3'	7'	1¼"	Front	Both or out	1	No	p 6"x8"	Upper pt.	24"	b	32"	36"	c				
Kan.•															100 sq. ft. - 4 sq. ft. per pupil plus 30 sq. ft.			
Ky.	3'	6'-8"		Front	Out						d	30"-32"	30"-32"		Adequate			
Md.					Out	2	No				a	32"-36"	32"-36"					
Mass.						2												
Mich.										24"	a	30"-32"	32"-36"	42"-48"			Slate	Even
Minn.	3'	7'		Front						24"	26"-28"	30"		Min. 42"	100 sq. ft. in Elem.			
Mo.•	3' b	6'-10"	1¼"	Front	Out			W	Upper pt.	22"-24"	a	30"	32"-36"	36"-42"	e	F & S		
N.J.					Out				On Swing Doors		26"	30"		48"	All avail. space F. & S.		Slate	
N.Y.										Depends on age						F & S		
N.Car.•	3'	7'	1¼"					W	Upper pt. c		f	30"-36"	30"-36"	36"-42"	30'-39'	F & S		
Okla.																		
S.Dak.																		
Tenn.•	3'	7'	1¼"						Upper ½		f	30"-36"	32"-36"	36"-42"	20'-40' for El.			
Tex.					Out													
Va.	3'	7'			In d		No				g	31"	36"	h	20'-40'	F & S		
Wash.•	3'	7'			Out		No	24"x30"			i	30"-36"	34"-38"	Max. 42"	22'-39'		Slate	
W.Va.	3'	7'			Out				Upper ½									
Wis.										24"		30"		36"-48"			Slate	
Wyo.										26" to 30"					20'			Dull Finish
Ind.•																		

State	WINDOWS: Ratio Glass: Fl.	Location	Unilateral	Exposure	Distance: Front Wall	Distance: Rear Wall	Distance: Ceiling	Sill Height	Width Mullion	Angle to Sky
Ala.	1:7	L or LR			4'	Close	Max. 12"	38"	Max. 12"	25°
Del.	1:5	L LA			5'-7'		Max. 6"		Small	
Fla.•	1:5	LA		E & W	5'-7'	30"	Max. 6"	Min. 40"		
Idaho	1:6	LA					Max. 12" a	Min. 48"		
Ill.•	1:6 b	LA	Yes	E & W	5'-7'		Max. 6"	36"-42"	Max. 28"	
Kan.•	1:5 c		Yes	E & W				36"-48"		
Ky.	1:6 e	L	Yes	E & W	4'		Close	36"	Max. 12"	
Md.	1:5		Yes f		5'-6" - 6'		d	39"-42"	Small	
Mass.	1:5						Max. 8"			
Mich.	1:5 g	L	Yes				Max. 6"	30"-42"		
Minn.	1:5	L LA						Min. 36"		
Mo.•	1:5	LA	Yes	E & W	5'-7'		Max. 6"	h		
N.J.	1:5	L or R					Close			
N.Y.	1:5	L		Sunny	Min. 6'		Close		Max. 8"	
N.Car.•	1:5	LA	Yes	E & W			Max. 6"	h		
Okla.	1:5						Max. 6"	36"		
S.Dak.	1:5	L	Yes				Close	High		
Tenn.•	1:5	LA	Yes	E & W			Max. 6"	i		
Tex.	1:5	L	Yes				Max. 6"	42"		
Va.	1:5	L or R			4'		Max. 6"	42"		25°
Wash.•			Yes				Close			
W.Va.	1:5	L	Yes				11' from Floor	42"	Max. 12"	
Wis.	1:5½				j	Close				
Wyo.	1:5	L or R		E & S						
Ind.•										

State	ARTIFICIAL LIGHTING: Foot Candles	Intensity Plane	Fixtures: Type	Fixtures: Number	Layout	HEATING VENTILATING: Temperature	Temp. Reading at	Control Humidity	Air Flow or Change ■	Window Vent Accept	Automatic Control	Outside Air Reg.
Ala.												
Del.	5	Working	Semi-Direct			70°			30 Cu.ft.	Yes		
Fla.•	8		No Glare						30 Cu.ft.			
Idaho						60-70°			30 Cu.ft.			
Ill.•	8	Working	Semi-Direct No Glare	* 2 Rows	Sep. Con.	70°		50%	30 Cu.ft.			
Kan.•						68-70°						
Ky.						70°	3'-4' a					
Md.										Yes	Yes	
Mass.	5 Min.		No Glare			68°	BP		30 Cu.ft.			
Mich.	3 Min.		Semi-Direct No Glare	6 Fixtures		68-70°			Adequate			
Minn.						68-70°		Yes	30 Cu.ft.			
Mo.•	8-10		Enclosed	4 Fixtures	2 Banks							
N.J.						70°			30 Cu.ft.			
N.Y.						70°		35%	30 Cu.ft.			
N.Car.•	8		No Glare								Yes	
Okla.									30 Cu.ft.			
S.Dak.									30 Cu.ft.			
Tenn.•	10	On Desks	No Glare			68°	3' a			Yes		
Tex.									30 Cu.ft.		Yes	
Va.									3* per Hour			
Wash.•												
W.Va.												
Wis.				6 Fixtures					30 Cu. ft. b		Yes	10 Cu. ft./Min/Pupil
Wyo.												
Ind.•			Semi-Direct	4 Fixtures	150 W. Each	67-70°			Sufficient Quantity			

Serial No. 78

APRIL 1937 SCHOOL CLASSROOMS—Recommended Standards

PURPOSE

This T-S.S. outlines normal classroom requirements and the adaptations desirable in specific cases. Data are based upon comparisons of state codes (see T-S.S. Serial No. 77, "School Classrooms—State Requirements"), recommendations of the National Council on Schoolhouse Construction, and of published works of Drs. N. L. Engelhardt and G. D. Strayer. Research was conducted by N. L. Engelhardt, Jr. and assistants. State or other authorities having jurisdiction should be consulted in all cases.

SIZE OF CLASSROOMS

Maximum Width of 24'-0" is based upon amount of natural light reaching all pupil stations. In the formula *Width = 2HW*, HW represents distance from floor to top of sash of flat headed windows or spring line of curved heads. If window exposure is poor or light is otherwise diminished, width of classroom should be reduced. If windows are on two parallel exterior walls, width may be doubled.

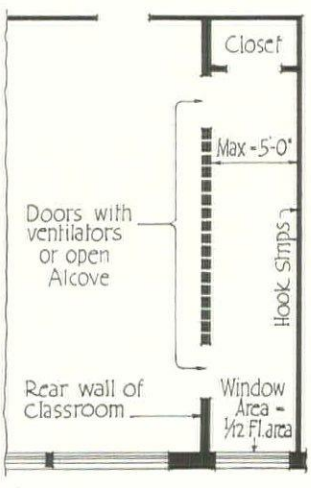
Length, Height and Space Requirements, including area and cubage per pupil, are outlined both in maximum dimensions and by formula in the accompany diagrams.

DOORS AND WINDOWS

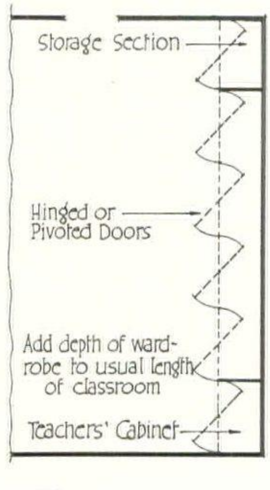
Doors should be 3'-0" by 7'-0", should open out toward exits, and should have no thresholds. Transoms serve only to light otherwise dark corridors and should be omitted if sound pictures are contemplated. Locks should operate from corridor side only. Glass panels may be omitted if local regulations permit. Elementary grades require one door located near front of room. High school rooms may require an additional door at the rear.

Windows should provide at least 1 sq. ft. of glass area to 5 sq. ft. of floor, more if possible. Mullions should be 12" wide (max.). Sills should be high enough to eliminate glare in eyes of seated pupils. Window heads should be flush with ceiling if possible, or a maximum of 6" below.

Lighting from windows on one wall is satisfactory if class work is done principally at desks. Informal class groupings now common may be advantageously lighted by windows in two or three walls.



1 Separate Cloakroom



2 Prefabricated Wardrobes

3 Lockers in Corridors

EQUIPMENT

Chalkboards. Width and trough height are indicated in diagrams. Lengths vary, boards on front and one side wall being normally sufficient. High schools require less space. Patented swinging or multi-use boards should be considered.

Bulletin Boards (corkboards), including *tacking strips* and *map rails*, should provide maximum space possible.

Window Shades should be translucent. Additional opaque shades or draperies may be required for motion pictures.

Aisles between walls and seating area should be as noted in diagrams. When seats are fixed to floor, intermediate aisles 1'-6" wide (minimum) are required. Modern practice demands movable furniture, however, and intermediate aisles vary.

CLASSROOM FINISHES

Walls should be finished in a color having a light-reflecting factor of 50% to 70%; *ceilings* 75% (min.); *desks, wood trim, dado* and *floors* 30% (max.) Glossy finish should be avoided to reduce glare.

STOCK SEAT and DESK SIZES

Movable furniture is recommended. Seats and desks may be unit type. All seats and desks should be adjustable and desk boxes shallow. In high schools, individual tables with tops at least 18"x 24", and separate chairs, are preferable. In kindergartens, do not use unit furniture

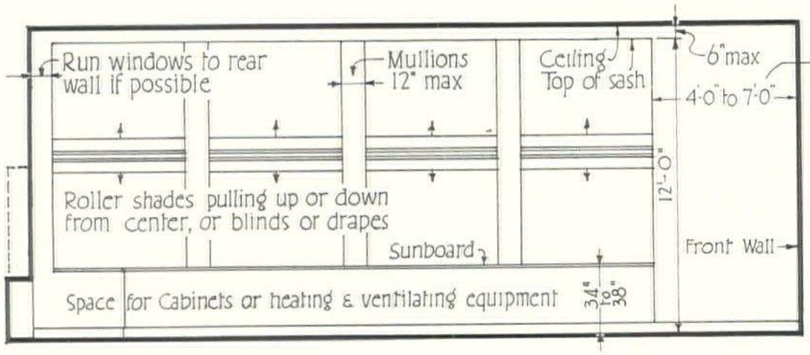
Grades	Range of Height of: Seat	Range of Height of: Desk Top	Approx. Floor Space Unit Type
Kindgtn.	9" - 11"	20" - 22"	
1st	10" - 13"	22" - 28"	24"x 31"
2nd	11" - 14"	23" - 29"	24"x 31"
3rd	11" - 14"	23" - 29"	24"x 31"
4th	12" - 15"	24" - 30"	24"x 33"
5th	12" - 15"	24" - 30"	24"x 33"
6th	12" - 16"	24" - 30"	24"x 33"
7th	13" - 16"	24" - 30"	24"x 33"
8th	13" - 17"	26" - 32"	24"x 35"
H.S.	14" - 18"	26" - 32"	24"x 35"

NON-ADJUSTABLE CHAIRS

If used, furnish in sizes according to following %

Grades	9"	10"	11"	12"	13"	14"	15"	16"	17"	17½"
Kindgtn.	50%	50%								
1st			90%	10%						
2nd			50%	40%	10%					
3rd			30%	50%	20%					
4th				20%	40%	30%	10%			
5th					25%	50%	25%			
6th						40%	40%	20%		
7th						20%	55%	25%		
8th							40%	50%	10%	
H.S.								25%	50%	25%

SCHOOL CLASSROOMS—Recommended Standards APRIL 1937



WINDOW WALL

Required by some state Codes

With flexible seating, windows may run to front wall

Glare may be eliminated on front chalk b'd as follows:

1 Draw shades, *(not recommended as light is reduced)*

2 Blinds or drapes

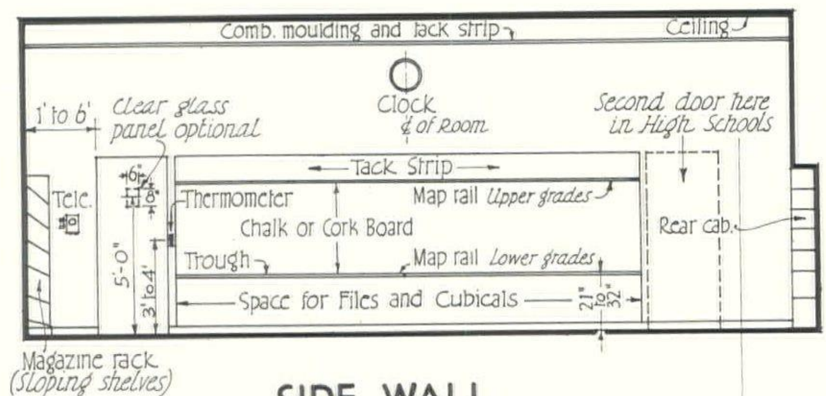
3 Placing of chalk board towards the corridor side of front wall

SPACE REQUIREMENTS		
Approx. **SQ.FT.** per pupil		
Kinderg't'n.		30
Elem. Grades		18 to 22
H.S. Recitation		16 to 18
H.S. Activity		18 to 25
H.S. Lab. & Special		25 to 50
Approx. **CU.FT.** per pupil		
Absolute Minimum		200
Mech. Vent.	20 cu.ft. per min. per pupil	300
	12 cu.ft. per min. per pupil	400
Window Vent only		500

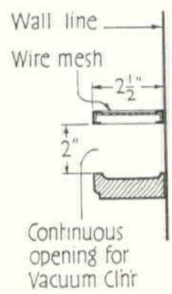
CLASS SIZES

(Primarily a local problem)
Elem. Sch'l. 35 to 40 pupils (approx)
High Sch'l. 30 to 35 " "

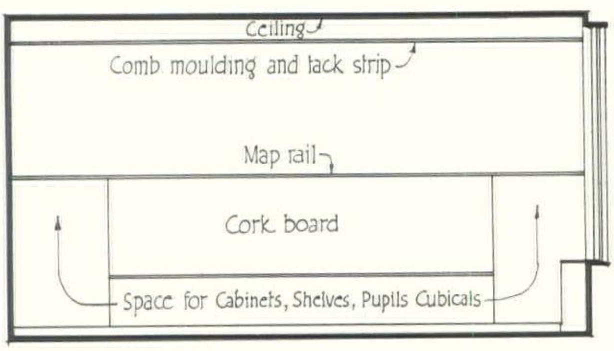
CHALK TROUGH HEIGHTS		
Grade	Desirable	Max.
Kinderg't'n.	21"	24"
1 - 2	24"	26"
3 - 4	26"	28"
5 - 6	28"	30"
7 - 8	30"	36"
Senior H.S.	32"	36"



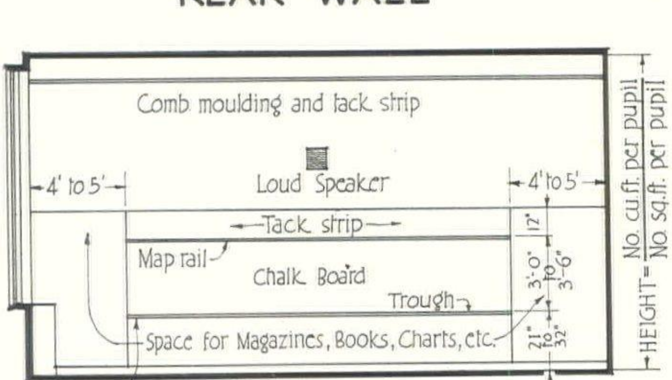
SIDE WALL



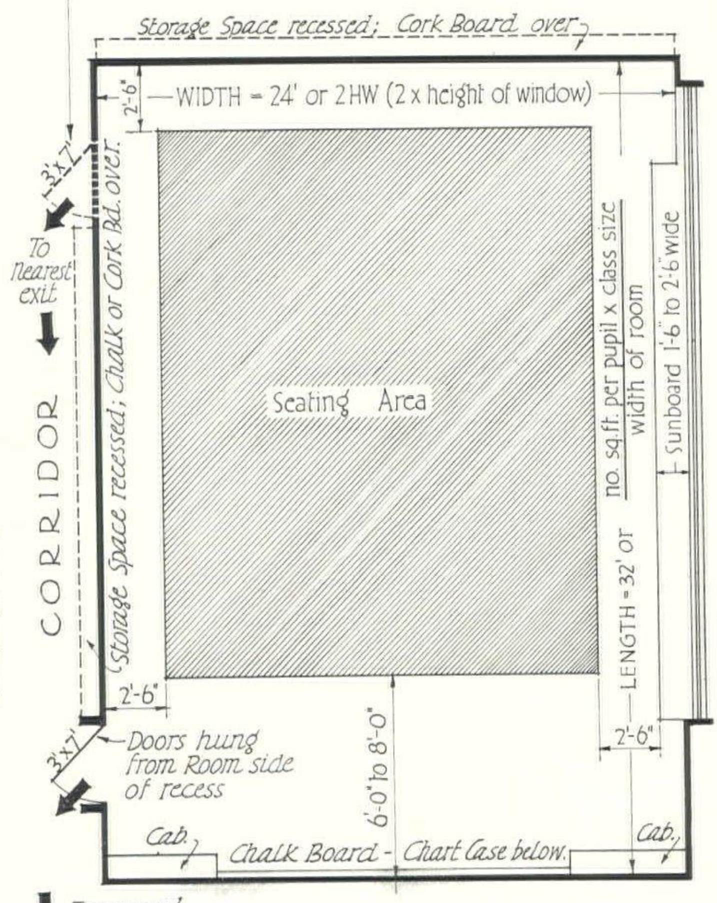
CHALK RAIL



REAR WALL



FRONT WALL



PLAN

TECHNICAL DIGEST

KEY TO PRESENTATION

Typical reference:
15 N'36:14-26 **gptv**

This indicates: Issue of November 15, 1936, pages 14 to 26 inclusive, presented according to the following key:

d—detail drawing **g**—graph **p**—plan
s—section **t**—text **v**—photo view

Accordingly, **gptv** means graph(s), plan(s), text and photographic view(s) in the article mentioned.

ACOUSTICS

Soundproofing the modern home. (M. Rettinger). Architect & Engineer. F'37:37-39 **dt**

Summary of methods for floors and partitions. Details for protection against both air-borne and solid-conducted sound, stressing the fact that an insulative type of construction is required, not merely special materials.

CONSTRUCTION

Engineering in Ancient Egypt. (J. C. Belknap, from Compressed Air Magazine). Science Digest. Ap'37:5-9 **t**

Brief description of ancient engineering feats. Dimensions of monuments such as the Great Pyramid and Temple of Karnak. Data on organization of labor, transportation, quarrying and splitting of stone and favored varieties.

Reinforced brick masonry. South African Builder. (Johannesburg). D'36:25. (23, 11) **dtv**

View of a reinforced brick cantilever slab, projecting over six feet, which is only two courses thick. Description of construction. Elevation and sections of a simple reinforced brick lintel made by placing three ¼-inch round bars in the vertical joint between a double soldier course.

Simplified computations for two-way slabs. (J. Di Stasio). Engineering News-Record. 18 F'37:268-269 **gpt**

Table and diagrams developed for a new section of the American Concrete Institute Building Code. Notation and the bare mechanics (no theory) of determining bending moments and shears.

Electro-concrete for winter building. (C. Kunz, E. Fontanellaz & P. Haller, from Le Genie Civil, 29 A'36 & 5 S'36). American Concrete Institute Journal. J-F'37:352 **t**

Description of superficial and mass treatment of concrete by 40-volt alternating current which raises temperature of mix, accelerating setting and permitting work in freezing weather. Impure water of mix acts as a resistance. When concrete sets even this poor conductor is removed and current flow stops.

The original article gives data on costs, which are rather high as yet, excepting where delay is particularly expensive. A well-illustrated article on the same subject appears in Die Bautechnik (Berlin) 5 F'37:75-76 dtv.

Welding in construction. (G. D. Fish, from lecture, D'36). Welding Journal. F'37:2-8 **dtv**

Article with excellent photographs of typical practical welding conditions and methods in building construction. Brief theoretical introduction.

Economics of welding and cutting from a cost standpoint. (G. G. Holbrook, from lecture). Welding Journal. F'37:16-20 **dgt**

Mostly concerned with ship construction but data is in part applicable to building.

What to do about termites. (B. B. Caddle). American Building Association News. F'37: 100-101 **st**

Brief description of destructive effects. Sketch details of copper shields for posts, walls and leader pipes.

COSTS

How to estimate cost of building accurately. (E. H. Boeckh). American Building Association News. F'37:102-103 **pt**

Based on "Boeckh's Manual of Appraisals," each installment of this series of short articles deals with the cost estimating of a single house. Each is illustrated with drawings and outline specifications. The type here considered is a small two-story residence with concrete block and stucco wall with concrete slabs on precast joists.

Loan values and the building industry. (R. L. Gordon). Architect & Engineer. Ja'37: 31-36, 40 **t**

An interesting and frank discussion of financing with the thesis that cheaper structures often produce best income and therefore are considered better risks than many luxury buildings. Cost of construction for individuals often includes special features which have little sale or income value. Quality construction commands better terms but a consideration of the commercial life, rather than the structural life, is important. A rating table is included which gives the structural and commercial life of buildings of various types, and also the per cent of average annual depreciation. There is brief concluding comment on the value of earthquake-resisting buildings.

HEATING

Electric heating for the home. (W. W Hicks). Architect & Engineer. F'37:41-45 **t**

Best results in electrical heating for residential use have been obtained with a combined convection and radiant heater. It is claimed that the convected air currents are sterilized and ionized by the heating elements.

Both schools and houses are now using electric heat on the Pacific Coast and in the Tennessee Valley where rates are below one cent/kwh. (2½ mills at Ketchikan, Alaska). It is reported that 35,000 houses in California depend primarily upon electric heat for comfort, and it is pointed out that satisfactory installations are not necessarily in mild climates. New types of automatically-controlled, built-in space heaters have been developed which dispense with fans and motors. Cost data are given for such widely separated localities as Tupelo, Miss., The Tennessee Valley, Northern and Southern California, and Mason City, Washington.

Plan for a modern basement. (L. M. Forbes). American Builder & Building Age. F'37:63-67, 132 **dpstv**

Application of coal stokers and dustless, efficient coal bins. Dimensioned drawings are given for bin and hopper-feed stokers, and of a bin with built-in baffle to hold coal back from opening. Photo views of fourteen models of stokers of various makes.

ILLUMINATION

What is wrong with our fifty foot-candle installations? (W. Harrison). Illuminating Engineering Soc. Transac. F'37:208-223 **gtv**

Deals with visibility, brightness and comfort at higher levels of illumination, challenging the use of 5-10 foot-candle methods for 50 foot-candles. Effect of ceiling height, and new unconventional methods of securing low apparent brightness. Stresses the quality of light. The concluding discussion brings out the need for co-operation between architect and illuminating engineer in the design of any building in which light is important.

Light & Architecture. (H. Robertson). The Builder. (London). 19 F'37:432-433 **t**

Report of a lecture by this British modernist. Effects of natural light and shade, and those induced by floodlighting are compared. A distinction is made between "incorporated" and "applied" light, and the functions of artificial light are discussed.

Luminescence and its applications. (J. T. Randall). Light & Lighting (London). F'37:44 t

Report of a paper recently read before the Royal Society of Arts. It includes a brief discussion of fluorescent materials, applications, the use of fluorescent powders in discharge lamps, and fluorescent glass. There is also a short reference to the part luminescence plays in television.

The section on materials gives data on the various colors of light secured with different minerals. Vivid green, blue, blue-white, deep yellow, greenish white, are among these, and depend on slight amounts of various metallic impurities in the primary substance (Zinc Sulphide) Zinc-Cadmium Sulphide has a continuous color range from green to brick red depending on the proportions of the combination.

Lighting problems. (W. J. Jones). The Builder. (London). 5 F'37:327 t

Brief report of a lecture, pointing out that lamp replacements can often be reduced by fixtures designed to hold lamps base up, and by use of larger, more efficient lamps.

A table of reflection factors for twenty-one different finishes is given.

Artistic illumination of interiors. (M. Müller). Deutsche Bauzeitung. (Berlin). 3 F'37: 70-77 **dstv**

German text. Illustrations of good and bad lighting in various typical rooms. Sections on intensity; types (Direct, Mostly-direct, Semi-indirect, & Indirect); plastic effect of shadows; reflections; equal distribution. There are also sketches of several lighting coves.

Behind the Neon sign. (R. E. Barclay). Science Digest. Ap'37:45-47 t

Description of the gases used in luminous tube lighting, and their properties.

Argon is mixed with Krypton and Mercury vapor for a light blue color. In a yellow tube it gives a green. Neon is the familiar red. Xenon is used as a voltage-lowering agent with other gases. Helium gives white, or yellow in a yellow tube.

A clear description of electronic theory, upon which this type of lighting is based, is followed by a brief consideration of the manufacture of both tubing and signs.

The largest transformers now in use deliver 30 milliamps at 15,000 volts, and will operate 60 feet of neon-filled tubing (footage capacity depends on gas and tube-diameter). The most efficient reflectors are mat, rather than polished. Thus white plaster is quite satisfactory.

MATERIALS & FINISHES

The Munsell System of color specification. (W. M. Scott). Modern Plastics. F'37:42, 68-71 **dt**

Clear description of a method of color analysis by its three qualities of hue, value and chroma (intensity), which enables a designer to specify any color exactly by formula (not chemical, but based on visual effects). These three properties may also be considered equivalent to the Spectrophotometric properties of dominant wave-length (hue), brightness (value), and excitation purity (chroma).

This simple system of notation is an extremely valuable aid to anyone working with color since it gives a basis for accurate analysis and copying of color, seen in any field, without samples (which may fade). It has been used successfully by color printers, dress and textile designers and reporters. The formulas can easily be transmitted by telegraph or cable.

The trend in American construction & housing. Part II. (J. E. Burchard, Jr. B3). South African Builder. (Johannesburg). Ja'37: 9-15 **tv**

A review of new materials suitable for use in prefabrication. Asbestos-cement, glass in many forms, plastics, tung-oil paints, plywood adhesives and stressed-panel construction, corrosion resistance of metals, non-ferrous novelties, and vacuum concrete are among those mentioned.

The steel of the future. (H. W. Magee, from Popular Mechanics). The Enamelist. F'37: 29-33, 62 **tv**

Brief history of steel manufacture, description of present processes and alloys. Reviews the discovery of carbon steel, the blast furnace, pig-iron, puddled wrought iron, crucible process steel, the Bessemer converter, and finally, the open hearth furnace, holding 100-ton charges with temperatures as high as 3000° held for hours. Such terrific heat requires occasional complete rebuilding of furnaces. The story continues with descriptions of the rolling mill and the continuous strip mill producing 200-foot-long ribbons at the rate of a ton every 32 seconds. There is also data given on the properties of the alloys: nickel, chromium, manganese, cobalt, molybdenum, vanadium, titanium and tungsten.

PLANNING & DETAILS

Churches. (F. E. Towndrow & R. L. Stubbs, comp.). Design & Construction. (London). F'37:132-163 **pstv**

Reference supplement. Text on the evolution of the English church plan. Planning data. Illustrations and plans of 21 British ecclesiastical buildings and details, and of ten churches of other countries.

Shops, Fixtures & fittings. (B. & N. Westwood). The Architect's Journal. (London). 11 F'37:275-280 **dpstv**

Data on and details of drawers, counters, wall fixtures, movable fittings, seats, cash desks, staircases, etc.

Shops. Floor & wall coverings. Part I. (B. & N. Westwood). The Architect's Journal. 18 F'37:315-318 **ptv**

Floors: wood, rubber, linoleum, cork, tile, travertine and marble. Wall coverings: glass, tile, wall papers, etc.

Shop types. Part II. (B. & N. Westwood). The Architect's Journal. (London). 4 F'37:237-240 **ptv**

Continuation. Includes grocery, pastry, fish, general provision and butcher shops. Typical plans and data on equipment and materials.

Staircase & handrails. (Thomas Ritchie). Architect & Building News. 12 F'37:199-201 **pst**

Data on planning, dimensions (width, headroom & pitch), length of flights, winders, exterior staircases. An analytical table of stair dimensions for numerous French, British and Italian examples is included.

Part II. 19 F'37:229-230 **pt**

Data on handrailing, considering particularly the avoidance of "bumps."

Part III. 26 F'37:263-264 **dpt**

Methods of proportionate variation of tread widths at turns, important in preservation of smooth handrail curves at quarter-space (90° turns) and half-space landings (180° turns).

Superflood bulkheads installed in a Pittsburgh store. Engineering News-Record. 18 F'37:254-256 **tv**

After damage by unexpected flood in 1936 in which heavy steel bulkheads could not be brought from warehouse and placed in position in time this firm installed more easily handled bulkheads of aluminum (¼-inch thick, with reinforcement).

Sixteen show windows are protected with panels which roll on overhead tracks to a position ten inches behind the plate glass. The flood water is permitted to come behind the glass in order to equalize the pressure. A floating barrier protects it from drifting objects. Vertical sliding, overhead hinged, fixed and portable compression bulkheads, caulked with oakum when in place, are used for other openings.

The sidewalks were also reinforced and waterproofed to carry a twelve-foot head of water, and the pumping and drainage system augmented. Pump outlets rise with flood water to prevent back pressure.

Fixtures for the lower floors are now made of materials not injured by water, or easily transportable, with merchandise, to upper floors.

The remodeling of this flood protection system was handled by Janssen & Cocken, Architects.

BIBLIOGRAPHY OF IMPORTANT BOOKS IN THE SCHOOL BUILDING FIEL

BY N. L. ENGELHARDT, JR.

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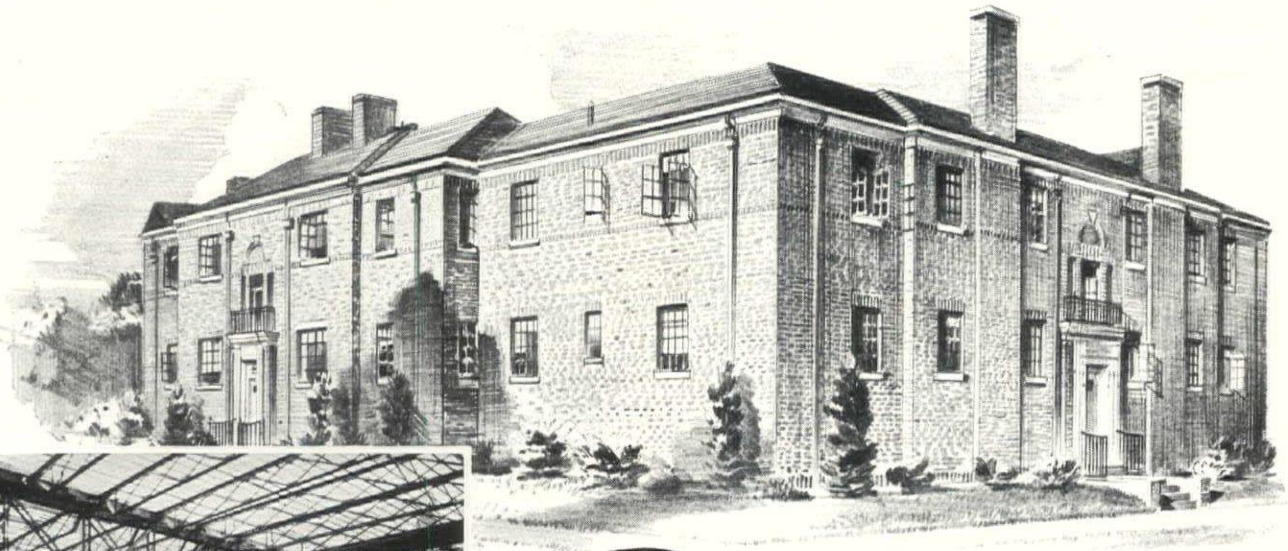
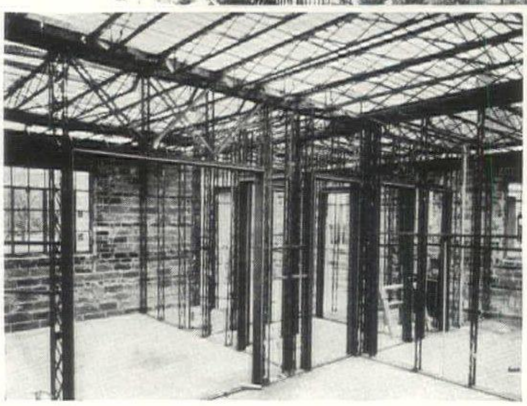
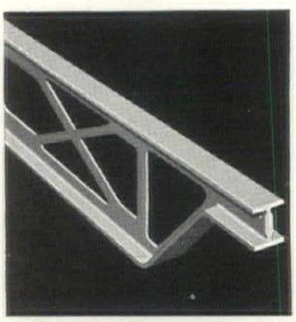
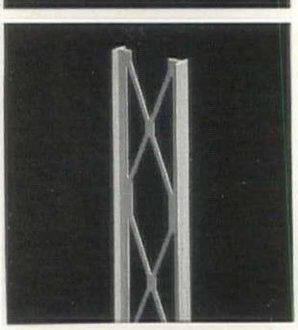




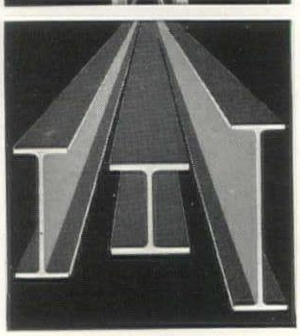
For fire-safe, shrinkage-free light-occupancy structures



Bethlehem Open-Web (Kalman) Steel Joist. *The open-web design does much to help reduce air-borne and impact sounds and facilitates the installation of plumbing and heating pipes and air-conditioning ducts, which can be passed through the web of the joist without need for cutting.*



Bethlehem Open-Web Steel Stud. *These light-weight studs may be welded to the joists to form the upright members of the complete steel frame.*



Bethlehem Light Sections. *These light-weight solid-web members are similar in appearance to regular Bethlehem heavy structural shapes and have ample thickness of metal in flange and web to meet all building law requirements.*

Bethlehem Light Steel Members open the way to the economical construction of all types of light-occupancy structures with steel frames. They have been used efficiently in residences, schools, stores and smaller apartments.

These Bethlehem Light Members are of both the solid and open or lattice-web types. They do not restrict the designer in any way—are readily adaptable to any architectural style from the ultra-modern to the most conservative Williamsburg-Colonial. Their use involves no complicated engineering and but slight departure from the construction methods prevailing with conventional materials. They are simply bolted, riveted or welded together into a complete steel frame that brings the many advantages of steel construction to every size and type of light-occupancy structure.

Primary advantage is that such a frame provides the basis for a high degree of fire-safety. The rigidity and freedom from shrinking and warping assured by a frame of steel are next in importance. Floors do not warp; interior trim remains in place; the possibility of unsightly plaster cracks is eliminated; door and window frames do not sag out of line. In addition, the steel-frame structure is immune to deterioration from such causes as termite attack, and reduces noise transmission.

The home-buying and building public is increasingly interested in the steel-frame house for its safety and as a protection against depreciation for a major investment. Bethlehem Light Members enable you to meet this growing interest without the necessity for any drastic revision of present architectural practice.

BETHLEHEM STEEL

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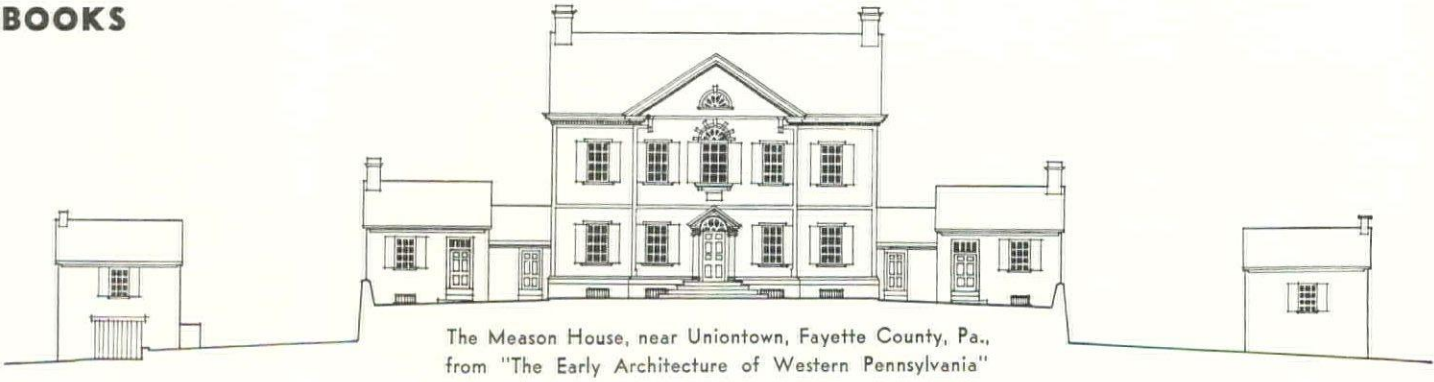
BOOKS



The Meason House, near Uniontown, Fayette County, Pa., from "The Early Architecture of Western Pennsylvania"

THE EARLY ARCHITECTURE OF WESTERN PENNSYLVANIA. By Charles M. Stotz. Introduction by Fiske Kimball, 290 pages, 10½ by 13¾ inches. Illustrations from photographs and drawings and a map showing the location of architectural monuments. New York: 1936: William Helburn, Inc. $15.

The work of many men over many months has gone into this record which, for some unexplained reason, is the first rounding up of early American architecture in this section of the country. It is also undoubtedly the final and definitive record, for it is difficult to conceive of a better one ever being made.

There have been many such records of geographical variations in our early architecture, and naturally there have been lessons learned from each of these, particularly as to the manner of presentation and the limits of inclusion. Charles Morse Stotz has evidently profited by each one of these lessons, for in arrangement, quality of photography, excellence of measured drawings and their uniformity of presentation, he has brought the work to a degree of excellence which will probably not be surpassed. This is the more surprising and praiseworthy because of the fact that the material was gathered in the course of an architectural survey made through the employment of many men, not all of whom could have been imbued with the enthusiasm of the chairman and his associates in the Pittsburgh Chapter, A.I.A.

The Western Pennsylvania Architectural Survey was instituted in 1932—originating in a desire to turn enforced leisure within the architectural profession into useful hobby riding. It was made possible through the generosity of the Buhl Foundation, to which the profession is also indebted for the creation of Chatham Village. This survey should not be confused with the Historical American Buildings Survey, organized eighteen months later under the public works program of the Government. This latter project, fortunately, was carried on also under Mr. Stotz's direction, thus avoiding duplication of effort.

Those who undertook the direction of this tremendous effort have succeeded in bringing together a collection of photographs and of drawings that should give Western Pennsylvania a position of importance in the honored group of New England, the Southern Colonies, the Dutch settlements about New York, Delaware, the ledge-stone country of Eastern Pennsylvania, and our Spanish Southwest.

SOIL-CORROSION STUDIES, 1934. RATES OF LOSS OF WEIGHT AND PENETRATION OF NONFERROUS MATERIALS. By Kirk H. Logan. 24 pages, 6 by 9 inches. Illustrations from photographs and diagrams. Research paper RP945. Paper binding. Washington, D. C.: 1936: U. S. Department of Commerce, National Bureau of Standards. 10 cents.

NUOVA ARCHITETTURA ITALIANA. Edited by Agnoldomenico Pica. Preface by Marcello Piacentini. 412 pages, 8¼ by 8¾ inches. Illustrations from photographs and drawings. Cloth binding. Milan: 1936: Ulrico Hoepli. 60 Lire.

This book gives a complete record of the best modern architecture produced in Italy in the last three years, a period filled with interesting progress. The publication springs from the Architectural Exhibition at the Sixth Triennial Exposition at Milan.

Among those whose works are shown are Marcello Piacentini, Arnaldo Froschini, Gio Ponti, Giuseppe Pagano, Giovanni Michelucci, and Agnoldomenico Pica. The three pieces of work given most importance in this collection are the new "University City" in Rome, the railroad station of S. Maria Novella in Florence, and the city of Sabaudia, newly built on the reclaimed Pontine Marshes.

CITY PLANNING HOUSING. Vol. II of Text: Political Economy and Civic Art. By Werner Hegemann. Edited by Ruth Nanda Anshen. Preface by Joseph Hudnut. 431 pages, 6 by 9 inches. Illustrations from plans and line drawings. New York: 1937: Architectural Book Publishing Co., Inc. $3.75.

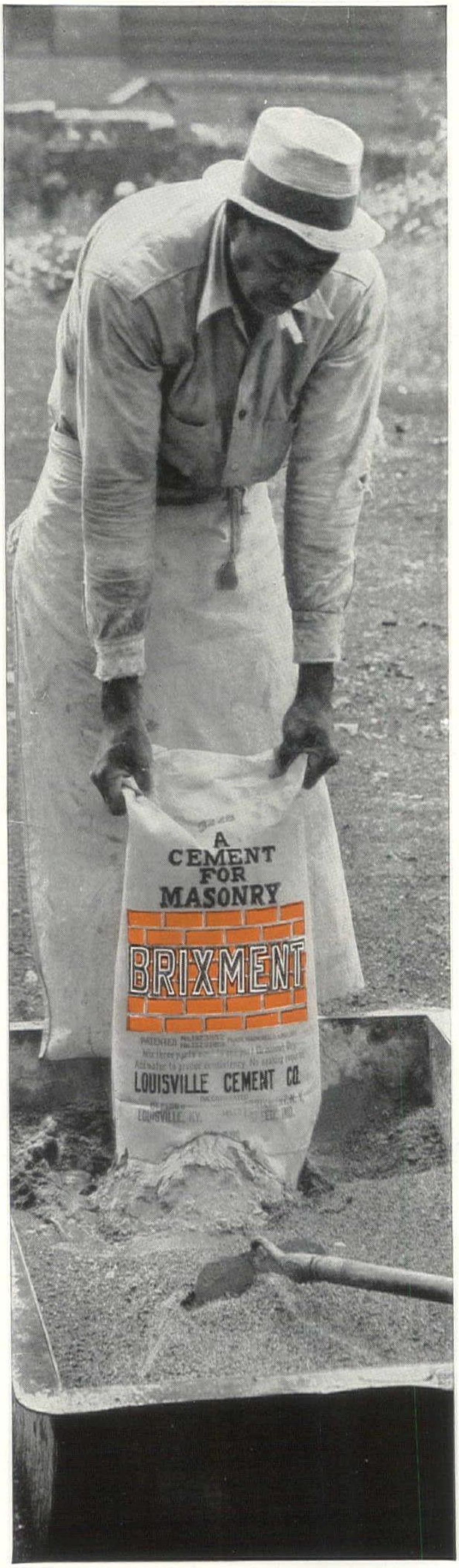
It is a great pity that Dr. Hegemann could not have lived to put his own voluminous findings in order for publication. The present volume in that case probably would not have shown the title as it does. A more descriptive one perhaps would have been "The Works of Werner Hegemann" for in it he discusses many things. The reader senses his glee in showering many of the present day architectural critics and historians with the sharp arrows of his scorn. Elbert Peets contributes a chapter on Washington, Williamsburg, The Century of Progress, and Greendale.

AIR CONDITIONING—INSULATION. By J. Ralph Dazell and James McKinney. 301 pages, 5½ by 8¼ inches. Illustrations from diagrams and photographs. Chicago: 1937: American Technical Society. $2.50.

An outline of the physical principles of insulation, followed by information as to the practical application of these principles in connection with what the market affords in materials.

MODERN ARCHITECTURE IN ENGLAND. With essays by Henry-Russell Hitchcock, Jr. and Catherine K. Bauer. 104 pages, 7½ by 10 inches. New York: 1937: The Museum of Modern Art. $1.85.

The Museum of Modern Art is performing a real service in recording with some regularity the more important of its exhibitions. These little volumes, if one may judge by the short history behind them, are likely to become records of importance and significance. There are seventy-two illustrations taken from photographs, plans, and models representing the work of the younger English architects.



BRIXMENT

ASSURES THE MIX YOU SPECIFY

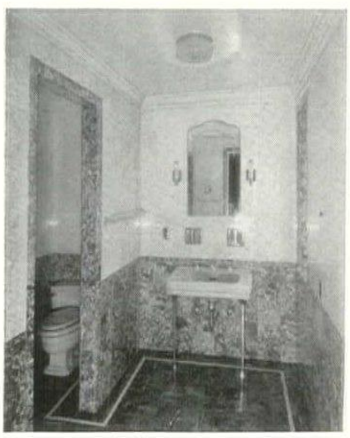
WHEN you specify portland-cement-and-lime for mortar, you have no assurance that the proportions of your specifications will be accurately followed unless your superintendent is constantly at the mortar box. . . The proportion of lime may be increased for the sake of plasticity or the mix may be oversanded. In either case the strength of the mortar is impaired. ★ ★ The use of Brixment, however, is your assurance that all mortar will be uniform in strength and color and that specifications will be accurately followed. If oversanded, Brixment mortar works short and, since there is no lime in the mix, the necessary plasticity can be secured only by using the proper amount of Brixment. The proper mix is one part Brixment, three parts sand — an *ideal* mortar for all masonry. Louisville Cement Company, Incorporated, Louisville, Kentucky. ★ ★

MATERIALS

RESILIENT TILE FLOORING

The abrasive resisting qualities of brake linings suggested the possible use of a similar compound for floor coverings and it was with this thought in mind that a new type of resilient floor tile was developed in the automotive industry. This new tile, known as Dee-Gee, is a soft, resilient, light weight floor tile which, when properly laid, creates a walkway which is said to be noiseless, non-slippery and pleasing in appearance. It will not absorb moisture or such fluids as ink and other discoloring liquids. It is die-cut, and special dies can also be made and cut in irregular shapes to form various patterns. When laid on uneven sub-floors, Dee-Gee tile may be sanded to form a level floor. It is available in 1/8″ and 3/16″ gauge and in six colors through Paul Coste, Inc., Providence, R. I. **777M**

MARBLE WALL TILE



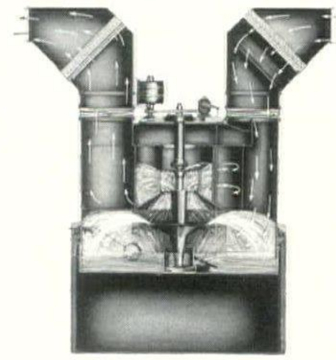
Through the introduction of special equipment which is said to reduce the cost of manufacture, the Vermont Marble Company, Proctor, Vt., is offering genuine marble in tile forms, 1/2″ thick, cut to standard sizes and grooved on the back like glazed or enameled ceramic tile. It is known as "Markwa" and is specified as tile. The standard finish of Markwa is Bright (glossy), and is intended primarily for walls. Mat finish and Flemish Nonslip finish, adapted for floors, can be substituted without extra cost. The four arrises of this marble tile are slightly rounded and finished. The edges and corners are straight and sharp and all unexposed surfaces are free from gloss. The back of the tile has two parallel bonding grooves. The surface of the back is rough and this, with the grooves, is said to insure a tight bond in erection. **778M**

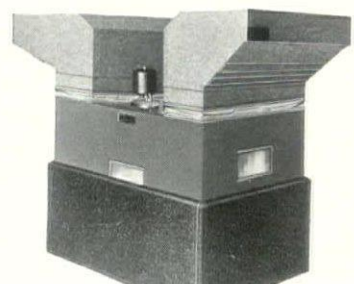
PLASTIC WALL FINISH

Polytect, a new water plastic, is said to possess unusual decorative qualities. It is applied like paint on walls and ceilings, or any solid surface, such as concrete, plaster, wallboard, stone, wood, metal, and may be polished after application. Applied smooth and polished the material may be given a tile-like appearance. Raised portions of brushed or tooled surfaces may be rubbed smooth so as to contrast with indentations. Polytect can also be metallized in a cold mechanical way, without the use of metal powders. With this method, or various other operations, any type and shade of metal may be reproduced on a Polytect surface and may be brought to any desired degree of polish. To use Polytect you add water, mix thoroughly and apply like paint. To obtain any desired color, you add dry colors according to instructions, either before or after mixing with water. Polytect is manufactured by the American Polytect Corporation, New York. **779M**

AIR CONDITIONING

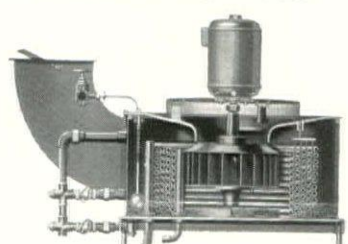
AIR CONDITIONER





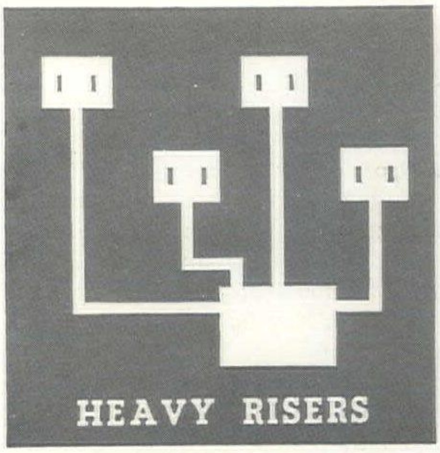
The Utica Air Cond tioner for residences an medium - sized installation in restaurants, shops, the atres and manufacturin plants, employs the Hydro Air System of Washed Ai Control. There are fou standard sizes, each on capable of variable capaci ties, by adjustment. Th line ranges from 500 cfi to 5400 cfm; in terms c heating from 7500 Btu t 480,000 Btu and in term of cooling from 1½ ton I.M.E. to 20 tons I.M.E All units are alike excep for size and capacity. Ther are two patented and ex clusive features to the Utic Air Conditioner. One is th Turbinator which throw two sprays, a heavy rai washing spray through which the air is drawn and thor oughly washed, and a slow moving mist spray which pro vides complete humidification treatment. This washed ai is then drawn through the Aqualute, a special tapering spira passage, where it is scrubbed and slowed down in velocity at the same time eliminating all entrained moisture or fre water. From there it passes through the discharge heade out into the ducts. The Utica Air Conditioner can be in stalled to serve one cycle and then progressively added t cover heating, cooling, humidifying, dehumidifying, air ci culation, induction of outside air and air washing an filtering. Utica Radiator Corp., Utica, New York, is the manufacturer. **780M**

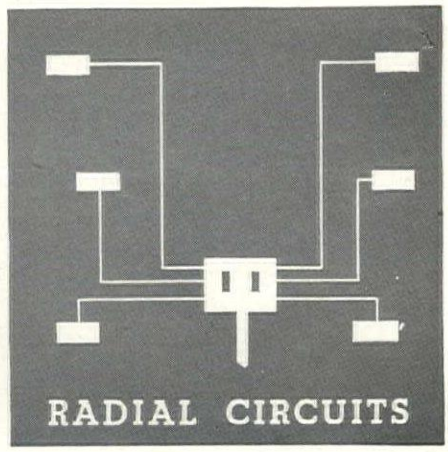
EVAPORATIVE CONDENSERS



One of the recent ad vances in the progress o commercial refrigeratio and air-conditioning equip ment is the development o the GR Hydrocyclonic Con denser, the product of Gen eral Refrigeration Corp. Beloit, Wis. This nev equipment, which comes i three sizes and is designed for use on methyl chloride an Freon-12 installations, is self-contained, and includes a com plete assembly of tank, condenser coil, motor fan, water lift float control and water valves. Operating economy is a outstanding claim for the Hydrocyclonic condenser. Water propelled by centrifugal force, is mixed with the air travel ing at cyclone speed, and the resultant spray goes over th hot refrigerant coils. This transfers the heat from the coi to the evaporating water, which is carried off in the air. Th

SPECIFY THE 3 FUNDAMENTAL FEATURES OF THE G-E RADIAL WIRING SYSTEM*





FOR YOUR CLIENTS' SATISFACTION

To be sure of adequate electrical wiring in the homes you design, specify the three features illustrated above whether you call the wiring a G-E Radial Wiring System or not. These three features are simple, sound, and adaptable to any house — heavy risers, upstairs circuit control and radiating circuits — planned to give users the utmost in electrical convenience, comfort, safety and economy. Of course, plenty of outlets should be specified too.

G-E Wiring Materials are ideal for this modern planned wiring. The line is complete including G-E White Rigid Conduit, BX, "Safecote" Wire, Switches, Convenience Outlets, etc., including Ivory Devices, Fuses and Branch-circuit Circuit Breakers.

For detailed information on the three fundamental features of the G-E Radial Wiring System or on G-E Wiring Materials, see Sweet's 1937 Manual for Architects or write to Section CDW-714, Appliance and Merchandise Department, General Electric Company, Bridgeport, Conn.

*Planned Wiring

GENERAL ELECTRIC

WIRING MATERIALS

APPLIANCE AND MERCHANDISE DEPARTMENT, GENERAL ELECTRIC COMPANY, BRIDGEPORT, CONNECTICUT water is completely evaporated. A float valve automaticall maintains proper water level in the tank. Only one motor used to operate the water-lift and vertical blower fan. N pump is required. It is not necessary to remove the coi to clean them as they may be completely submerged and flushed clean. **781M**

CONSTRUCTION

TILING CONSTRUCTION SYSTEM

A new development in tile installation makes it possibl to install tiling over existing wall surfaces without removin the plaster or without other preparatory work. It is equall applicable to new construction work and can be installe over any type of structural wall materials. The new syster consists of an interlocking series of metal studs and cros purlins, and suitable metal moldings which accommodate a sizes of tile and all shapes of trim that may be selected. Afte adjusting the first course of tiles to the selected type c base the metal wall studs are fastened securely to the wal The first horizontal purlin strip is leveled and joined to th corresponding strip on the adjacent walls so that the til joints will run continuously around the room. When th first purlins are leveled, all the other purlins above will b automatically leveled by the notches in the vertical stu members. If desirable, the metal framework of the syster may be assembled at one time and lifted into place. Lockor Inc., New York, is the manufacturer of this Lock-on Tiling Construction System. **782M**

TRANSFER SYSTEM FOR OVERHEAD CRANES

A novel transfer system for moving loaded overhead crane from one bay to another has recently been installed in Detroit plant. This installation consists of four units—tw of which are standard overhead travelers moving up an down the working bays, while the other two are transfer which travel at right angles along both ends of the building Through ingenious arrangement, heavy machinery units i the process of fabrication in the main working bays ar lifted by the overhead cranes which travel to the end of th runway where the entire cranes with their loads are picke up by the transfers traveling at right angles, and thus transferred to adjoining bays for the next steps in production This transfer is accomplished as follows: Suspended fron the bottom of each transfer crane is a section of runway which, when locked into position, serves as a projected trac and carries attachment for the entire bay crane and it load. Moving along the end of the building, the transfe crane can be locked into position at the exact point wher the carrier runway is aligned with the main bay runway Thus, the runway end-stops are raised, permitting the entir crane to move off the transfer runway to the permanent ba runway. This installation was the result of collaboratior between American Blower Corporation and the consulting engineers, Albert Kahn, Inc. It was installed by the Harnischfeger Corp., Milwaukee. **783M**

LIGHTING

SELF-CONTAINED PHOTOTUBE RELAY

The Teletouch Corporation, New York, announces a self-contained phototube relay in which both the light source and the phototube are mounted. No separately mounted

TECHNIQUES...

light source is required, the light being reflected by a passing object into the phototube. An earlier model, which made use of a separate amplifier and required the services of an electrician for installation, was used principally for window-lighting purposes. This model contains amplifier and sensitive unit in the same casing. It can be installed simply by plugging into the light-socket and aimed in the desired direction where intruders will cause an alarm to ring when this type of protection is desired. **784M**

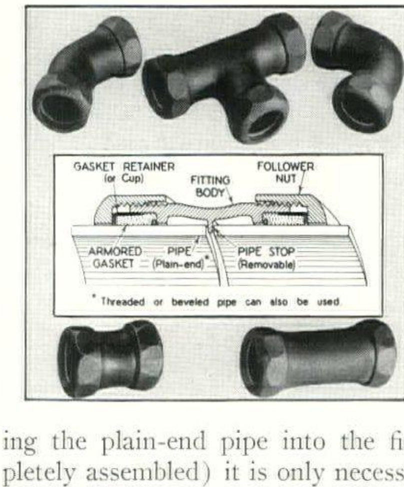
HEATING

COMPOUND MOTORIZED BLOWER UNIT

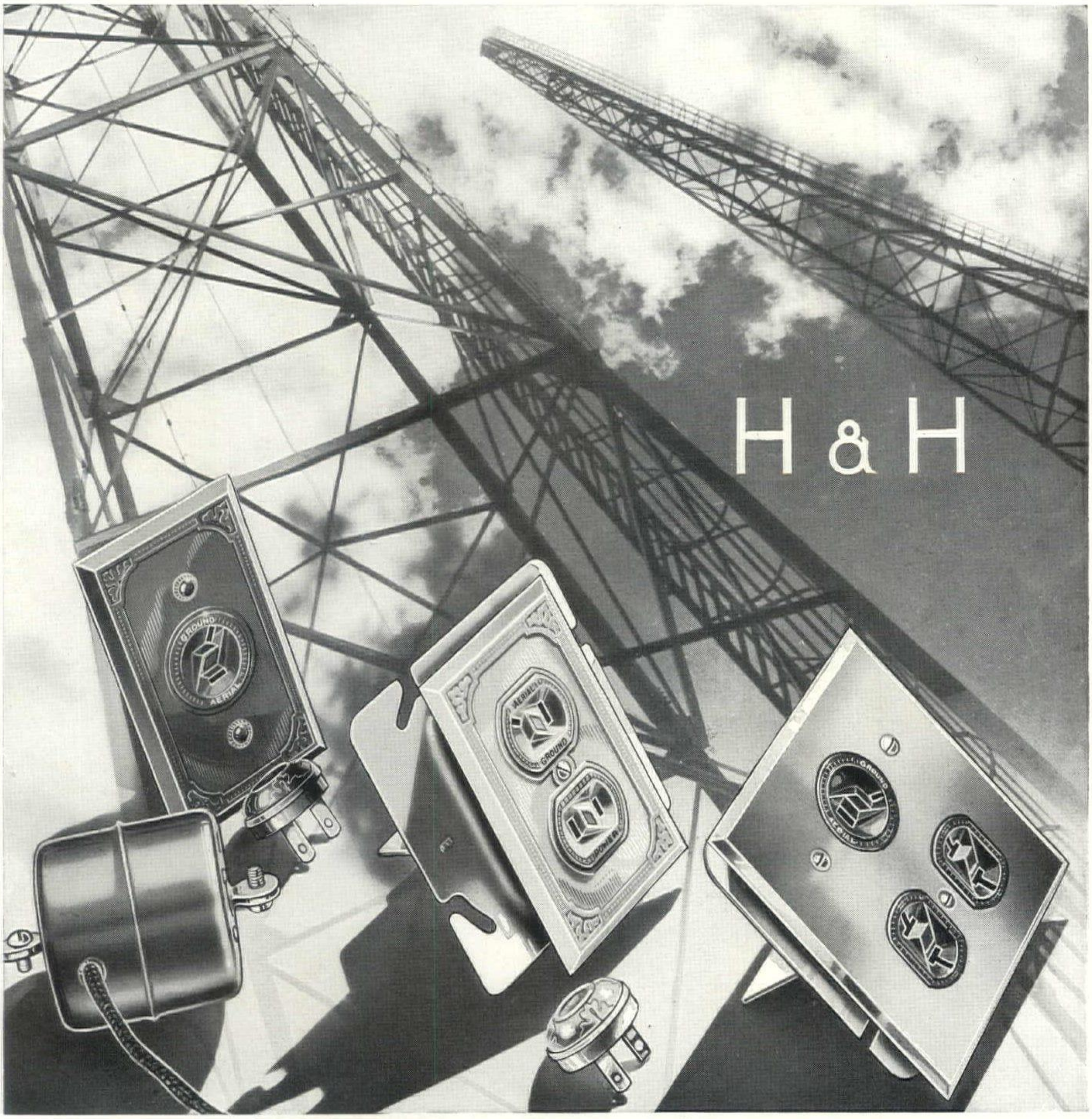
What is claimed to be a radically new design of blower has been developed by L. J. Wing Mfg. Co., New York. By a 2-stage combination, the pressures (6" or 7" w. g.) and volumes required for forced draft and similar work are obtained at low constant speeds, regulation of the air volume being secured by built-in control and redirecting vanes. These units consist of a constant speed electric motor with double extended shaft; two propeller-type fan wheels, one mounted on each of the two extended shafts; an integral damper control and air redirecting mechanism built in between the two propeller fan wheels. The entire assembly is placed within a cylindrical casing, arranged for ready accessibility. The units have the driving motor self-contained and are built for both horizontal and vertical mounting. They are especially adapted for forced draft service for either hand-fired, stoker-equipped, oil or gas-fired boilers, or for the secondary air supply of pulverized fuel burning boilers in industrial plants, hospitals, utility central stations, etc. **785M**

MISCELLANEOUS

COMPRESSION FITTINGS



With the standard line of Dresser Style 65 Fittings for oil, gas, water, air, or other industrial lines, just announced by S. R. Dresser Mfg. Co., Bradford, Pa., it is claimed that nothing but an ordinary wrench is needed to complete a joint in a few moments. After inserting the plain-end pipe into the fitting (which comes completely assembled) it is only necessary to tighten two threaded octagonal follower nuts with a few turns of the wrench. As this is done, resilient "armored" gaskets at each end of the fitting are compressed tightly around the pipe, forming a positive seal. The resulting joint is said not only to be permanently tight, but to absorb normal vibration, expansion and contraction movement, and to permit deflections of the pipe in the joint. The complete line of Style 65 Fittings includes: standard and extra-long couplings, ells (both 45° and 90°), and tees, all supplied in standard steel pipe sizes from ½" I.D. to 2" I.D., inclusive, black or galvanized. (*Continued on page* 124) **786M**

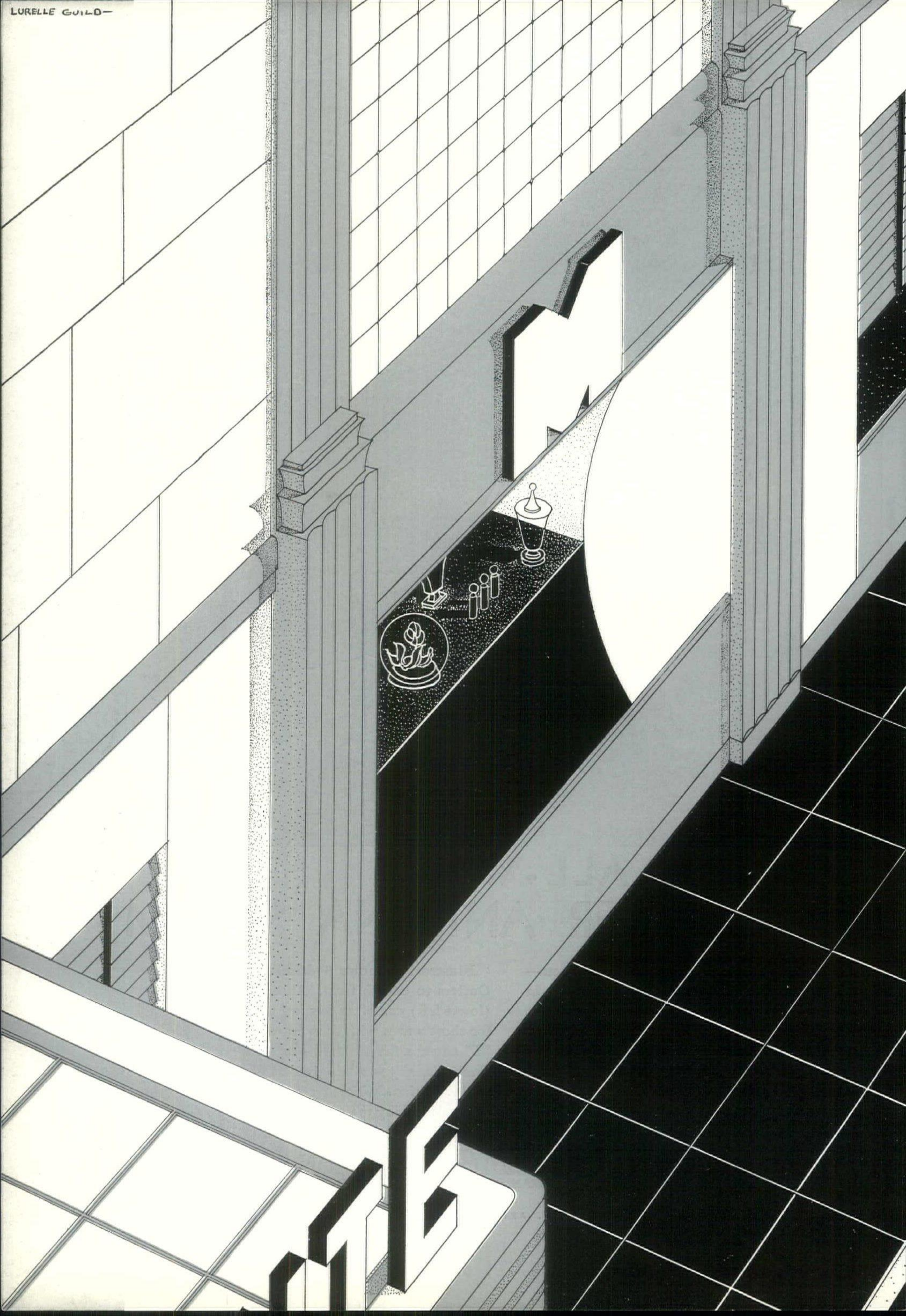


ALL-WAVE
MULTICOUPLER ANTENNA SYSTEM

For multiple operation of from 2 to 20 radio sets—both for standard broadcast and short wave—in private homes and apartment houses, schools, hospitals, hotels. Gets rid of straggling aerials and supports; avoids property damage and installation hazards. Easily installed by the electrician; is inexpensive in first cost and involves *no upkeep expenses* or replacements.

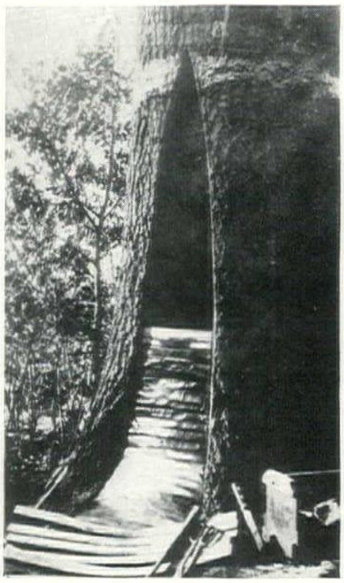
Illustration shows 3 different Multicoupler Outlets to choose from. Antenna Transformer (lower left) combines features of double antenna for short waves with accepted advantages of the "T" antenna for standard broadcast wavelengths. *Free engineering service* is given on plans and layouts for installation. Write first for general instructions folder describing the system.

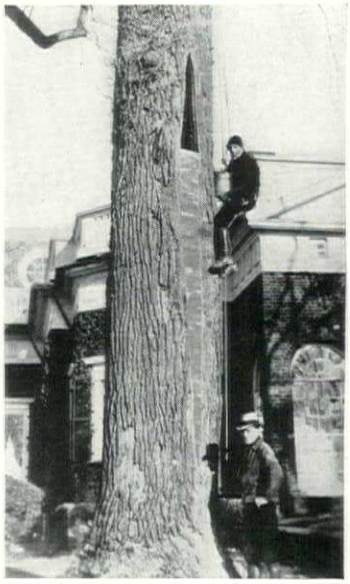
HART & HEGEMAN DIVISION
THE ARROW-HART & HEGEMAN ELECTRIC CO. HARTFORD, CONN.


LURELLE GUILD—

TECHNIQUES...

MISCELLANEOUS

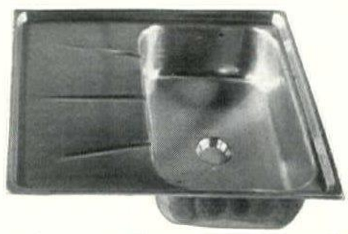




TREE SURGERY

A new form of tree surgery employs rubber for sealing up the cavities caused by rot after they have been thoroughly scraped of all decayed wood. This special rubber is made up in strips about 1½" wide by 1¼" thick. After the decay has been removed from the tree, the cavity is walled up with these rubber strips much in the same manner as you would lay brick. They are cut so that their length is slightly greater than the width of the cavity. This is done so that the ends of the strip will compress against the sides of the cavity to give a tight seal. One strip is laid upon another, each being cut so that it will exactly fit the contour of the cavity. As the wall of rubber is built up, the remainder of the space back of it is filled with a cementitious mixture designed to absorb all moisture and not shrink. The inside surface of the strips contains a series of small double dovetails which are embedded in the cement to prevent any possibility of their pulling away from the filling. This specially compounded rubber is a development of The B. F. Goodrich Co., Akron, Ohio. **787M**

SMALL-SIZE SINKS



A new Monel sink for motor boats and various industrial purposes has been placed on the market by The Parsons Company, Detroit. It is made in a single piece with an integral drainboard, which can be sheared off if desired. The sink is made of 18-gauge sheet. The complete unit with its drainboard has an overall length of 25 in. and a width of 21 in. The bowl itself is 12 in. by 18 in. by 6 in. The ribbed drainboard and bowl are recessed ⅞ of an inch to prevent water splashing over. **788M**

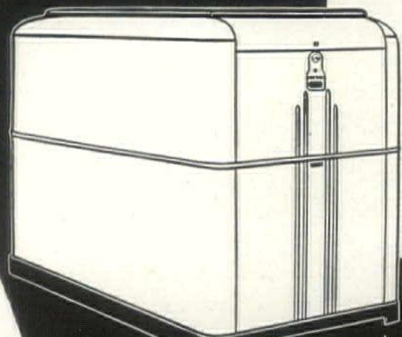
AGAIN NORGE LEADS!

HOME HEATING EQUIPMENT THAT HELPS PAY FOR ITSELF THROUGH SAVINGS IT CREATES

● Like all Norge products, Norge heating and air-conditioning equipment has vital differences in design and construction to assure maximum operating economy. The money saved in fuel costs alone, when an old-fashioned heating plant is replaced with a super-efficient Norge Fine-Air Conditioning Furnace, will convince any owner of the wisdom of his investment. Investigate the Norge heating and air conditioning line without delay. Ask the Norge heating expert to come over and discuss your problem.

NORGE HEATING AND CONDITIONING DIVISION *Borg-Warner Corporation, Detroit, Michigan*

HC-4

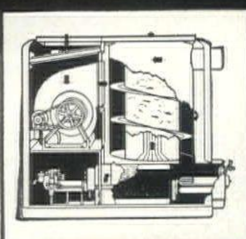


NORGE FINE-AIR CONDITIONING FURNACE

Filters, warms, humidifies, and circulates air in every room of the house. Can be adapted easily to full summer air conditioning as well. Delivers more than twice the amount of heat that old-fashioned furnaces do from the same amount of fuel.

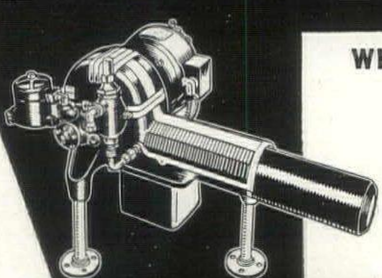
CUTS HEATING COSTS

Exclusive design of heat transfer unit makes possible a saving of up to 50% in heating costs for the average home now using old-fashioned equipment.



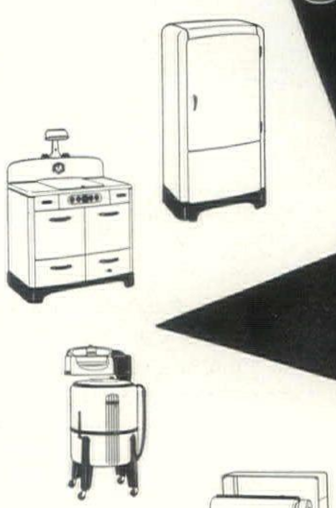
NORGE GAS BURNER

Cuts gas heating costs as much as 50%. Triple-control gives economy never before possible with gas. Be sure to get full details about this amazing burner.



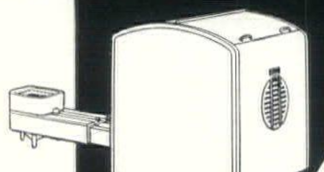
WHIRLATOR OIL BURNER

The Norge Oil Burner operates on the exclusive Whirlator principle—clean, quiet, economical. For use in the Norge Fine-Air Furnace or in modernizing existing heating plants.



NORGE COAL STOKER

Makes an automatic heating plant of the old-fashioned coal furnace. Extra capacity, most modern design, low in cost. Feeding mechanism of exclusive Norge construction—trouble-free, dependable.



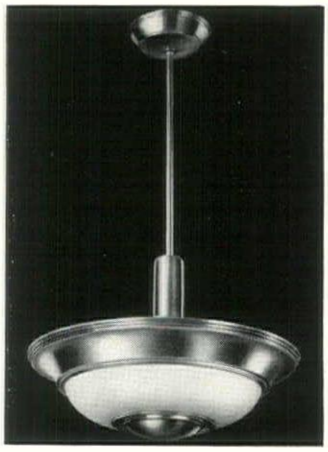
● Norge Rollator Refrigerators, Gas and Electric Ranges, Washers and Ironers are the new performance and style leaders.

NORGE

Plus Value **HOME APPLIANCES**

TECHNIQUES...

LIGHTING FIXTURE

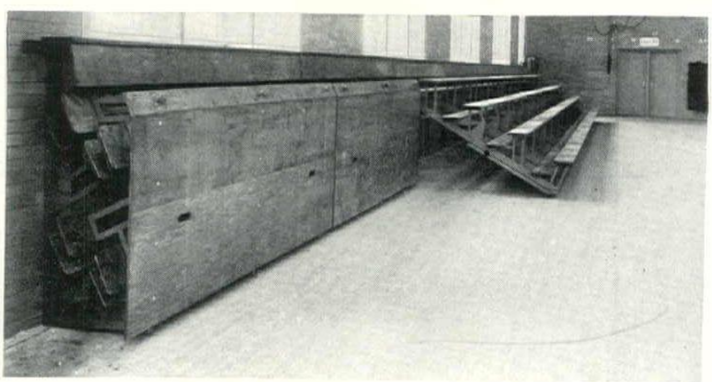


Bet-R-Lite is one of the newest lighting fixtures recommended for school use. It is claimed that Electric Testing Laboratories' test shows an unusual evenness and width of lighting distribution. Surface brightness of less than one candle foot per square inch is exceptionally low. A patented leakage opening makes this possible. Sizes are of a variety that make possible the proper use of from 150 Watts to 1500 Watt lamps, with maximum light output. Bet-R-Lite is a product of the Lightolier Company of Jersey City, N. J. **789M**

SLIDE RULE

The Winslow Strength Computing Slide Rule is a direct-reading, calculating device for solving any beam problem with mechanical precision. It answers every question concerning the strength of beams and takes into consideration kind of material, fiber stress and factor of safety; size of beam (cross section) and section modulus; length of span and method of support; spacing on centers; character of loading and amount of load or bending moment; number of beams; and deflection, shear and flexture. The rule is made of special, hard, non-metallic material, and is manufactured by Henry W. Tomlinson, Joliet, Illinois. **790M**

FOLDING GRANDSTAND



Adamson Folding Grandstands are available from 4 to 8 rows in height and in multiples of 10 feet in length. They operate by simple action. The counterbalance is said to be such that the stand will remain in perfect balance when lifted from the floor, and requires a minimum of effort to operate from fully open to fully closed and vice versa. The stands automatically come to the rigid position and are locked there ready for spectators upon being completely opened. Safety is said to be assured by this locking device, which fastens main load bearing supports in place. This device can only be released by person in charge. Heating units can be installed behind these units as circulation can be assured without interference. These stands, known as "Gymseating," are manufactured by Superior Seating Co., Inc., New York. **791M**

SHOWS AND FAIRS

HISTORIC AND PICTURESQUE OLD NATCHEZ is busy primping and pruning in expectation of thousands of visitors this spring. For Natchez, together with Vicksburg, New Orleans, Mobile, and the other cities of these three southern states, is reviving the spirit of the South as it was before the War Between The States.

Probably the greatest attraction of these "pilgrimages to the Deep South," as they are called, will be the tours of ante-bellum homes, and an opportunity to see the magnificent gardens for which the South is justly famous . . . and proud.

Natchez, itself has a past which goes into the realm of sheer romance. In Colonial days it was a mecca for adventurers of every sort, from princes of the blood, to pirates, poets, and gamblers. Later, as cotton made it the commercial center of the South, and brought almost fantastic prosperity, the descendents of English, Scottish, and Huguenot families carved magnificent estates out of the productive wilderness. Today, the placid dignity of Natchez is as rich in heritage as the century-old camellia japonicas which bloom in its Old World gardens.

Each of the cities has its heirlooms and treasures ready for the occasion. And each has some distinctive charm to show its welcome visitors: Vicksburg with its historic sites; Mobile, an almost never-ending garden; and New Orleans with its vivacious spirit, are but a part of the carefully preserved life of the "Deep South."

THE FIFTY-FIRST ANNUAL EXHIBITION of the American Architectural League of New York will open to the public at the American Fine Arts Building, 215 West 57th Street, on Thursday, April 22nd. Architecture, painting, sculpture, landscape design, and craftwork related to architecture will be included in the exhibition.

In the architectural division, the place of honor, namely the Vanderbilt Gallery, will be assigned to the Board of Design of the New York World's Fair 1939. They are preparing a collection of sketches, renderings, and models of buildings planned for the Fair. For the first time, the public will be afforded a comprehensive illustration of the vast preparation necessary from the point of view of arts in designing so great an enterprise as New York's exposition.

All parts of the United States, and many countries of Europe, will be represented in the exhibition.

ORGANIZATIONS

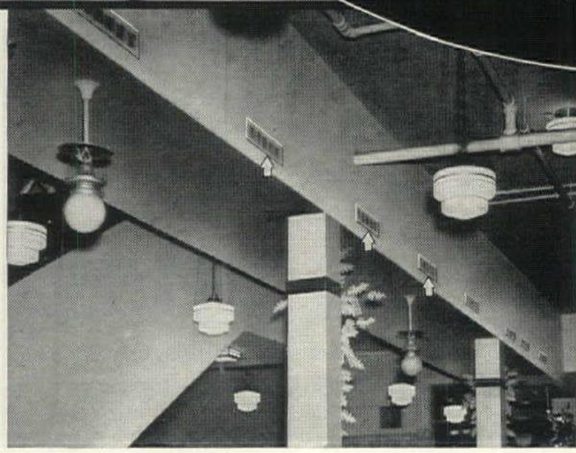
THE AMERICAN INSTITUTE OF ARCHITECTS, headed by William Stanley Parker of Boston, has started a movement to set up in every community in the country a building council in which builders, architects, labor interests, and material dealers of the immediate locality will meet and discuss problems peculiar to the area. The sixty-eight regional chapters of the association have been enrolled in the movement. "Law codes and regulations reach some abuses, but the real trouble lies in the disregard of fair play and honest work. Most cities should revise their antiquated building codes. There should be laws making mandatory the supervision of all building operations by qualified architects or engineers. Unsafe building should be dealt with like other crimes. To accomplish the needed reforms, the construction industry must be more thoroughly organized. . . . Every community should have its own construction organization, bringing together all the elements of the industry."

"Experience Saves Money — Assures Satisfaction"

Specialist in retail store design and construction is Architect Solomon Kaplan, who lists among his achievements the designing of the world's largest women's chain shoe store; the first shoe store with completely concealed stock; and the modernizing of one of the largest women's wear stores.

says Architect Responsible for Modernizing Leading Philadelphia Stores with

Carrier Air Conditioning



Eight Connecting Buildings, added at various intervals, comprise Blauner's—well-known Philadelphia store. When called upon to modernize these buildings for the greater comfort of customers and employees, Mr. Kaplan recommended Carrier Air Conditioning based on his knowledge of Carrier's 35 years of achievements.

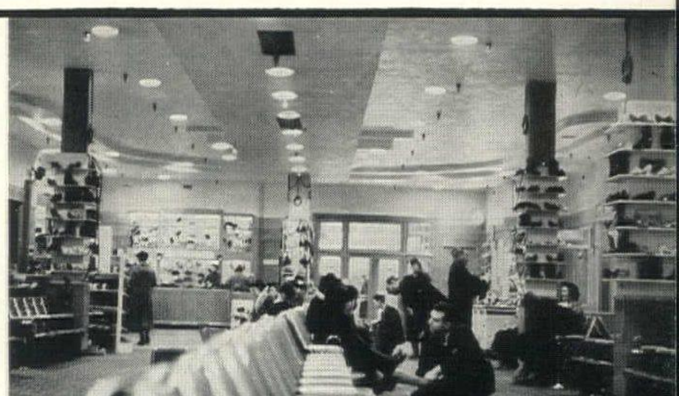
Tough Problem: From one central plant to provide efficient air conditioning for eight buildings — each with varying floor and ceiling levels — each with individual heating plants requiring a maze of pipes. Impossible? Not at all! The Carrier equipment specified by Mr. Kaplan keeps temperatures closely controlled — provides cool, dehumidified comfort for customers and employees.

Profitable? Ask Blauner's! Since installing Carrier Air Conditioning, soilage due to perspiration has been reduced to a minimum, and tremendous merchandise losses avoided. The cool, fresh atmosphere provided by Carrier has made Blauner's basements among the most popular places in Philadelphia.

More than 35 Years' EXCLUSIVE Air Conditioning Experience— AT YOUR COMMAND!

WHEREVER you may be located, there's a Carrier man within easy calling distance ready to help you solve your air conditioning problems. Behind this man is the accumulated experience of the organization that originated air conditioning—that has designed and installed air conditioning systems for every conceivable size and type of enclosed space—from the smallest corner store to the towering Philadelphia Savings Fund Society Building; Los Angeles Times Building; Edificio Kavanagh, Argentina; and New York's Waldorf-Astoria. From long experience, the Carrier man can help you select the equipment best suited for the particular job—and show you tested "short cuts" that save time and save money. He's a good man to know, the Carrier man, why not call him today? Or mail the coupon at the right for his address and latest copy of Sweet's catalog.

Since 1902, Willis H. Carrier and his associates have devoted their efforts exclusively to the science and art of air conditioning.



More Problems: Design the world's largest women's shoe store, and provide year 'round comfort for a seating capacity of more than 400. Mr. Kaplan solved the problem for Mary Jane Shoes with Carrier Air Conditioning. A few blocks away, the first shoe store where all merchandise is concealed is being completed for A. S. Beck Co., designed by Mr. Kaplan, Air Conditioned by Carrier, of course.

CARRIER CORPORATION, Desk 225,
850 Frelinghuysen Avenue, Newark, N. J.

Please send name and address of the nearest Carrier man—also latest copy of Carrier's catalog in Sweet's.

NAME ....

COMPANY ....

ADDRESS ....

PHOTOGRAPHS EXCLUSIVELY FOR CARRIER CORP. BY WALTER ENGLE, PICTURES, INC.

LETTERS...

GENTLEMEN:

There is no reason to suppose that the American public will ever care as much about the kind of architecture it gets as it does about the kind of government it enjoys. Nevertheless, it is a pity for it to remain oblivious, if a concerted effort on the part of those who do care about architecture can call their attention to just what they are getting.

The average American, whatever his party convictions, is proud of the fact that his government is an essentially liberal and progressive one. He takes it for granted that no one is expected to work seventy or eighty hours a week in order to survive, as many people were forced to do a hundred years ago; he expects to ride in a fireproof, all-metal railroad car, and he would strenuously object if anyone suggested replacing the electric light in his home with gas. In short, even though he may not be a progressive in politics, he is in his daily life.

Unfortunately, when he is confronted with a building that stands for the exact opposite, he is not well versed enough in architectural matters to realize how fundamentally it contradicts his modern point of view.

The proposed Jefferson memorial from the office of John Russell Pope is just such a building. Its design offers nothing that is imaginative, adds nothing creative to the history of American architecture. It is a contradiction in stone to the forward-looking and inventive genius of the American people and, more particularly, it is profoundly antagonistic to the spirit of the man whose fame it is supposed to commemorate.

One has the conviction that if Thomas Jefferson were alive he would be sad indeed to see such a moribund piece of architecture being erected in his honor, and that if he were allowed a hand in the matter he would recommend that the building of such a memorial be made the opportunity for men of vision in the architectural profession to show what they can do.

HAROLD STERNER

GENTLEMEN:

The Designers of Shelter in America, as a group dedicated to the achievement of honesty and quality in design, register herewith an emphatic protest against the proposed Jefferson Memorial in Potomac Park, Washington.

The proposed design has nothing whatsoever to do with the idealism of Thomas Jefferson, or with the idealism of America today.

The published design is contrary to that very idea of a living American culture for which Jefferson fought during his entire life.

The proposed design is expressive only of ideals of wasteful ostentation, and cultural stagnation which we hope are long since outmoded.

A memorial which could serve as a king's mausoleum is no fit commemoration of the life and work of America's premier democrat.

We protest emphatically that any memorial national in scope should be built without competition equally national among architects and sculptors.

We believe that the entire creative mind of American designers should have the opportunity of working upon such a project, and that the choice of architects, sculptors, and other necessary artists be made intelligently and not on the basis of personal predilection or political expediency.

The Designers of Shelter in America are therefore publishing this protest widely, and express the hope that all those interested in this project, and agreeing with this stand, will add their personal protests by letters to the President of the United States, to their congressmen, and to the Chairman of the Fine Arts Commission, Charles Moore, Esquire, Washington, D. C.

WALTER SANDERS,
Chairman, Public Affairs Committee.

A. C. SHIRE, President

TALBOT HAMLIN	JAN RUHTENBERG
ALBERT MAYER	HENRY N. WRIGHT

GENTLEMEN:

We, the undersigned members of the staff of the School of Architecture, Columbia University, herewith register an emphatic protest against the erection of the Jefferson Memorial in Potomac Park, Washington, D. C., according to the present proposed plans.

We protest especially the fact that the design of this great monument, to be built with national funds for a national hero, was chosen without a nation-wide competition or series of competitions. Only by a system of open competition can the creative genius of America find an opportunity of expressing itself as to what the character and form of such a monument should be. Only in this way can architects, painters, and sculptors for this magnificent enterprise be chosen on merit and creative ability rather than by arbitrary and restricted preference.

We protest also because we feel that the chief objective of any such memorial is to express and to commemorate the character of Thomas Jefferson, the great statesman and educator, who was such a powerful and liberating influence during the formative period of America, not only as a liberal democrat, but also as a progressive architect. We believe that the monument, if built as now projected, would be a lamentable misfit both in time and place.

Signed:

LEOPOLD ARNAUD, Acting Dean

C. C. BRIGGS	WILLIAM H. HAYES
CARL FEISS	JOHN C. B. MOORE
DONALD FLETCHER	EUGENE RASKIN
TALBOT HAMLIN	KENNETH SMITH

EDGAR I. WILLIAMS

The undersigned wish to register an emphatic protest against the construction of the proposed Jefferson Memorial in Potomac Park, Washington, D. C., for the following reasons:

1. The building is completely inappropriate and un-American in that
   a) it is a flatulent "adaptation" of a second-rate Imperial Roman Building—the so-called Pantheon, built by the Emperor Hadrian in the second century and consequently
   b) it in no way reflects the character, life, or accomplishments of Jefferson, who abhorred everything Imperial and whose University of Virginia is one of the most beautiful, fresh and deeply felt creations in the country.
   c) It will serve to make America ridiculous in the eyes of other nations, where architecture is a serious contemporary art, not an exercise in archeology.
   d) The site selected mars the beauty of the Tidal Basin and its cherry trees, and creates a serious traffic problem in the use of the 14th Street Bridge.
2. The basis for the selection of the architect is unknown. The building was awarded without competition, which is an incredible and high-handed procedure for a public monument of such importance.
3. The building will be a useless structure, which, if published reports of foundation conditions are true, will cost for foundations alone almost as much as the present appropriation of $3,000,000 and will benefit no one. A memorial to Jefferson should be something for use and enjoyment by the people; it should be democratic architecture of today, neither Imperial pomp, nor the conspicuous waste of economic-royalism.

THE LEAGUE FOR PROGRESS
IN ARCHITECTURE

We bring before the bar of the American people the Thomas Jefferson Memorial Commission.

We accuse this Memorial Commission in this, the 161st year of our Declaration of American Independence, of betraying the artistic integrity of our people, and of desecrating the memory of our great statesman, Thomas Jefferson, by erecting to him not a monument representative of his ideals and his search for truth for which we honor him, but a mockery of that truth.

INSULITE
BILDRITE SHEATHING

Is WATERPROOFED

Rain and Snow During Construction . . . But Bildrite Sheathing Weathered the Storm!

Take the house pictured above. Even extreme moisture conditions, brought about by heavy rains and a three-inch fall of snow, did not impair the strength and efficiency of Bildrite Sheathing. Asphalt-treated all the way through during manufacture, every fibre is protected . . . one of many reasons why architects can and do specify Bildrite Sheathing with utmost confidence:

1. **Four times the bracing strength of ordinary wood sheathing.**
2. **Far more insulation than lumber.**
3. **No open joints or knotholes—windproofed walls.**
4. **Prevents infiltration of dampness and humidity.**
5. **Lower application cost.**
6. **One solid piece . . . easily applied.**
7. **Prevents internal condensation and moisture accumulation.**

FOR FURTHER INFORMATION SEE OUR CATALOG IN SWEET'S

ARCHITECT: Wessel, Brunet and Kline
CONTRACTOR: Wessel and Johnson

QUICKLY APPLIED

WRITE FOR SAMPLE AND LITERATURE

The INSULITE Co.

BUILDERS EXCHANGE BUILDING • MINNEAPOLIS, MINNESOTA

Insulite Products are Protected Against Attack by Termites, Rot and Fungi, and Have Always Been Guaranteed

In every advertisement to prospective home builders we say, "IT WILL PAY YOU TO SEE AN ARCHITECT BEFORE YOU BUILD OR MODERNIZE"

Let it be remembered that it was Thomas Jefferson who helped to declare these United States an independent and virile young nation—a nation that has taken its place among the nations of the earth—with the right to develop upon this most fertile soil an art natural to its soil and the spirit of its people.

This Memorial Commission has now approved a design of a monument to that great author of our Declaration of American Independence—to the man who had helped to declare us a free people with the right to independent existence—not a monument, but a senile sham, not a representation of an ideal, but a burial of that ideal under the guise of misunderstood tradition and architectural decay. It has selected a design foreign to people of our time and unnatural to the soil upon which it is to be reared. A monument in imitation of a weak imitation of a culture, which even the first imitators did not understand: an affectation which will mark for all time a sense of superficiality rather than the truth Jefferson sought and which will remain a disgrace and a blot on this generation for as long as this memorial endures.

Let us not take as an excuse the fact that Jefferson had used the Pantheon in Rome to serve as a model for Monticello, or that he had advocated the study of Greek and Roman architecture as examples for the public buildings of his period, because, to use his own words in a letter to James Madison, he said, . . . "as representing to travelers a specimen of taste in our infancy, promising much for our maturer age."

We must remember that we were still at that time too young to have an architecture of our own, for then we were only a provincial offshoot of European culture. Jefferson, a "modern" among the architects of his day, joined with other provincial architects in the movement then spreading fast in the mother country and in France in a rebellion against the Baroque which followed the disintegration of man during the "Renaissance." It was Jefferson's blind search for simplicity and dignity in his desire to arrive at a form which would express the simplicity and straightforwardness of our people, as Jefferson himself further states in his letter to Madison—"You see I am an enthusiast on the subject of the arts, but it is an enthusiasm of which I am not ashamed, as its object is to improve the taste of my countrymen, to increase their reputation, to reconcile to them the respect of the world and procure them its praise."

Today, when we are developing men who are beginning to assert our artistic independence and where, day by day, we are becoming less and less a provincial offspring of European art; when we are developing a culture which is becoming distinctly our own and which we are sure would have been Jefferson's wish, it becomes fitting, that a monument to him shall be the expression of this attainment.

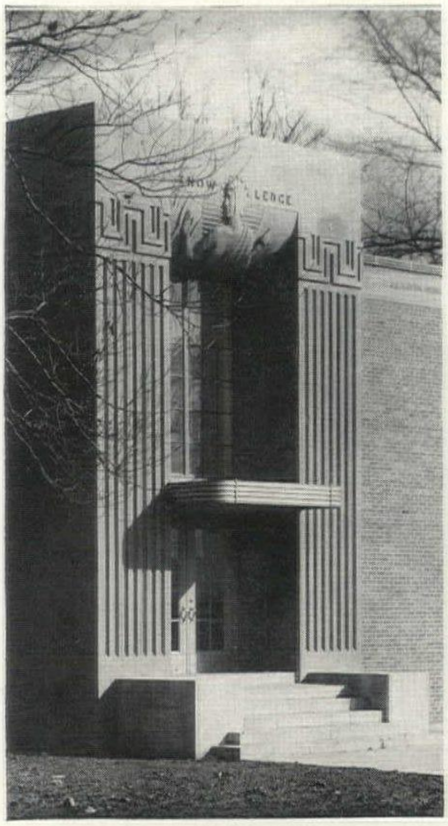
We, therefore, demand that the Congress of these United States discard this design and lift the curse which Jefferson, himself, wrote in his Notes on Virginia 153 years ago, when he said: "The Genius of architecture seems to have shed her maledictions over this land"—and issue a competition open to all architects and sculptors and that the basis of that competition shall be the choice of a design which will be natural to its site, built in materials which are most natural to its location, in which there shall be a perfect collaboration between the arts of architecture and sculpture; also, in its dignity, truth and virility be a true symbol of our commemoration to the man who wrote our Declaration of American Independence, who was the third President of our United States and a man who sought after an architectural truth.

SOCIETY OF AMERICAN SCULPTORS.

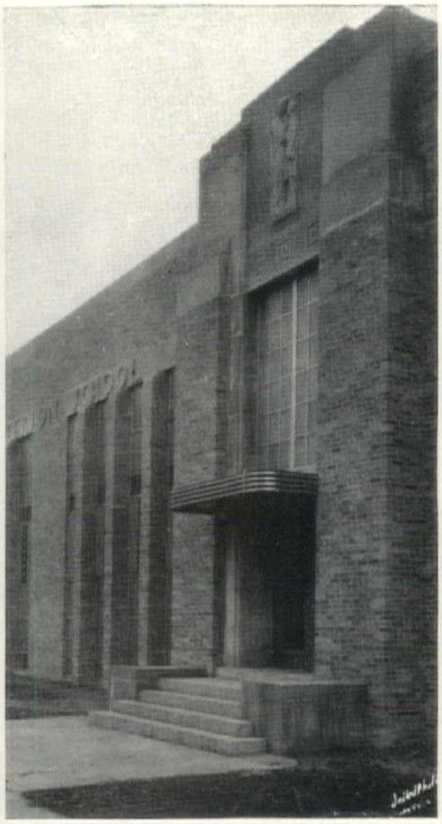
MILTON HORN,

Chairman of Cultural Committee and Member of Executive Board of the Society of American Sculptors.

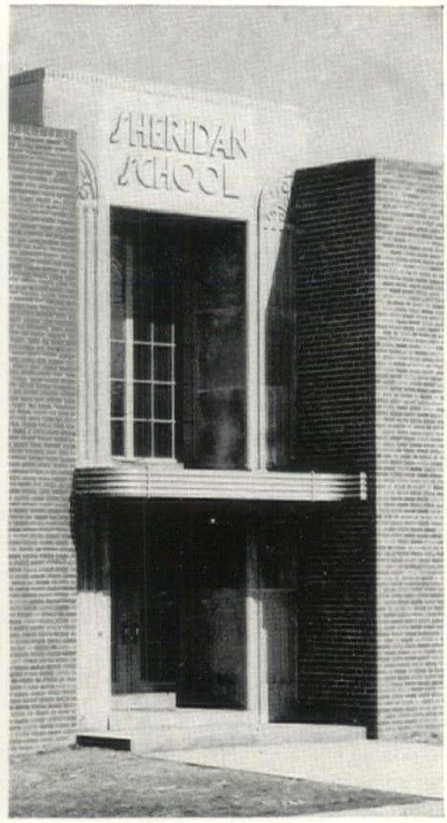
The following organization has indorsed this action of the Society of American Sculptors: Society of American Painters, Sculptors and Engravers.



Lincoln Grade School



Jefferson Grade School
Schaeffer & Hooton, Architects—Bloomington, Ill.



Sheridan Grade School

Inside These Doors

HEALTH-COMFORT-CONVENIENCE

WITH JOHNSON REGULATION

Regardless of the type of system employed in heating and ventilating a school building, proper Johnson automatic control equipment is available. The inevitable result is health and comfort for teachers and pupils, convenience and economy for operating personnel. . . . . These modern buildings at Bloomington, Ill., are heated and ventilated by "warm air blast". A Johnson thermostat in each room operates, silently and effectively, a Johnson mixing damper, and the proper mixture of heated and tempered air is carried by each delivery duct. Johnson Service Company, Milwaukee, Wis., and *direct* branch offices in all principal cities.

JOHNSON

AUTOMATIC TEMPERATURE AND HUMIDITY CONTROL

For Heating - Cooling - Ventilating & Air Conditioning Systems

SUMMARY OF WAGNER-STEAGALL HOUSING BILL

By EDMOND H. HOBEN

This bill outlines a long-term, national policy to provide decent housing for families of low income in the United States. It establishes a policy of co-operative effort among local, state and federal governmental bodies and private agencies. The federal government's administrative agency in this joint undertaking is called the United States Housing Authority. The phrase, "families of low income," is defined as "families who cannot afford to pay enough to cause private enterprise in their locality or metropolitan area to build an adequate supply of decent, safe, and sanitary dwellings for their use."

The bill also deals with "public housing agencies," which are state or local governmental bodies with powers to develop and administer low-rent housing. They include what are commonly called local housing authorities. It also refers to "consumers' housing societies," which are non-profit corporations or co-operatives under the supervision and control of the Authority. The members of these societies are persons of low income who need and are interested in securing better housing. "Limited-profit housing agencies" are co-operatives, limited-dividend, or non-profit corporations strictly regulated by law or by the Authority.

The policy set forth in the bill recognizes the distinction between slum clearance and low-rent housing. Slum clearance is defined as the demolition and removal of buildings from a slum area, regardless of the future use of the area, and may include the adaptation of the area to public purposes such as parks. The development of low-rent housing includes any or all steps in planning, financing, acquiring land, demolishing old buildings, constructing and equipping adequate housing for families of low income. Thus it may include slum clearance.

THE UNITED STATES HOUSING AUTHORITY: The United States Housing Authority is an independent, public, corporate body of perpetual duration. It is controlled by a board of directors composed of three members, appointed by the President with the advice and consent of the Senate. The normal term of board members is five years. The original terms are staggered—one, three and five years.

The primary duty of the Authority is to assist public housing agencies (chiefly local authorities) by loans and grants, to provide decent low-rent housing in their localities. Certain standards of preference are set up to guide the Authority in making these loans and grants. For example, if a development includes slum clearance, proper rehousing must be available to families displaced; funds are to be distributed as widely as practicable throughout the country in accordance with housing needs of low income families; the proposed housing must fit in with the rational development of its community; and substantial assistance by local or state government (in such forms as partial financing, annual contributions to supplement rents, partial remission of taxes, or land, community facilities and services) will be counted in favor of a project.

The Authority is also empowered to make loans but not grants to limited-profit housing agencies. Not more than \$25,000,000 of such loans may be made in any year. No loan of this kind may exceed 85% of a project's cost. The standards of preference mentioned above also apply.

The Authority also has a limited right to develop and administer a few demonstration projects either for low-rent

housing or slum clearance. These projects may be started only with the consent of a local governing body. Not more than one demonstration project may be developed in any locality and not more than $25,000,000 spent upon such projects in any year. Furthermore, the Authority has to rid itself of the control of a demonstration project as soon as practicable; it may sell the project to a public housing agency or lease it to a public housing agency or consumers' housing society. Standards of preference also apply to the development of demonstration projects. While title is held by the Authority, it may pay service charges in lieu of local taxes.

The other minor and subsidiary powers of the Authority include the right to make surveys and studies and to undertake and encourage research and experimentation in various aspects of housing.

LOANS AND GRANTS TO LOCAL HOUSING AUTHORITIES: The plans for loans and grants under the Wagner-Steagall bill differ markedly from the existing methods of financing low-rent housing in this country. Care must be taken to avoid misunderstandings from a mixing of present practice and contemplated plans. The chief difference between them is that under this bill, capital or lump-sum grants or write-offs of capital funds are not allowed. Terms and concepts based on this practice have to be dropped if the new plan is to be understood.

Under this bill the Authority will raise capital funds by the sale of its bonds, guaranteed by the United States. It may lend these funds to public housing agencies (and to limited-profit agencies) for the development of low-rent housing. These loans may amount to the development or acquisition cost of the project. As pointed out, however, preference will be given to projects for which part of the capital funds are raised from other sources. The interest rate may not be less than the going federal rate at the time the loan is made. Length of loans (not more than sixty years), security, and method of repayment are to be determined by agreement between local and federal authorities.

In place of capital or lump-sum grants, the Authority is authorized to make separate contracts with local authorities (in addition, that is, to the loan contracts), for fixed and uniform annual contributions to supplement the rents collected by the local authorities from the low-income tenants. No annual grant may exceed a sum equal to the annual yield at the going federal rate of interest plus one per cent upon the development or acquisition cost of a project. The maximum possible period for these annual contributions is sixty years. The Authority is charged with limiting the amount and the length of term of these grants to the minimum necessary to assure low rentals in each project. The effect on rents of the maximum subsidy under present costs of producing and operating typical housing in the larger cities would equal roughly a reduction of forty to fifty per cent of a strictly self-liquidating rental based on low interest rates. Annual grants may not be paid out of monies borrowed by the Authority. The Authority may not enter into new contracts for grants averaging more than $10,000,000 annually.

The Authority has ample power to assure the continuing low-rent character of projects financed by it. If the borrowing agency does not keep rents low, the Authority may collect interest at a rate increased to the going federal rate plus two per cent or may declare the unpaid principal of the loan due forthwith. In making contracts for annual grants, it will reserve the right to reduce or discontinue the grants if the local public agency should break its agreement to maintain low rentals.

FUNDS FOR THE AUTHORITY: The Authority is authorized to issue its obligations, guaranteed by the United States, in amounts not to exceed $200,000,000 on or after July 1, 1937, $250,000,000 on or after both July 1, 1938 and July 1, 1939, and $300,000,000 on or after July 1, 1940. As mentioned above, monies from these bond issues may not be used to pay annual grants but only to make loans at not less than the going federal rate of interest.

The cost of annual subsidies is to be met by periodic appropriations by the Congress. The bill calls for an appropriation of $51,000,000, of which $1,000,000 is for subscription to capital stock in the Authority. The balance may be paid out in annual grants in accordance with contracts made with local authorities.

MAJOR MISCELLANEOUS PROVISIONS: The President is authorized to transfer to the Authority any projects of existing federal low-rent housing agencies and the other assets, contracts, records and materials connected with such projects.

New employes of the Authority, except officers, attorneys, experts, skilled and unskilled building labor (on demonstration projects) are to be selected under the civil service laws. Employes taken over from other federal housing agencies are "covered into" the civil service only if certified by the Authority and if they pass a non-competitive examination given by the Civil Service Commission.

OBITUARIES

PROFESSOR ELIHU THOMSON, 83, dean of American scientists, and one of the founders of the General Electric Company, died at his home in Swampscott, Mass., March 13. He had been seriously ill since January. Professor Thomson, together with Thomas A. Edison, James J. Wood, and Charles F. Brush were the great quartet which created the modern electrical industry. Funeral services were conducted in Lynn, Mass.

Elihu Thomson was one of America's greatest pioneers in the field of electrical science. His technical work was directly reflected in practical developments, and he held upward of 700 patents in the United States alone. His life was very active outside of the electrical field as well. One of his many important contributions was to the field of his life hobby—the fused quartz mirror for astronomical telescopes.

Among his many awards, Professor Thomson was the only man who ever received all three of England's highest scientific honors—the Hughes, the Lord Kelvin, and the Faraday medals.

THE OFFICERS AND DIRECTORS of the Allegheny Steel Company announce with deep sorrow the death of Mr. Harry E. Sheldon, President and founder of the company, on Wednesday, February 10, 1937.

MARCUS TULLIUS REYNOLDS, architect, traveler, writer, and genealogist, died on March 18th in the Albany Hospital after a week's illness. He was stricken several days before he was to have sailed for Rome, where he was scheduled to address the American Academy of Architects on "Civic Planning." He was sixty-seven years old.

Mr. Reynolds was a member of one of Albany's most distinguished families. Born in Great Barrington, Mass.,

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The great enemy of insulation is moisture. And moisture is prevalent in varying quantities in hollow walls and roofs of every structure. It is normally suspended in the air in the form of vapor. As long as air is permitted to circulate in between structural framing members, little effect of this moisture laden air is observed.

When temperature changes occur, this moisture laden air may reach its "dew-point" temperature within the wall or roof structure. Then the vapor condenses into water. The use of an insulation, like ALFOL, which does not lose its insulating efficiency when exposed to condensation *keeps insulating values constant* under all service conditions.

ALFOL INSULATION, being pure aluminum metal, cannot absorb moisture. As installed, it permits enough air circulation to quickly re-absorb any condensation that temporarily appears. ALFOL meets the severe demands imposed by modern air conditioning because its efficiency is unaffected by varying outdoor or indoor humidities.

Showing how Alfol utilizes air spaces in combination with reflective insulation.

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he attended St. Paul's School, and graduated from Columbia University in 1893 with the degree of Ph. B. He studied architecture in Paris, Rome, and Athens, returning to America in 1895 to establish practice. One of his achievements in the architectural field is the Gideon Putnam Hotel and the Saratoga Springs State Reservation.

WILLIAM R. FERGUSON, retired New York architect, died at his home in New Rochelle, N. Y., of a heart attack recently. He was 73 years old.

Mr. Ferguson was born in Aberdeenshire, Scotland. He started his architectural work in New York in 1889 with the firm of Bruce Price. For twenty-five years he was associated with the firm of H. J. Hardenburg as supervising architect. He worked on many important New York hotels, including the old Waldorf-Astoria, the Plaza, the Martinique, and the Manhattan, and on several large office buildings and apartment houses. He also supervised the construction of the Copley Plaza Hotel in Boston, and the Mohican Hotel in New London, Conn.

JAMES REILLY GORDON, honorary president of the New York Society of Architects, and president of the New York State Council of Registered Architects, died at his home in Pelham, N. Y., after a brief illness. He was seventy-three years old.

Buildings designed by Mr. Gordon stand in almost every part of the United States. They include many courthouses, banks, hotels, churches, and theaters. Lately he had been commissioned to design a building for the New York World's Fair. He was chairman of the architects joint committee which is preparing a new building code for New York.

A native of Winchester, Va., Mr. Gordon spent his youth in Texas, and acquired his knowledge of building construction working under the United States Supervising Architect's Office. He was president of the New York Society of Architects for thirteen terms, also chairman of its board of directors and executive committee. When he declined another term, the society created the honorary presidency.

FREDERICK McMONNIES, American sculptor, died on March 22nd at Doctor's Hospital, of pneumonia, with which he had been stricken a few days ago. He was seventy-three years old.

Mr. McMonnies was recognized both here and abroad as one of the world's first rank artists. The brilliance of his work as a student in Paris won him honors and recognition seldom accorded a foreigner, and his later achievements earned international fame not exceeded by any contemporary American artist. His greatest works were the Marne Battle Monument, at Meaux, France; the Washington group, at Princeton, N. J.; and the Nathan Hale statue in City Hall Park, New York.

CORRECTIONS

In the Portfolio of Show Windows published in our February issue, we illustrated the Schilling Flower Shop on Wilshire Boulevard, Los Angeles, crediting the design of it to Morgan, Walls & Clements. The latter firm designed the building itself, but the design of this shop, among others adjoining, was the work of J. R. Davidson of Los Angeles.

On page 84 of the March issue we referred to Walter Dorwin Teague as the architect of the Ford Florida Exhibition Building. Actually Mr. Teague is a designer.

We incorrectly gave the engineers credit in our February issue for good taste in painting the Golden Gate Bridge International Orange. We have learned that the taste was due to the consulting architects, Morrow & Morrow of San Francisco.

Reconstruction and Revival

Reconstruction and modernization of outdated but latently valuable property is featuring the first stages of the building trades revival already underway as a part of the general business upturn throughout the country, declares Ely Jacques Kahn of New York, Chairman of the Committee on Allied Arts of the American Institute of Architects.

Reviewing the field in a report to the Institute, Mr. Kahn says that only by installation of modern improvements, in many cases amounting to almost complete redesigning, can the "actual value" of many neglected structures be brought to light. Included among the improvements he mentions are up-to-date elevators, air conditioning, proper lighting, and effective fire safeguards.

"For many years little has been done to preserve existing buildings," explains Mr. Kahn. "There are countless homes, schools, churches, office buildings, and factories that need modernization urgently.

"The actual value of so much property can be brought to light by minor or major improvements, additions, or possible rebuilding. So much is being done successfully at this moment that it is not an exaggeration to assume that a great number of buildings will come under similar scrutiny in 1937. New elevators, air conditioning, proper lighting are but a few of the features that will be considered.

"Many stores will be redesigned completely. They are dingy, old fashioned, and lack modern conveniences.

"Many office buildings cannot compete with the newer ones—their lowered incomes are directly the result of physical conditions that need correction. The owner who refuses to analyze his investment is like the man who insists on preserving worthless stock certificates because he likes the paper on which they are printed.

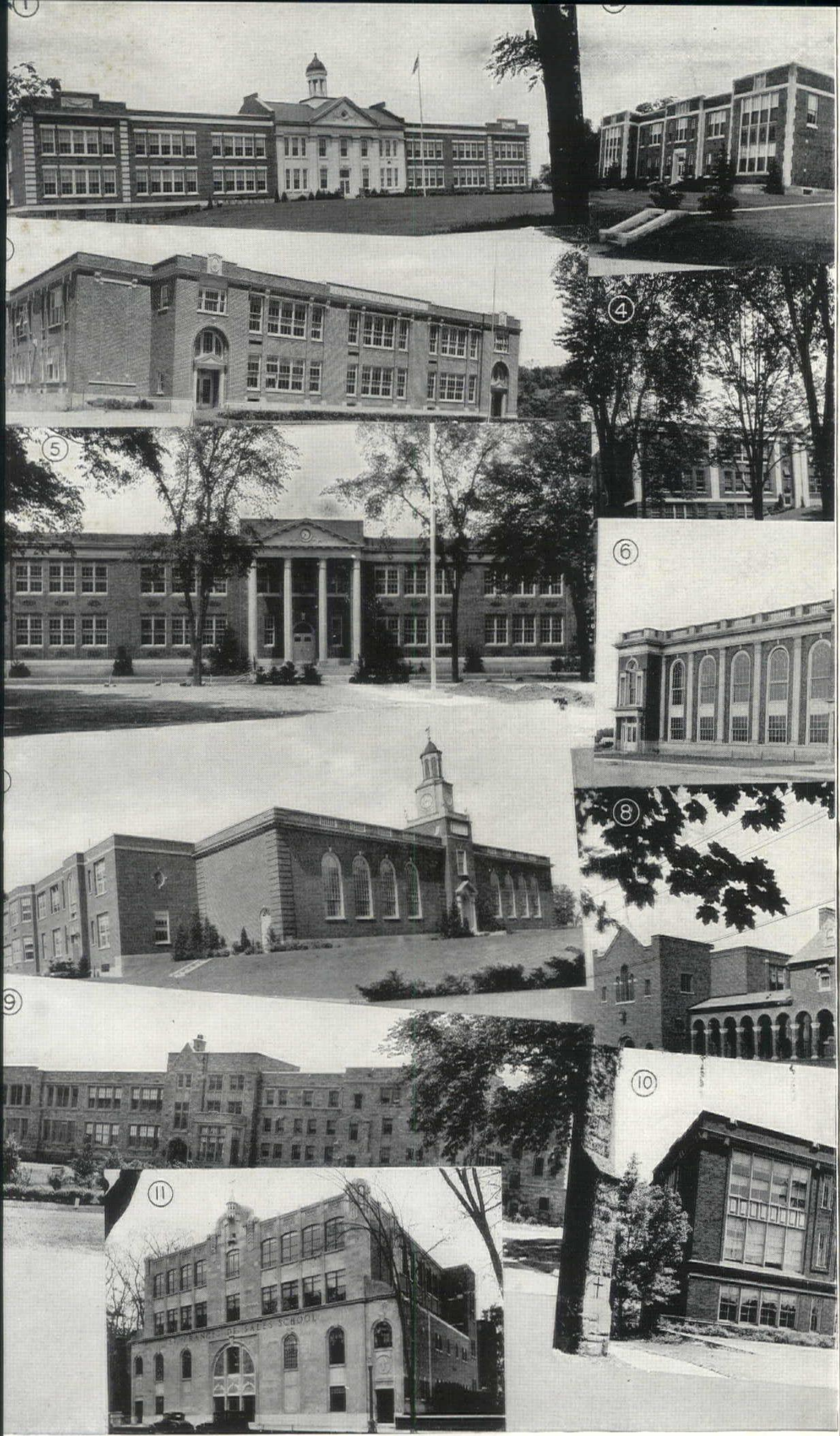
"The pressure is here, and there will be more of it. There is a French saying that when building develops, everything develops—note the reports of the steel industry and the great companies who supply other building materials. The architect's function is to direct this work of building and rebuilding not only so as to obtain beauty, but to insure intelligent use of materials and money.

"A year or more ago, architects were very much interested in the possibilities of a real housing program coming to fruition. They gave of their time, and spent large sums of money—particularly that provided by Federal agencies dealing with this most necessary feature of shelter for the vast number of people of moderate income. Little resulted beyond more experience, more study, and more expense.

"It is realized now that housing cannot be handled so casually. If the government does not propose to sponsor this activity it will undoubtedly be shifted to private enterprise, based on a definite knowledge of demand, available rentals, available financing and more particularly a determination that protection for those who deserve it is as important a public responsibility as hospital or police service.

"As building progresses it is essential that jerry building be controlled. One of the important building news services is now agitating a demand that the loaning institutions insist on proper supervision of buildings erected with their money. The situation is so elemental that there can be little argument against its acceptance for we have seen enough of amateur building, where return is the only consideration.

"The public is interested, for it has seen collapses and deaths and knows that shoddy buildings are the result of carelessness, due primarily to the laxity of those who sponsor such strange investments. If another surge of building does develop, some agency must assist the building departments in producing proper work: it does not appear that the type of builder who scrambles into construction because it offers opportunities for a quick grab at profits should be stimulated. He slashes at professional fees, proper control and accomplishes nothing of permanent value."



NEW YORK STATE SCHOOLS ENJOY MODERN HEATING

Webster Hylo Systems Give Excellent Results in Upstate Schools

COMFORT IN ZERO WEATHER

Throttling Type of Control Checks Overheating and Reduces Steam Costs

2 TO 5 YEARS OPERATION

Albany, N. Y.—The picturesque wood range, which heated the little red school house, is a far cry from the efficient central heating systems in schools of today.

But despite vast improvements in heating methods, school officials have found that well-regulated, carefully balanced heating cannot safely be left to chance. The modern heating system must meet class-room temperature requirements day in and day out, it must be relatively free from trouble, and it must be simple to operate and, above all, economical.

This is the heating record of eleven upper New York State schools within 50 miles of Albany where heating needs are being met by the Webster Hylo System of Steam Heating.

These 11 schools, located in a section of New York State noted for its severe winters, have enjoyed economical heating service, comfortable indoor temperatures and minimum repair and maintenance bills with Webster Hylo Systems. Webster Control has been in operation in these schools for periods ranging between two and five years.

With the Webster Hylo System, heat loss is reduced to a minimum. If the outdoor temperature is 35 degrees, the operator adjusts the weights on the Webster Hylo Variator at 50 per cent. Direct radiators are then kept approximately half filled. During all periods of mild weather, the radiators are partially filled with steam. This throttling type of control is achieved with Webster's simple, rugged, conveniently located Variator valve.

School officials have come to value the service of the Webster Organization. Webster engineers study each installation carefully, make adjustments to meet particular conditions involved, and stay on the job until the installations are operating at maximum efficiency.

Eleven of the upper New York State schools heated by Webster Hylo System are illustrated here and can be identified by number as follows: (1) Central School, Greenville; (2) Central School, Westport; (3) Central School District No. 1, Averill Park; (4) Central School, Schoharie; (5) Lewis Rutherford Morris Central School, Morris; (6) Central District School, Broadalbin; (7) Central School District No. 1, West Winfield; (8) Blessed Sacrament School, Utica; (9) St. Agnes School, Loudonville; (10) Grade School No. 1, Mechanicsville; (11) St. Francis de Sales School, Utica.

IMPROVED *Webster* Systems of Steam Heating

The Webster Hylo Steam Variator—a simple, rugged central control—regulates the heating of 11 New York State school buildings shown on this page. The Hylo Steam Variator (illustrated) automatically throttles a rugged motor-operated valve in the steam main.

If you are interested in heating new buildings, or in improved heating service and lower heating cost in your present building, address

WARREN WEBSTER & CO., Camden, N. J.
Pioneers of the Vacuum System of Steam Heating
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COMPETITIONS

THE "BROTHERS OF THE CHRISTIAN SCHOOLS" recently held a competition for the design of a main Academy building with a capacity of 600 students, together with a Christian Brothers' residence housing twenty people and joined to the principal building by means of a connecting link. Six Albany architects were invited. The winning design was awarded to Gander, Gander & Gander, Architects.

ANNOUNCEMENTS

TWO ARCHITECTS WERE RECENTLY ELECTED to associate memberships in the National Academy of Design. They were, John Holabird, of Chicago; and Everett Meeks, Dean of the School of Fine Arts of Yale University.

SCHOOLS AND SCHOLARSHIPS

CHARLES E. McQUIGG WILL BECOME DEAN of Ohio State University's College of Engineering, July 1st, President George W. Rightmire announced not long ago. Mr. McQuigg graduated from Ohio State in 1909 with a degree in the school of mines. His appointment follows a canvass by a committee of faculty and alumni in which 65 names were considered.

Dean Embury A. Hitchcock retired as head of the engineering college at Ohio State last summer. Since that time the college has been administered by William D. Turnbull as acting dean. Mr. Turnbull had previously been junior dean of the college.

THE SCHOOL OF BUSINESS OF COLUMBIA UNIVERSITY and the American Institute of Real Estate Appraisers of the National Association of Real Estate Boards jointly announce the opening of two case-study courses in real estate appraisal to be given at Columbia University this summer.

Appraisal I, to be given June 7th to 19th, offers (1) a general groundwork in fundamental valuation principles applicable to all classes of real estate; and (2) proper procedure in the appraisal of residential properties. Appraisal II, to be given June 21st to July 3rd, offers practical training in the appraisal of typical small income properties

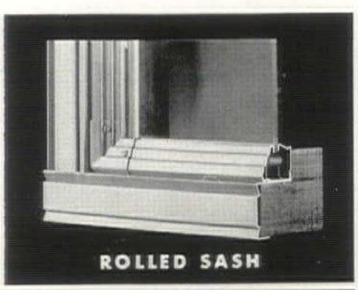
AMERICA IS OVER-SOPHISTICATED, NOT DECADENT, according to Professor Bowes, of the School of Dynamic Symmetry.

"The great weakness in the art of today lies in the fact that it does not disclose concrete proportion. It is also notably deficient in originality of design," he says, and continues, "Egyptian pyramids, Greek temples, and Renaissance cathedrals were all oriented to either stellar or solar systems, and the sculptures evolved from the 'sacred' astronomic discoveries. If an artist does not understand symmetry and rhythm, he can only trust to his feelings and design blindly. . . . After a certain point is reached he is left groping and embarrassed for lack of the technical knowledge necessary to overcome the simplest mechanical difficulty. . . . Application of the principles of dynamic symmetry will create an art in America which will surpass that of any cultural period in the history of the world."

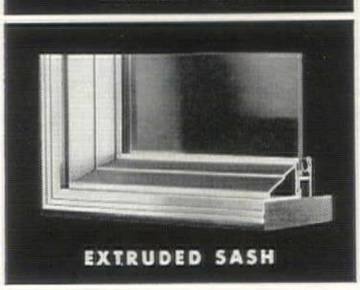
Dynamic Symmetry was described as "a system of proportion in the fine arts, based primarily on the length of the diagonal of a square or rectangle in relation to one of its sides, especially the development of a series of related rectangles with the same width, the length of which in each case is the diagonal of the previous one."

(*Continued on page* 150)

INTERESTING SUGGESTIONS ON THE USE OF ZOURI STORE FRONT CONSTRUCTION!



ROLLED SASH



EXTRUDED SASH

This new portfolio presents a group of original store front designs showing a few of the many possibilities that lie in the use of ZOURI Rustless Metal Store Front construction. Full size details are also available to anyone interested in store front work ... with data on many new mouldings, awning bars, extruded construction, and other new ZOURI developments. Special architectural metal work, of all kinds, is also furnished. Merchants everywhere are demanding better store front design, better planning, better construction. Be prepared for more profitable store front work! A 12 page catalog is at your disposal in SWEET'S; the Zouri distributor will be glad to work with you. PORTFOLIO OF ZOURI STORE FRONTS SENT FREE ON REQUEST TO ZOURI STORE FRONTS, NILES, MICHIGAN

ZOURI STORE FRONTS

(Continued from page 148)

THE DEPARTMENT OF ARCHITECTURE, College of Fine Arts, Syracuse University, will conduct courses in Architecture for a limited number of students during the Summer Session of 1937. Collaborative work in design and construction will be stressed, together with a study of existing early American Architecture in the Central New York area. The session will begin July 5th and will cover a six-weeks period of study.

The following courses will be offered:

Elements of Design and Theory of Architecture. Lectures and drawing. For beginning students in architecture. A study and analysis of the elements of classic architecture. Lectures covering the explanation and form of columns, entablatures, walls, doorways, windows, vaults, etc., combined with graphic presentations, rendered in India ink washes. 1 to 4 daily.

Introduction to Construction. The structural properties, methods of manufacture, and the artistic expression of the basic material groups are considered. Lectures, drawings, field trips. Monday, Wednesday, 12 to 1; Friday, 9 to 12.

Materials of Construction. Lectures on the physical properties, technical data and details of woods, concrete and concrete products, mortars, stones, brick, terra-cotta, gypsum, waterproofing, etc., including their application in detail to current design problems. Construction design studies in the making of dimensioned working drawings, together with the necessary calculations of current design projects. Field trips. Monday, Tuesday, Wednesday, Thursday, 8 to 12.

Freehand Drawing. Water color sketches and creative studies. Emphasis on the delineation of architectural subjects. Time to be arranged.

Architectural Design. One major problem and one minor problem in all grades of design. Five ten-hour sketch exercises in each grade. Collaborative criticism in design and construction. Field trips which will include a study of the early American architecture of Central New York. Students may elect the programs issued by the Beaux Arts Institute of Design in lieu of local assignments. One lecture each week dealing with the work of contemporary architects. Problems and lectures involving a study of Domestic Architecture will be arranged for students not majoring in Architecture. Forty dollars for the semester. Criticism 1 to 4 daily.

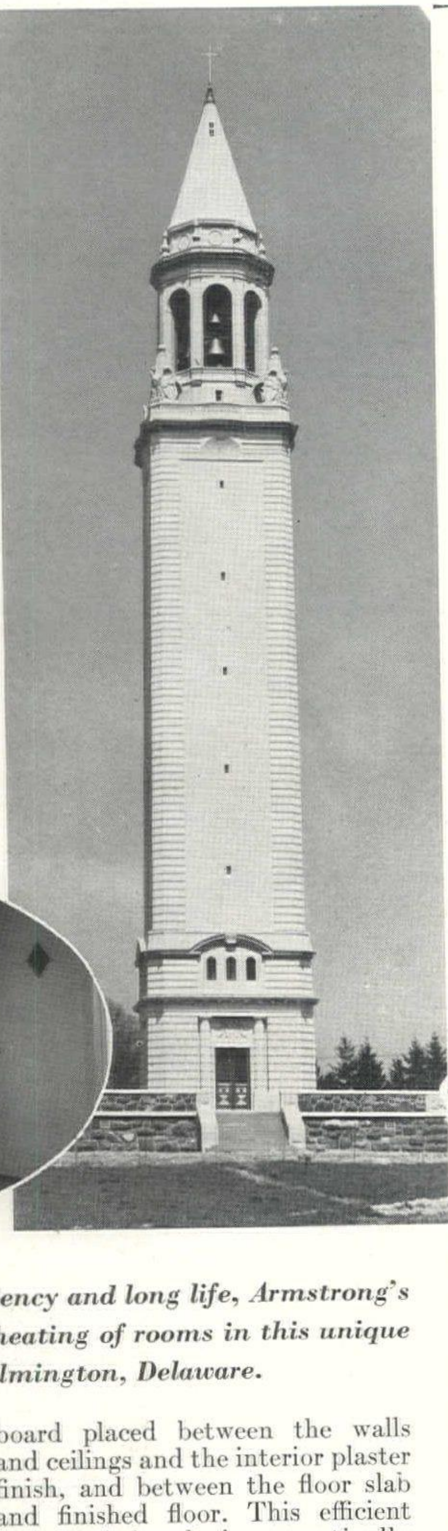
A bulletin of information may be obtained upon request to the Director of Summer Sessions, Syracuse University, Syracuse, N. Y.

The College of Fine Arts at Syracuse University is also offering architectural scholarships to freshman students. One $300 and four $150 scholarships to be granted by competition on Saturday, July 17th. The competition will be in two fields—drawing and preparatory school record. (1) Contestants must send to the College of Fine Arts not later than Monday, July 5th, a portfolio containing not more than 20 examples of their work in free-hand and mechanical drawing together with three letters of recommendation as to personality, character and general fitness. Judging the drawings by a committee of the Architecture Faculty will take place on Saturday, July 17th. (2) The High School records of all contestants will be carefully examined by the Director of Admissions and the Architecture Faculty Committee to determine fitness for a course in Architecture. Special attention will be given to ability in high school mathematics.

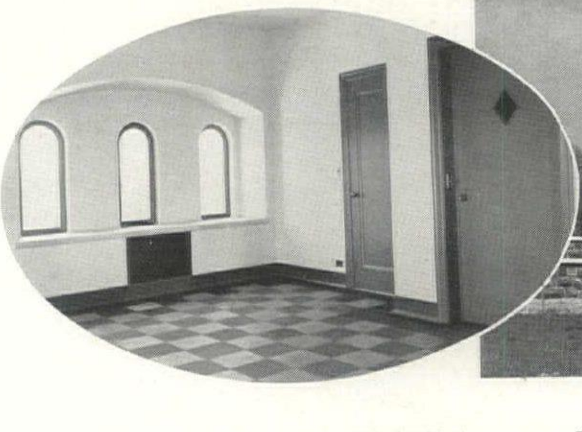
Each portfolio of drawings, etc., must contain the name

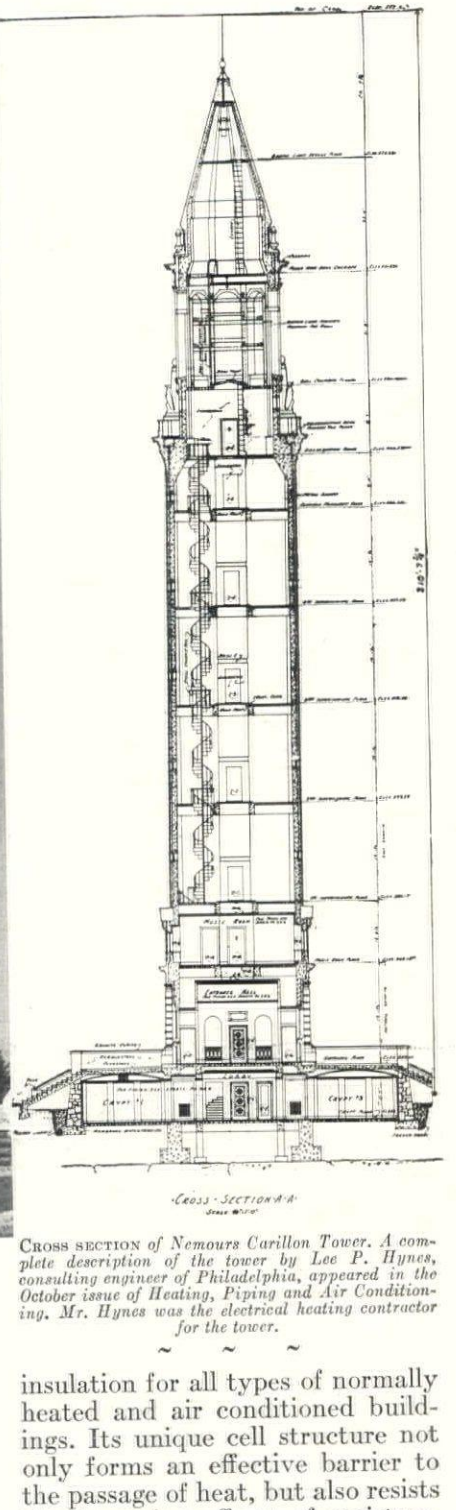
In the NEMOURS CARILLON TOWER

ARMSTRONG'S CORKBOARD HELPS TO SOLVE A HEATING PROBLEM



EXTERIOR VIEW *of the Nemours Carillon Tower, on the E. I. du Pont estate, Wilmington, Delaware. Quick heating of the music room and other areas is assured by Armstrong's Corkboard, sold by John R. Livezey, Philadelphia, and installed by Sauter and Schwertner, general contractors.*





CROSS SECTION *of Nemours Carillon Tower. A complete description of the tower by Lee P. Hynes, consulting engineer of Philadelphia, appeared in the October issue of Heating, Piping and Air Conditioning. Mr. Hynes was the electrical heating contractor for the tower.*

Because of its high insulating efficiency and long life, Armstrong's Corkboard assures quick electrical heating of rooms in this unique memorial tower near Wilmington, Delaware.

IN designing the imposing Nemours Carillon Tower, architects Massena & du Pont of Wilmington, specified Armstrong's Corkboard to help solve an unusual problem of heat storage in the music room shown above and in other areas. Because of the massive concrete and stone walls, it was found that heat absorption would seriously retard the rate of heating these rooms which must be quickly brought to 70° F. at certain times.

The heat absorption was effectively overcome by lining the rooms with 2" Armstrong's Corkboard placed between the walls and ceilings and the interior plaster finish, and between the floor slab and finished floor. This efficient pure-cork insulation practically eliminated the absorption of heat by the structure and provided desirable sound insulation. Armstrong's Vibracork was used under machinery and equipment to lessen the transmission of vibration. Armstrong's Linoleum and Cork Tile were chosen for the floors.

For more than thirty years, Armstrong's Corkboard has successfully proved its long-life efficiency as an insulation for all types of normally heated and air conditioned buildings. Its unique cell structure not only forms an effective barrier to the passage of heat, but also resists the damaging effects of moisture. Armstrong's Corkboard offers architects, heating engineers, and contractors dependable means of assuring more accurate temperature control, lower fuel costs, and more efficient operation of heating and air conditioning units. For complete details, samples, and prices, write Armstrong Cork Products Company, Building Materials Division, 926 Concord Street, Lancaster, Penna.

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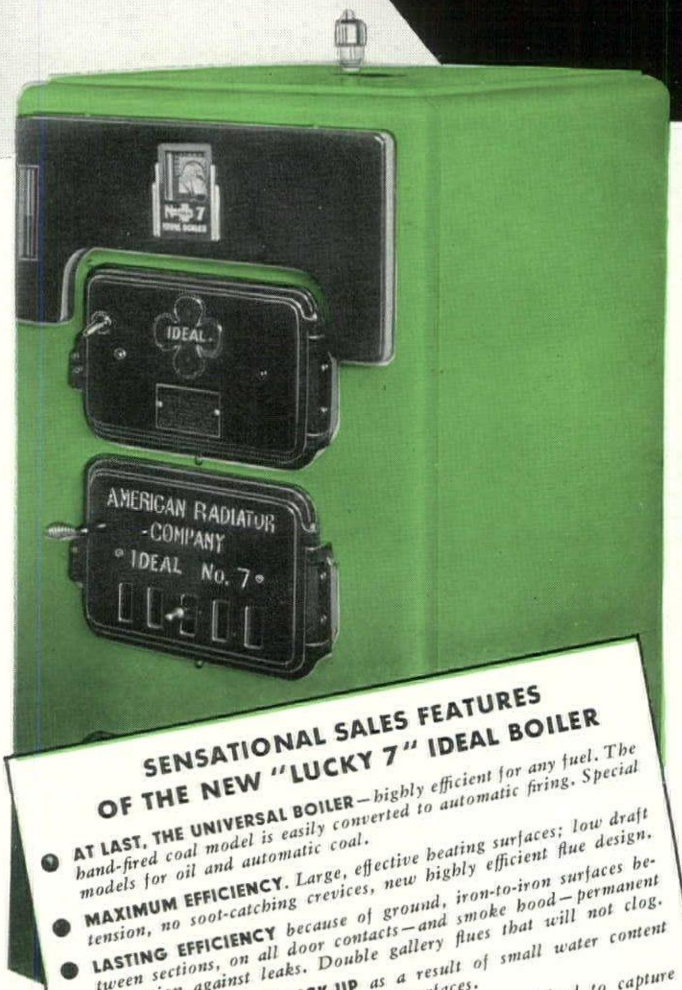

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Capitalize on this. Guide your clients to extra value — extra Personal Comfort with American Radiator Air Conditioning *plus* Radiant Heat . . . with automatic boilers for any fuel . . . year 'round hot water . . . guaranteed quality . . . backed by the name they know. Write — today — for details to

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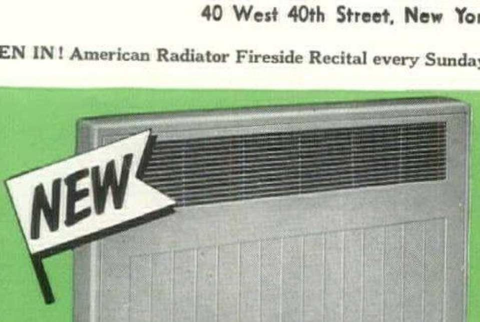
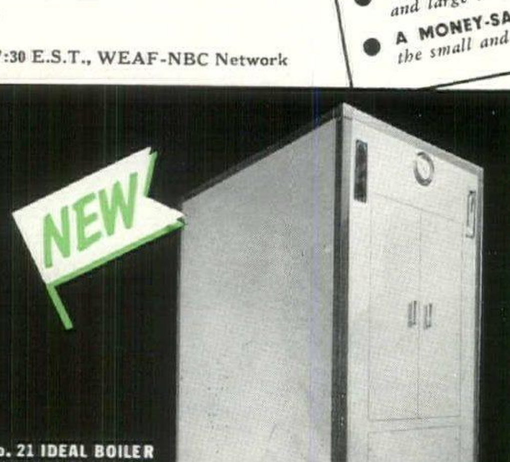
SENSATIONAL SALES FEATURES OF THE NEW "LUCKY 7" IDEAL BOILER

- **AT LAST, THE UNIVERSAL BOILER**—*highly efficient for any fuel. The hand-fired coal model is easily converted to automatic firing. Special models for oil and automatic coal.*
- **MAXIMUM EFFICIENCY.** *Large, effective heating surfaces; low draft tension, no soot-catching crevices, new highly efficient flue design.*
- **LASTING EFFICIENCY** *because of ground, iron-to-iron surfaces between sections, on all door contacts—and smoke hood—permanent protection against leaks. Double gallery flues that will not clog.*
- **UNUSUALLY QUICK PICK-UP** *as a result of small water content and large water-backing of heating surfaces.*
- **A MONEY-SAVING BOILER**—*a quality product priced to capture the small and medium sized home market.*



STREAMLINED RADIANT ARCO CONVECTOR—Newly styled — completely concealed. Provides Convected Heat from upper grille and Sunlike Radiant Heat from new radiant panel — the right combination for greatest Personal Comfort.



No. 21 IDEAL BOILER FOR AUTOMATIC COAL
A de luxe boiler for any standard stoker, front or side. Removable panels make installing easy.

ARCO HUMIDIFIER MODELS 8000 & 8040
Inexpensive. Supplies correct moisture to air in homes. Model 8000 for external connection to any boiler. Model 8040 built-in type with Taco Heater for No. 11 Ideal Boiler.

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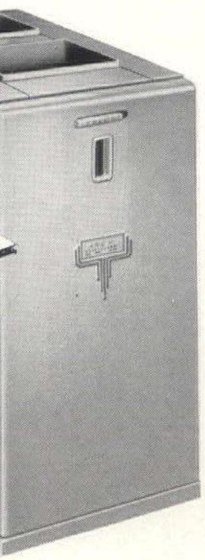
Now your line is complete — with equipment for every comfort need . . . every type of home . . . every pocketbook. Plan the kind of installations you want to sell — people want to buy — with complete assurance of quality and satisfaction.

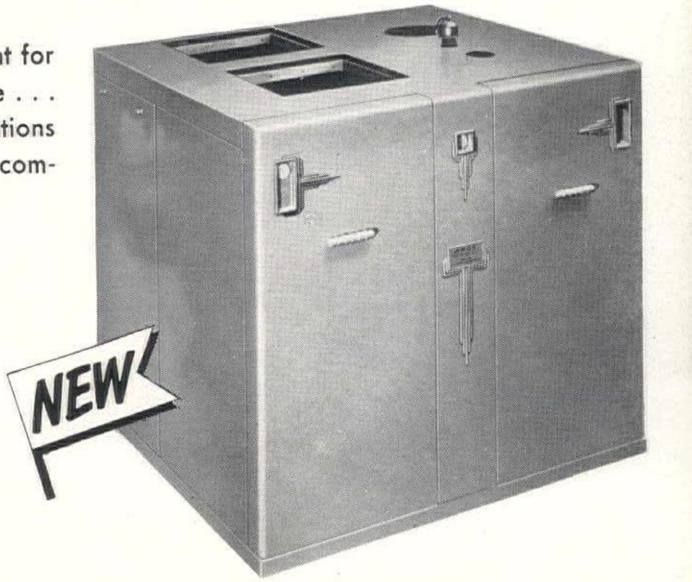


ONDITIONER 301-B

nditioning Unit . . . pro- as fresh, filtered, humidi- ction with steam or hot r type model needs no nd. Attractive green jacket.

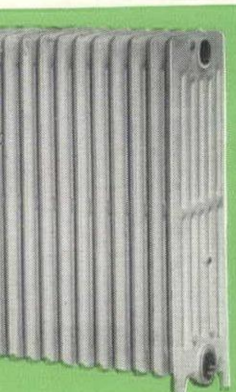
ARCO COOLING UNIT

Used with the Arco Air Conditioner, it brings summer cooling in reach of the average home. This model operates on cold water and is recommended where summer water temperature does not exceed 50° F.

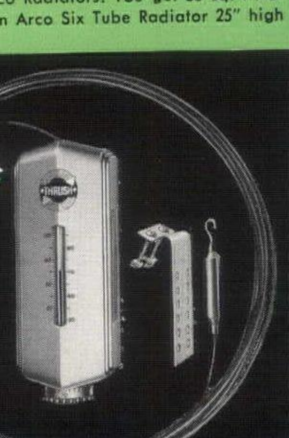


ARCO AIR CONDITIONER 1101-B

THREE IN ONE — Contains No. 11 Oil Burning Boiler, Arco Air Conditioner, and Taco Heater for year-'round hot water supply . . . in one attractive jacket.



ADIATOR—Small, trim and efficient — Completes the line of small tube, co Radiators. You get 58 sq. ft. of n Arco Six Tube Radiator 25" high



NT HEAT CONTROL—Insures constant most accurate temperature control. irculating hot water systems. *Equa-* erates on steam systems.

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AMERICAN RADIATOR PRODUCTS

Reproduction of a two-page spread in colors in the Saturday Evening Post, April 10th issue . . .

BLANKETING America, American Radiator's tremendous national advertising program is under way . . . telling American families about the new kind of **P**ersonal **C**omfort . . . showing new heating and air conditioning products . . . telling them what to look for, what to buy, to keep homes modern. In magazines, on the radio, in newspapers, home seekers, home builders are hearing, reading about these products. They'll be looking for them in your specifications. They'll want them in *their* homes.

Give the homes you plan the extra advantage of modern American Radiator Equipment. Give your clients the extra comfort of the

New **AMERICAN RADIATOR CONDITIONING SYSTEMS** and address of the student contestant and a statement from the student's high school principal that the drawings, etc. in the portfolio are the original work of the student submitting them. Stamps for the return and insurance of the portfolio must be sent to Dean H. L. Butler, College of Fine Arts, Syracuse, N. Y.

Each contestant must be a graduate of an accredited High School, and must, on or before June 22nd, apply to the Director of Admissions for entrance to the College of Fine Arts as a regular student, and submit a recommendation from his High School principal as to his character, health and ability. Only those who have met all entrance requirements and have been accepted as regular students by the Director of Admissions will be permitted to take part in the competitions.

ACCORDING TO CLAIR C. JOHNSTON, Professor
gineering, University of Detroit, the present
professional engineers and engineering agencies
cultural engineering training and a careful pr
professional standing have motivated the Fa
University of Detroit to establish definite objec
College and for each Professional Department.

The general aims of the college, which are
flected in the objectives of each department, are
three major parts as follows: (a) To give su
education as will prepare for a career and for
standing in the field of engineering. (b) To
graduate especially for the industrial and a
phases of engineering. (c) To qualify the gr
useful and happy life, to develop men and citi

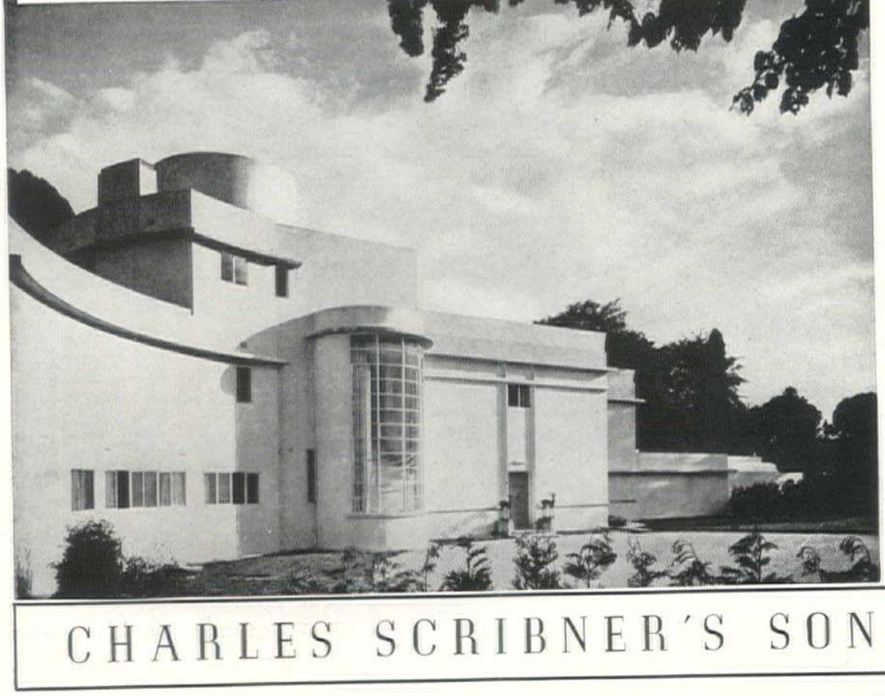
Modern Small Country Houses

by

Roger Smithells

The editor of *Decoration* surveys in this beautifully illustrated volume the small country houses which have been built in England during the last five years. With numerous photographs and plans the author describes forty-eight houses designed by prominent contemporary architects and built for twentieth-century living. The volume is a clearing-house of ideas for house designers of today in planning houses costing from $7500 to $25,000.

With plans and more than 200 photographs
$6.00



Garden Decoration and Ornament

for Smaller Houses

by **G. A. Jellicoe**

The author, who is well known as a town-planner and designer of houses and gardens, analyzes in this profusely illustrated volume the structural features and ornaments of gardens for small country houses, suburban and town houses. *The London Times Literary Supplement* praised it for its "beautifully chosen illustrations" and spoke of it as "of a quality rare in modern garden books . . . full of stimulating ideas." $6.00

Houses for Moderate Means

by

R. Randall Phillips

In this volume the author of *Small Family Houses* and numerous other housing books gives photographs and plans, interior and exterior, of fifty selected model English houses ranging from $2500 to $7500. With the revival of interest and activity in the building trade this work is particularly timely and of peculiar interest to future builders of small homes. $2.75

The Supervision of Construction

by **W. W. Beach**

This book is perhaps the first comprehensive treatment of the supervision of construction to be published and is indispensable to architects, engineers, construction superintendents, technical libraries, students and all interested in architecture and engineering. Written by one of the best-known architect-engineers in the Middle West, it is an authentic, up-to-date handbook that fills a long-felt need.

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CHARLES SCRIBNER'S SONS, NEW YORK

as engineers, and to impart an appreciation, at least, of social, civic and cultural values.

Many of the objectives of the Professional Departments have a common background. A representative cross section of the objectives for the departments of Aeronautical, Architectural, Chemical, Civil, Electrical and Mechanical Engineering may be grouped as follows: (a) To provide a curriculum which will give a broad and thorough foundation in the basic engineering sciences. (b) To qualify the graduate for professional standing by preparing him for examination by state boards of engineering examiners. (c) To provide a foundation in non-technical subjects upon which the graduate can build an experience in industry which will permit him to qualify for executive and managerial positions. (d) To exercise the student in sound habits of planning and analysis. (e) To impart to the student an appreciation of the professional atmosphere through associations with practicing engineers. (f) To impart to the student an appreciation of the economic aspects of engineering. (g) To impart facility and a knowledge of instruments through related laboratory training. (h) To give the student a flexibility of mind, imagination and sensitiveness to human factors.

The formulation of these objectives has charted a clear course of procedure for each department, has materially assisted the faculty in the preparation of course syllabi and has necessitated curriculum revisions to fully accomplish the aims outlined.

ORGANIZATION OF THE NEW OHIO STATE UNIVERSITY RESEARCH FOUNDATION has been completed with the election of officers and directors. The foundation was incorporated last November to bring about a closer co-operation between the university and industry, particularly in making the university's laboratory and research facilities of greater help in solving industrial problems.

Officers elected to launch the new enterprise are: George W. Rightmire, president; Carl E. Steeb, treasurer; Hurlbut S. Jacoby, secretary and director. All officers are on the university staff.

Directors are: Charles E. McQuigg, New York City; Thomas Midgely, Jr., Detroit; Charles F. Kettering, Detroit; J. L. Morrill, Columbus; Harry A. Toulmin, Jr., Dayton; Arno C. Fieldner, Washington, D. C.; Charles F. Michael, Bucyrus; E. E. Ware, Cleveland; James F. Lincoln, Cleveland; Harry A. Caton, Coshocton; and Julius F. Stone, Mr. Rightmire, W. W. Charters, John F. Cunningham, and William McPherson of Columbus.

Membership of the foundation includes ten councilors from national industries, ten Ohio State alumni members, ten councilors from Ohio industries, members of the university board of trustees, deans of the various Ohio State colleges, directors of campus research bureaus, and the director of the Ohio Agricultural Experiment station at Wooster.

ANNOUNCEMENTS

HARRY INGE JOHNSTONE announces the opening of an office for the practice of Architecture at 4 St. Joseph Street, Mobile, Alabama.

EDWIN J. PETERSON announces the opening of offices for the practice of Architecture at 310 Sherwood Building, Spokane, Washington.

WILLIAM DAVIES EVE, ARCHITECT, announces his association with Jack Chaffee Brown under the firm name Brown & Eve with offices in the Masonic Building, Augusta, Georgia.

How

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KOPPERS DIVISIONS—American Hammered Piston Ring Division . . . Bartlett Hayward Division . . . Engineering and Construction Division . . . Gas and Coke Division . . . Tar and Chemical Division . . . Western Gas Division

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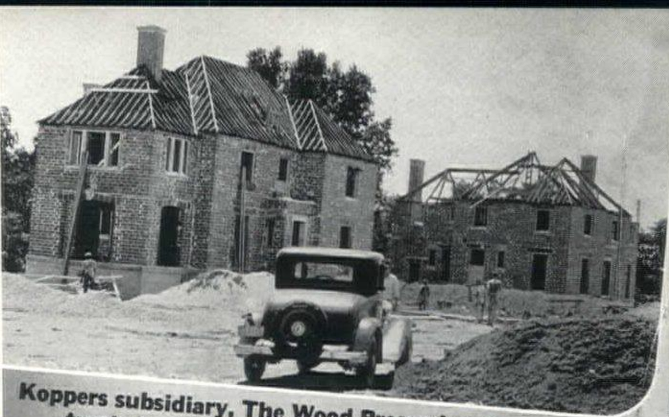
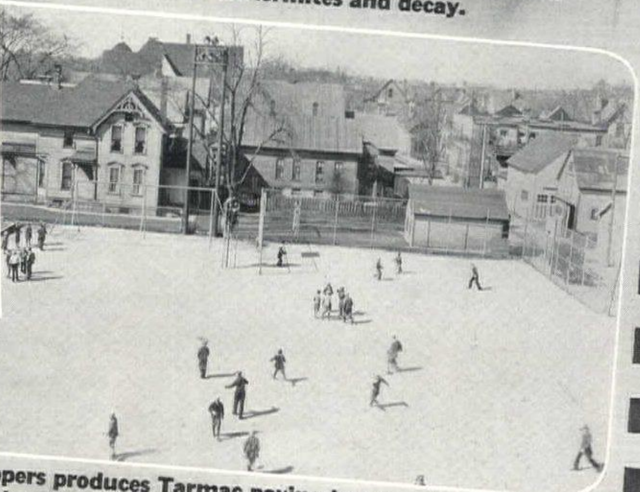


Koppers subsidiary, The Wood Preserving Corporation, treats lumber with creosote and salt solutions to resist termites and decay.



Koppers produces Tarmac paving tars for playgrounds, tennis courts, driveways, walks, parking areas.

...pers supplies Coal Tar Pitch and Felt Roofing that gives ...er life. For commercial, office and public buildings, apartments and flat-roofed residences . . .

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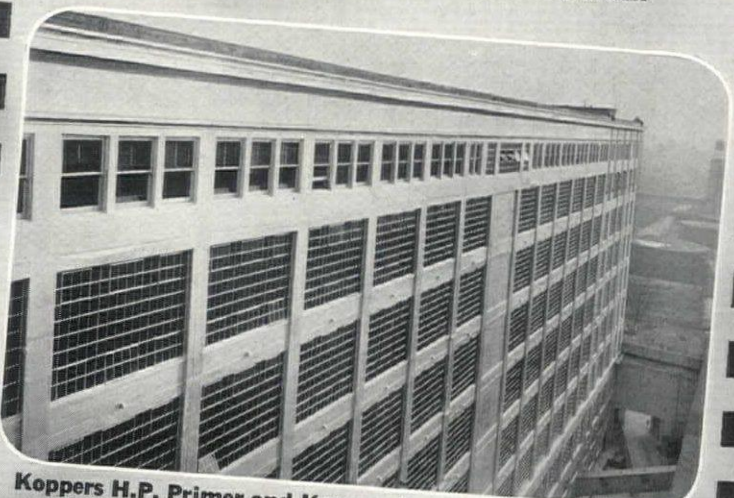
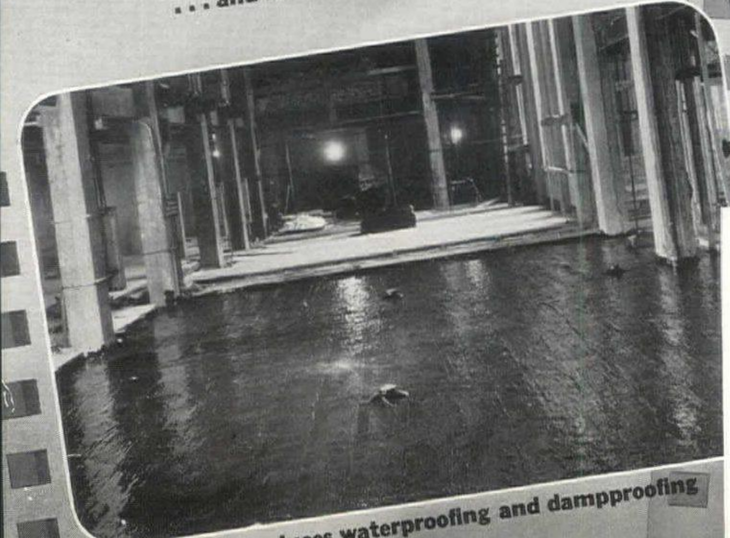


Koppers H.P. Primer and Koppers Lumino Bituminous-base Aluminum Paint were applied on this building to stop "spalling" of the concrete.

Koppers is engaged in so many enterprises in so many different fields of industry and commerce in America that the Koppers name in your specification is probably a familiar one to your clients. Koppers supplies machines or mechanical devices for their plants, raw materials for their products, fuel for their power. Specify Koppers materials on your jobs.



...roduces waterproofing and dampproofing

AA-4

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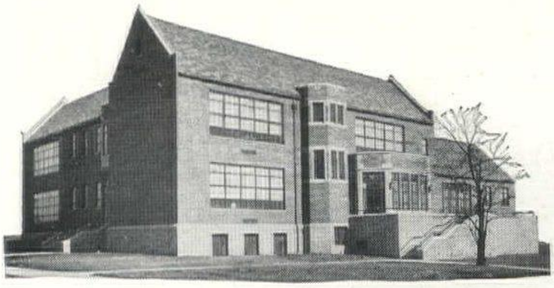
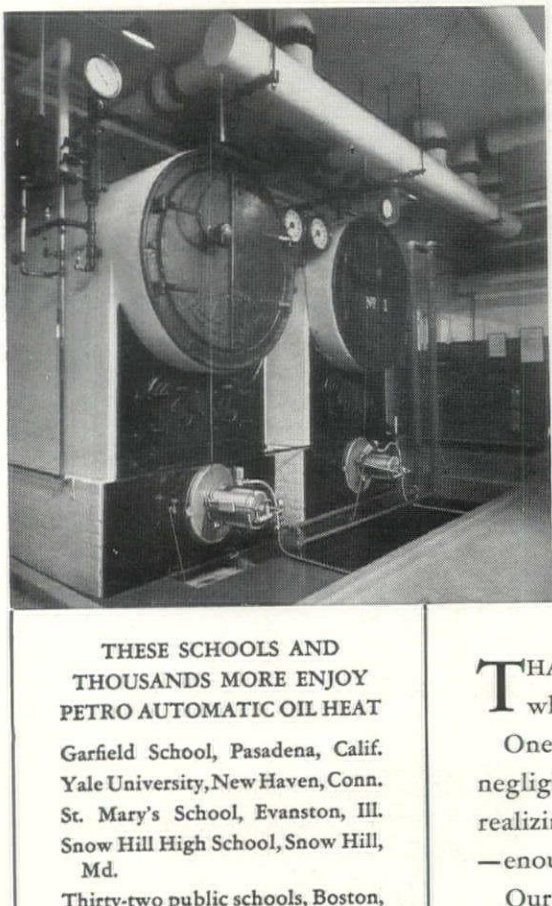
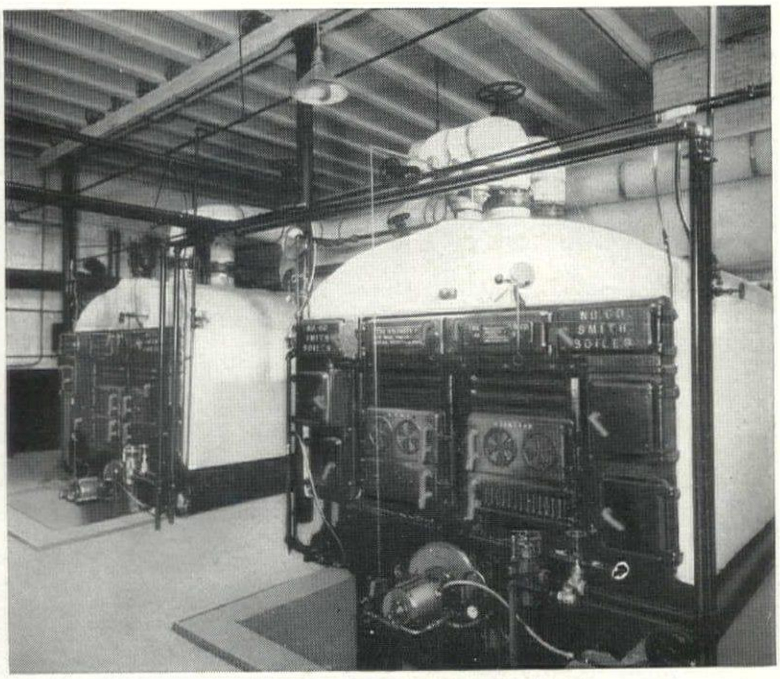
ON THE *Honor Roll* FOR GOOD HEATING







Above: Roosevelt School, Bridgeport, Conn. Mr. Leonard Asheim, Architect. One of ten schools in Bridgeport in which Petro equipment is installed. *Left:* Boiler room of Public School No. 26, Yonkers, N. Y., showing two semi-automatic Petro Model W Oil Burners. *Above, left:* Public School No. 26, Yonkers, N. Y. Architect, Mr. A. G. Corbin, Deputy Supt. Board of Education. Another school served by Petro Oil Burners.

THESE SCHOOLS AND THOUSANDS MORE ENJOY PETRO AUTOMATIC OIL HEAT

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- Yale University, New Haven, Conn.
- St. Mary's School, Evanston, Ill.
- Snow Hill High School, Snow Hill, Md.
- Thirty-two public schools, Boston, Mass.
- Babson's Statistical Corporation, Wellesley Hills, Mass.
- Detroit University, Detroit, Mich.
- Battle Hill School, White Plains, N. Y.
- St. John's College, Brooklyn, N. Y.
- Toledo University, Toledo, Ohio
- Sacred Heart School, Pawtucket, R.I.
- Brown University, Providence, R.I.

THAT is what you, too, would say if you could visit the many schools which Petro Oil Burners are now serving.

One enthusiastic installation reports "Operation perfect, maintenance negligible, janitor gives burner only attention it receives." Another is realizing an annual saving of 40% of the former operating cost with coal, —enough to amortize the Petro equipment in two years. And so it goes!

Our publication "Petro Commercial & Industrial Oil Burners" will prove helpful in laying out your new jobs. Ask for Catalog No. W.

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Oldest and Largest Organization Exclusively Devoted to Oil Heating

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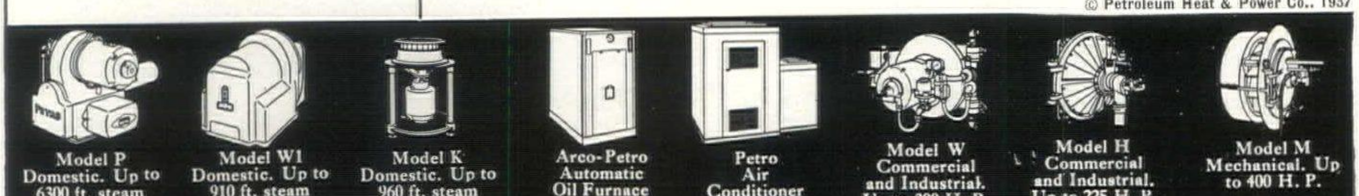
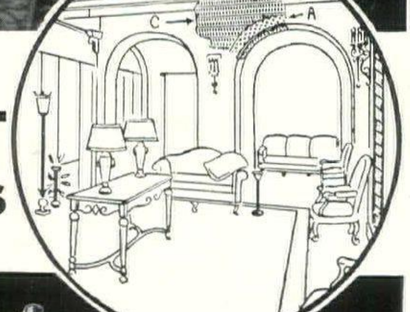
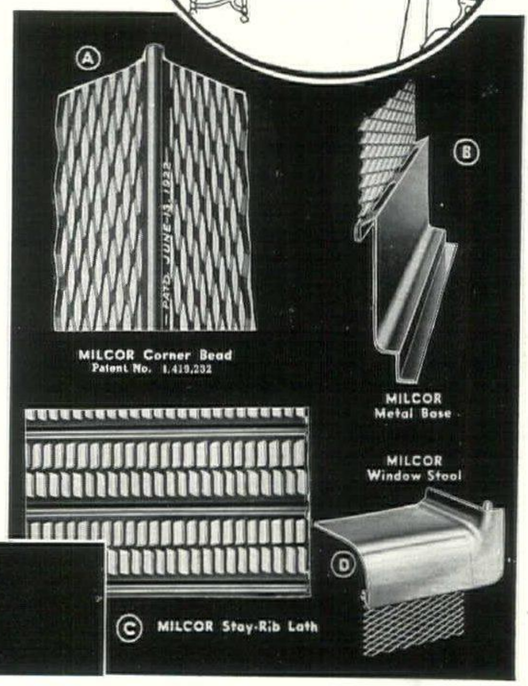


... it pays to BASE THEM on STEEL with MILCOR products



THE enduring beauty of plaster surfaces is a basic factor in the owner's appreciation of your work as a designer. You are *sure* of it when plaster is based on steel — with Milcor products which are engineered by one staff to meet every conceivable need in every type of building. The Milcor system of construction gives you a strongly reinforced, firesafe wall secure against cracking and chipping. The plaster is locked in the rigid grip of steel fingers that absorb stress and strain. It is protected with attractive, practical beads. It is finished with metal trim that unifies the whole structure. Refer to the Milcor Manual in Sweet's Catalog File.



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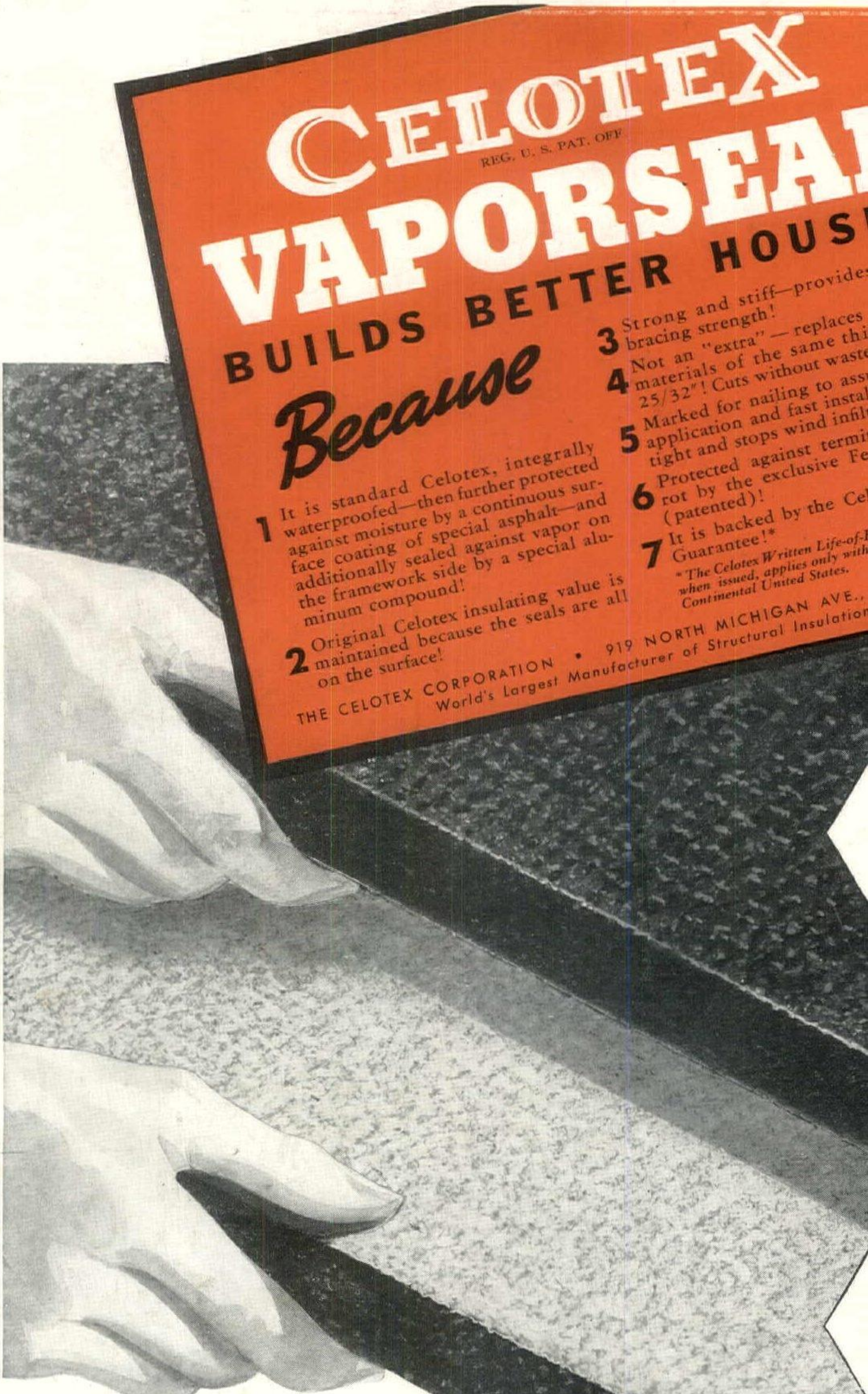

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