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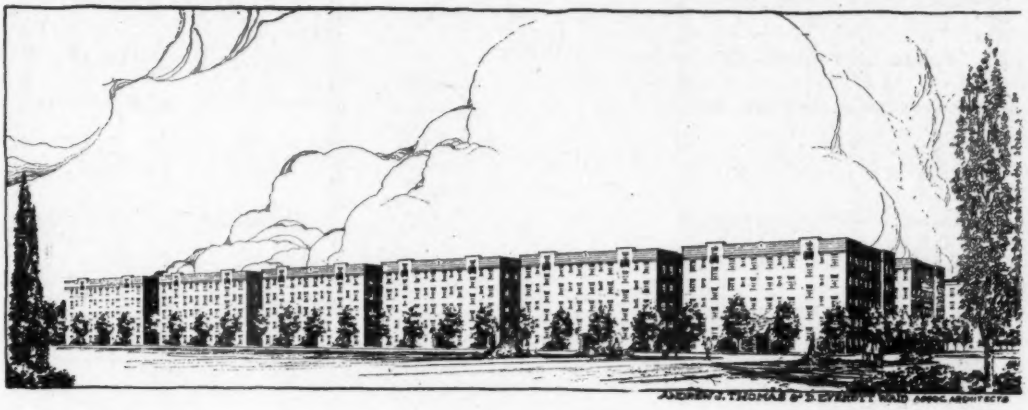


HOUSING PROJECT FOR METROPOLITAN LIFE INSURANCE COMPANY

ANDREW J. THOMAS AND D. EVERETT WAID, ASSOCIATE ARCHITECTS

THE housing project of the Metropolitan Life Insurance Company, will, it may with safety be predicted, mark the beginning of a new era in the architecture of American housing. It creates an entirely new standard in multi-family housing. What this means to the dwellers in crowded cities will be realized by comparison with standards which have been established in the housing problems of individual dwellings in small towns and suburbs of cities.

The last thirty years have developed remarkable progress in small town housing. The American who lives in the small house of the best type, of five or six rooms, located on a little plot of land, enjoys, in comfort and convenience, the highest standards of living in the world.

But his city brother has not been equally fortunate. Hasty and speculative methods of building, characterized by unenlightened copying of out-of-date models, have up to a few years ago, retarded real improvement. Since the World War, progress has been more rapid. The Metropolitan Life Insurance Company through its architects has taken advantage of recent improvements to produce a new type of model housing, believed to be better than anything of the kind ever before attempted.

There are necessarily many sides to a project so vast, and with countless technical ramifications, but the appeal to the public, as well as to professional housing experts, will be found in the practical aspect. The vastness of scale of this operation is shown in the fact that it comprises 50 buildings each housing 39 families, a total of 1950 families occupying 8250 rooms.

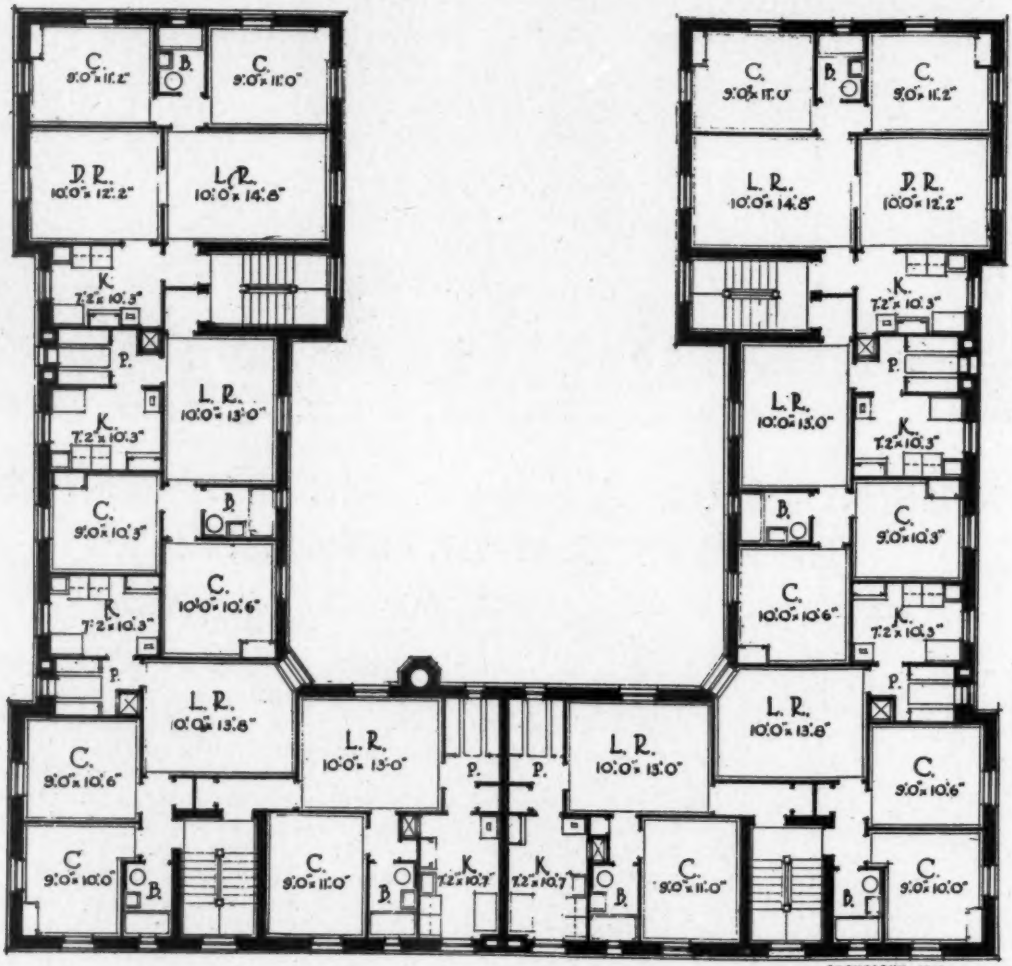
The economics which have been worked out in the design are in a sense extraordinary, extending as they do from the main essentials to the smallest details of architecture. More than anything else, the large scale of operation creates the greatest savings. The benefits of large scale operation and organization are just as great in housing as in any other form of production. They extend to design and construction, that is to say, the *use* of materials, and the buying of materials, the systematizing of erection, and — equally important — the maintenance and operation of the houses after they are completed. The design of these apartment houses has been worked out to establish the maximum economy in all these respects.

In these economics, the repetition of one unit fifty times permits the design of that unit to be perfected with great care, and in a manner which

would not be possible, because too expensive, if a single unit only were to be built. Every possible saving, large or small, has been made through intensive study of the design on the part of the architect. Concentration of space, compactness of details, the fine openness of the plan, the careful consideration of every brick and every piece of timber and trim, the use of stock details, and the careful working out of the mechanical features of

Great as these benefits are, however, they are not as important as the advantages gained by big scale planning of a city block as a whole—probably the highest point housing economics can reach.

Because of this concentration of space in the apartments themselves with elimination of non-rent paying space in the form of public corridors, the plan of the buildings has been opened up to

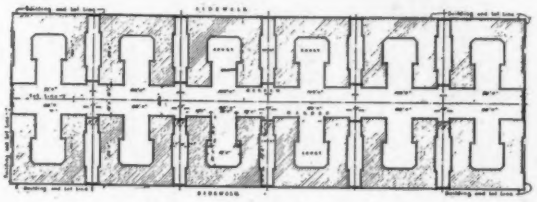


TYPICAL FLOOR PLAN

heating, plumbing and electricity, where every foot of piping and each valve has been calculated as to cost and efficiency—these are some of the problems solved and ends achieved. As examples, the excavation work has been almost eliminated by placing the heating plant along the fronts of the building, requiring only one long trench on each street. Windows are generally of one size.

give the maximum of sunshine, of circulation of air and of cheerful outlook. Each unit stands free, and as the picture shows, dividing the usual solid street wall into twelve buildings, housing 39 families each. Together they occupy approximately only fifty per cent. of the area of the block. This type of design, together with the U shaped plan of each unit, makes possible three prominent features.

The first of these is the large interior garden, about 36 feet wide by 600 feet long, extending through the center block, affording a fine outlook over green lawns and good planting. This garden area is preferable to the hot, dirty and noisy street. Second, is the series of twelve U shaped courts,



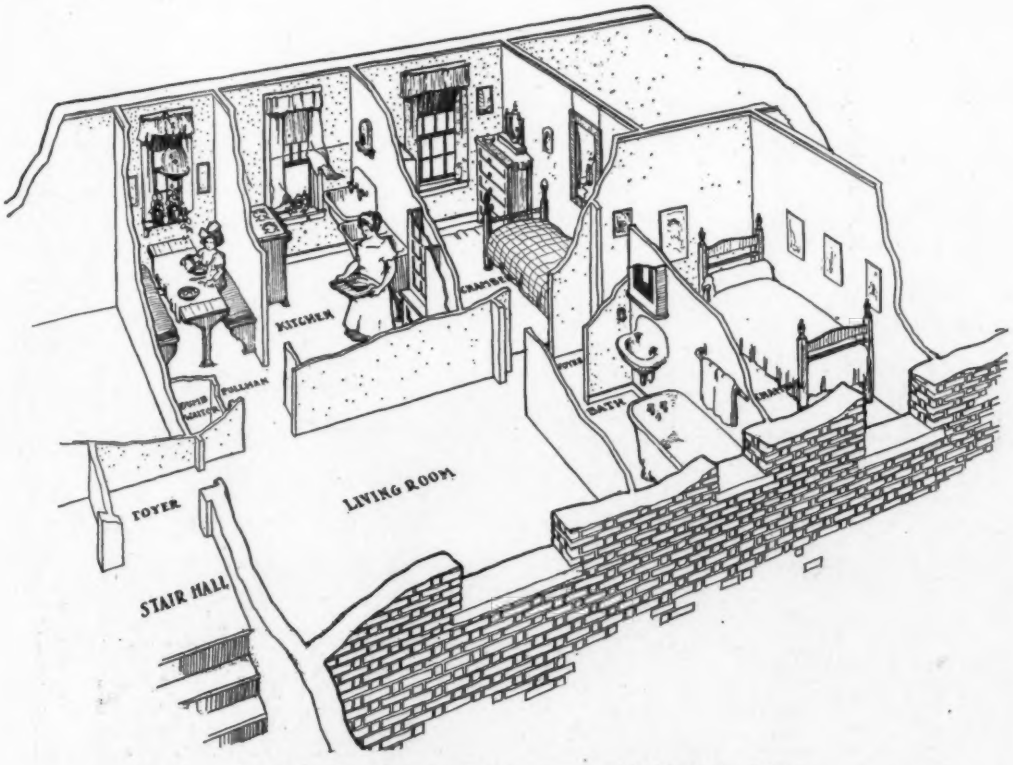
Plot Plan

opening into this great garden and thereby creating cross gardens, so to speak, each about 154 feet long by 40 feet at the widest point. And thirdly, there are the passageways between buildings at intervals of 100 feet into the interior garden. These passageways have numerous advantages: together with the courts, they bring outside light into the buildings and they permit the planning of a large number of corner bedrooms and create splendid cross ventilation, in the individual apartments. They also permit the fire escapes—those disfiguring features which encroach on the sidewalks and ruin the appearance of New York City streets—to be placed so as to be almost out of sight. Furthermore, they are important from a fire risk standpoint, as they cut down the hazard by breaking up the solid building mass with open passages along the street.

The value of this plan to the individual tenant is easily seen. To begin with, one apartment is almost as good as another. The rear apartments with their quiet outlook over the gardens are even more desirable, because of street noise and dust, than those situated along the front. What this means may be realized by making a comparison with the stereotyped discredited "rear" apartment, with its situation on narrow, pocketed, dark and badly-ventilated side courts; or on a dingy rear yard, with outlook over back fences and alleys.

The Plan

SUCH are the main features of the Metropolitan housing project in its economic and technical aspect. The real human interest, however, lies in the arrangement of apartments themselves. This fact the architects have always kept foremost in mind throughout the development of the design. They realized that, when all was said and done,



View of Interior, showing Middle Apartment on right hand side of plan

HOUSING SCHEME
for
METROPOLITAN
LIFE INSURANCE
COMPANY,
NEW YORK

ANDREW J. THOMAS
and
D. EVERETT WAID
Architects

View in Court
(From the Architects' Drawing)

Look into the Court

they were providing homes for living people, real homes which should be as humanly comfortable as possible. They thought of the tenants as possible owners and that therefore economy in repairs is an object to attain. They also thought of operation and maintenance and objected to those extreme "savings" in construction which would be many times lost in subsequent repairs or upkeep.

The cheerfulness and homelike character and the outlook, and outdoor air and sunshine, were, as explained above, paramount. Every apartment has cross ventilation and corner rooms are frequent on the plan. There are always two and sometimes three exposures to each apartment, as in a country house. When it came to domestic arrangements the architects realized that the one to consult was not alone the expert, but the housewife herself, who could count better than anyone else the steps saved in performing her housework and the time and labor she might economize. The plans were passed upon by women experts in this type of work, who had carefully investigated the actual working out of the arrangements of the model tenement and had discovered that the women who lived in them were dissatisfied with many of present living arrangements. Particularly they found much complaint over the combination of living room and kitchen into one room, as adding largely to their work and interfering with their privacy.

In addition, the architects submitted their plans for criticism to an audience of mothers at several large meetings, held in one of the East Side Settlements, where every detail was discussed.

The typical arrangement is shown in the accompanying perspective of an apartment interior. It shows a triple division of each apartment into living room, kitchen and dining facilities and bedroom portions—an aid both to operation and to privacy. There are only two apartments to a stairhall, aiding further to the privacy, and each living room is separated from the hall by a small foyer. The kitchen part is separated from the living room, and contains the latest improvements in domestic equipment. A gas cooking range with hood, a sink and two wash tubs with white enamelled metal cover, hinged to swing up against the wall when the tubs are in use, and serving as a drainboard for the sink at other times; a dresser, a refrigerator and a dumbwaiter are the principal features. All is arranged to save the housewife steps, and a little space is provided, screened off from the rest of the kitchen, for eating.

The chambers, together with the bathroom, are screened off from the living room. All the interior details are simple but in good architectural taste. The rooms are of good size for this type of work, well above the minimum sizes allowed by law.

Thus is provided a remarkably efficient, ample and comfortable, human home. Although a few of the apartments are larger or smaller, the Metropolitan Life Insurance Company has adhered to the standard of the four-room apartment for the great majority. This is a most progressive decision, because it repudiates the two and three-room standard, which has been adopted for much housing since the war, as being definitely below the American standard of living.

Still another great advance in living standards is the mechanical features. Although steam heat, hot water and electricity, are not usually provided at these rentals, they could be included in the plan because of the savings made in other ways. What this means in the cost of living of the single family may be realized when it is considered that only a little more than two tons of coal will be required to heat one apartment, while six or more tons would be needed to heat the five-room individual dwelling.

This complex design has resulted in an architectural exterior of dignified effect. By reason of the separate buildings, the monotony of the long street wall is broken. The simple building masses, with their contrast of windows and wall spaces and the big center archways of the entrance passageways and the vistas into the courts—these features, the architects feel, will furnish a homelike appearance to the group. The more one studies this well considered architectural scheme, the more it is to realize its well considered economies and homelike character. It appears to be sound in every essential and all its details. It undoubtedly will have a revolutionary effect on city housing and also on certain phases of city life.

THOMAS HASTINGS, R. I. B. A. GOLD MEDALLIST, 1922

THE following editorial, commenting on the presentation of the Gold Medal of the Royal Institute of British Architects to Mr. Thomas Hastings, appearing in *The Architect*, of London, in its issue of June 30, will, we are sure, be read with interest by architects in this country. It states, in part:

"We are in cordial agreement with all that Mr. Waterhouse said in presenting the Royal Gold Medal to Mr. Thomas Hastings on Monday evening last, and divided though we frequently are in questions of professional politics, Mr. Hastings may feel sure that the great honor awarded him is in the opinion of his colleagues in this country a well-merited and unavoidable one. Since the deaths of Stanford White and Charles McKim there has been no American architect who so fully sums up in his achievements the expression of what may be described as the architectural Renaissance of the modern world. We are convinced that in centuries yet unborn men will recall the great works which have been produced by the best designers in America during the last four decades as we recall the achievements of the masters of the Italian Renaissance. More than this, it is probable that to America is chiefly due the growing conviction that architecture is among the greatest expressions of civilization, and one in the growth and permanence of which all should feel pride and interest. And it may be further added that the fact that this Renaissance has occurred in a land the people of which have justly earned for themselves the reputation of being the most hard-headed business community in the world, has a special significance.

"That American architects should be firmly convinced that out of tradition alone real architectural development is possible may seem surprising to those who look at the question superficially. In reality it is inevitable. Architecture is little more than the expression, more or less direct, of construction; and construction is governed by scientific laws. As Macvicar Anderson said years ago in a presidential address, people were always asking for some new expression of architectural form, but the habits and wants of men of which it is the outcome have remained much the same for untold generations. He might have added that the physical laws to which it had to conform were even more unchangeable, and that the early builders had conformed to these through instinct while we conform to them through fuller knowledge and understanding. It is difficult, if not impossible, to separate the so-called decorative adjuncts of architecture from the constructional, but if we imagine we can succeed in doing so—and it may be pointed out that this alone is what the exponents of *l'art nouveau* and similar manifestations have tried to do—it has been merely to substitute a number of weird and unmeaning forms for others which have the sanction of generations of architects and which appeal to us like the words of a language with which we are familiar. Roger Fry, Clive Bell and other writers on art produce a maze of words about 'essential beauty in structure,' but they fail to point out any illustrations of their definite meaning or to give any reasons for their condemnation of conventions of the past.

"It was necessary that in laying the foundations of the great structure of modern American architecture its exponents should build on some precedent and on some definite system, and it was equally clear that the choice of that foundation should be the Ecole des Beaux-Arts, for in France alone has architecture been recognized as an important national interest from the days of Colbert. American architecture, however, shows in its development that it is no transplanted growth but the outcome of systematic and scientific thought. In Florida and California the indigenous architecture of old Spanish colonies has been absorbed and developed; while in New England the original Colonial and Old Dutch types have enriched the American vernacular. Another controlling element has been the necessity for devising buildings of a scale and height not attempted in Europe, comprising within their construction the last improvements of invention and science.

"All these factors have ended in the production of a school of architecture which is as distinctive as that of France, and which, to use a simile, has only borrowed when it could repay with interest. To the pioneers of the great movement, of whom Mr. Hastings and his late partner, Carrère, were great protagonists, we as architects owe a debt of gratitude. What seems natural and passes unchallenged and admired today was not achieved without hard work and much controversy in the darker days of the last century, when the 'brown stone' fronts of Boston and New York were as tasteless as the majority of our Victorian buildings and when the average American millionaire was no more cultured than his British colleague. The enlightenment of America to the merits of architecture and of design is not due to the inherent taste of the American people, but to the fact that its architects have proved their ability to lead and to direct a great movement. The building instinct is not entirely the outcome of the possession of great wealth but in no small measure due to the fact that American architects have given full value for funds they have expended in their clients' interests."

ADDRESS OF PAUL WATERHOUSE, PRESIDENT, R. I. B. A., ON PRESENTATION OF ROYAL GOLD MEDAL TO THOMAS HASTINGS

"IT will be of very little interest to Mr. Hastings to be told that he has been the author of 50 works of really first-class importance, that six or more of these were of parliamentary or municipal consequence, that the remainder are libraries, university halls, banks, railway stations, hotels, bridges, monuments, as well as vast town-planning schemes; or to be reminded that the buildings so enumerated comprise only those which have been thought conspicuous enough to put into a list. I have little doubt but that the unrecorded remainder would be sufficient to make two or three European architects contentedly rich and reasonably famous.

"What may affect Mr. Hastings, and what does affect us, is the supreme significance in modern history of forty years' work such as his.

"I am perfectly sure that the opening words of any reply which Mr. Hastings is good enough to give us tonight will be a modest disclaimer. He will say that we are asking our King to honor his epoch and his country, and that the allocation of this honor to his individual personality is a mere accident. Let him say so. He will not thereby shield himself from the direct attacks of our respectful homage, nor will he dilute or divert in any degree the enthusiasm with which we acclaim him as the man of the hour.

"It is perfectly true that we are consciously applauding America of the twentieth century. But what of that? It is the architects of America who make American architecture, and in searching for a true and significant example of that group of creators we have—with very great, very careful deliberation—thrown our choice on Mr. Hastings. I am sure we will stand firm in support of our own judgment. Mr. Hastings can diffuse, as much as he pleases, our compliments among his able countrymen, so long as it is on his neck that the King's Gold Medal crosses the Atlantic, and so long as he is our most respectfully chosen ambassador.

"The very fact that Mr. Hastings is surrounded in the States by confrères whose aims are his own, the very fact that there are others in his favored country who may rightly be classed as of Gold Medal rank, only enhances, I hope, the honor which we try to pay to him and through him to his colleagues, many of whom are men to whom his example, his rivalry, and his instruction have meant much.

"I make no apology for being, by the accident of the Presidency, the man through whose hands the medal passes from its gracious giver to its worthy receiver. Rather do I with complete immodesty rejoice that so great a piece of good luck falls in my way, for I have wanted, above many other wants, to stand face to face with a great American architect and tell him exactly what I think of the present-day school of American design in architecture.

"I believe, with a very profound belief, that it represents a most significant fact in the history of our art. I do not say 'of our age,' but of that ageless company of centuries which, viewed from Art's point of view, stand not behind one another in series, but abreast. There is a reality called Eternity. Some define it as time with the beginning and the end removed. They define it falsely. It is the great Now. It lies with architects more than with other artists, it lies with artists more than with other men, to realize (and this is a realization shared with religion) that the brotherhood of man has its extension forth and back in time no less than East and West in space.

"This is not wandering on my part. I could make it plainer by detaining you with a history of civilization (if I were capable of it). I would sooner try to make it plain by talking about the United States.

"There is much heretic talk of progress in architectural design. There *is* progress, of course; but there is much more evidence of the sham progress which is no friend of art at all. The horrible experiment to which a certain old-world country is submitting herself, the experiment of attempting an architecture 'free from historic style,' would be a nightmare to Europe and a grim menace to all lovers of the beautiful were there not a bright hope that so foul a conflagration will soon burn itself out.

"Let us turn happy eyes to America and take to our hearts the remarkable testimony she gives to the divine sovereignty of tradition.

"America is of all countries the land whose civilization was unprejudiced—a vigorous population on virgin soil found itself free to look forward without any obligation to look back. There was the country of all countries in which could flourish unhindered and undismayed that traditionless architecture which is the dream of some of our art philosophers.

"But what has come to America in her freedom? What, after the early flutterings of untried wings, has been the direction of her flight? What star guided her? What voice prompted her? None other than the star of that civilization which leads and has led old Europe, no voice but the voice of the ancients.

"Ladies and gentlemen, were there ever wanting some proof that our happy bondage to the ways of our forefathers is not a bigot's delusion, but a free man's song of liberty, that proof is given to us by

the choice of America—or shall I say rather by America's joyous submission to the golden chains in which we also labor?

"In the name, Mr. Hastings, of our gracious King, and as the spokesman of my brother architects of England, I transfer to you the greatest testimony we have to offer; and, in doing so, I thank you and your colleagues in America for the encouragement you give to our ancient art, and I congratulate you with the warmest cordiality on the fact that your line of thought, your line of work, and your spirit of achievement are the very spirit, work, and thought that have for centuries bound into a timeless brotherhood the architects of Europe."

ADDRESS BY THOMAS HASTINGS, F. A. I. A., ON ACCEPTANCE OF THE ROYAL GOLD MEDAL OF THE R. I. B. A.

"WHILE we Americans have inherited your language and consequently have no right to complain, I must admit on this occasion I find the English vocabulary quite inadequate—there are no words to express my grateful appreciation of the honor which His Gracious Majesty the King has conferred upon me. Realizing that it was prompted by the action of this time honored Institution, I would like to feel that it is in recognition of such service as the profession in our country has rendered in the interest of contemporaneous architectural education. In all sincerity, I would rather believe that by example I had in some way influenced others in the right direction than to be conscious of individual success or feel that what little I have done were worthy of your commendation.

"I believe we should return to follow and respect the traditions which obtained before the present modern confusion, that we should be careful of the direction in which we work and thoughtful of our influence upon future generations. It would truly seem that nowhere has such remarkable progress been made, as obtains in America in the methods of teaching architecture. Great changes have been brought about largely because of the indirect influence of the many graduates of the Paris Ecole des Beaux-Arts. For several years I have had the honor of being President of The Beaux-Arts Institute of Design in America, which is composed of graduates of the Paris School. In this capacity I have had perhaps an exceptional opportunity to observe their untiring efforts in behalf of education. They have practically brought about a centralized and co-ordinated system of competition or comparison between our schools and colleges, similar to what obtains physically in the intercollegiate games.

"Practically all the colleges from the Atlantic to the Pacific receive simultaneously our programs and send the work of their students all solving the same problem to be judged by our society in New York. This healthful situation might perhaps have been brought about by any other well organized institution, not necessarily of Beaux-Arts affiliations, in which case it might equally as well have resulted in awakening this unusual interest and improvement in the quality of the students' work, as well as in the curriculum of our many colleges scattered throughout the country.

"This architectural interscholastic work in America has in a measure brought into effect what is always greatly to be desired, a recognized art center in the metropolis of a country. I am heartily in sympathy with this, for I feel that a school should communicate something of the spirit of the sportsman to the life of the student, in the development of the mental as well as the physical side of his character, stimulating a form of intellectual curiosity which will make him rise above mere unimaginative and pedantic proficiency. While a thorough education is of paramount value to an architect, it is, after all, the true inborn sense of beauty which assures his success. Goethe said: 'The Beautiful is a manifestation of secret laws of nature, which but for this appearance, had been forever concealed from us.'

"The layman too frequently, only superficially understands Beauty in defining its attributes, as though it were a mere appeal to the emotions, a pleasure-giving luxury, or a refining influence. It is rather an organic vital provision of nature, manifestly a part of the order of the universe—divinely ordained for the specific purpose of promoting and insuring economy and permanency in all things and giving life and enthusiasm wherever it may find its resting place. It is indeed a force in life capable of stimulating the noblest endeavor and capable of making virtue appeal to the senses, and making truth endure.

"Nowhere is this truth so vividly illustrated as when we consider architectural design. The practicing architect if he continues, as he should, to be a draftsman all his life, must realize that beauty of design and line build well in construction, and with greater economy and endurance than construction which is mere engineering. So the qualitative side should first be considered, then the quantitative side. All form and all design are the natural and legitimate outcome of the nature or purpose of the object to be made. The practical and the artistic are inseparable. There is beauty in nature

because all nature is a practical problem well solved. The truly educated architect will never sacrifice the practical side of his problem. Some of the greatest economic as well as architectural calamities have been executed by so-called practical men with an experience mostly bad and with no education.

"The science of modern engineering has too frequently divorced the architect from many of the larger and more interesting so-called utilitarian problems of construction. Some of them are legitimately architectural problems while in other cases the architect should collaborate with the engineer. There may be no question of decoration or ornament involved, but architecture and practically all construction are inseparable.

"An earnest appeal should be made for this collaboration not merely in the interest of beauty but rather more in the interest of economy; beauty will follow in its natural sequence. In the larger municipal and suburban problems requiring economy in cost, and saving of energy, even when commercial and investment interests are involved, in problems of traffic, rapid transit, and public comfort, under all conditions in the solution of these greater problems the qualitative and quantitative viewpoints should be inseparable. Following the natural laws of the survival of the most economical, as well as the fittest if undertaken with art, beauty will predominate in the end, and so deliver us from the defacement of nature and make the city and suburbs fit to live in, especially where the working and poorer classes are concerned. Only in this way can we hope to obliterate even more successfully than with charity the sordid habits of life and the depravity of poverty.

"Such problems may only involve a thorough knowledge of good planning.

"In the first years of my architectural career I was accused by my fellow countrymen of attaching too much importance to the artistic study of the floor plan; it was constantly asserted that I was trying to inculcate the Paris Beaux-Arts methods of education into our American architectural practice, my critics not realizing that these methods of study in plan have been adhered to at all times since the beginning of architecture.

"They little realize that if the floor plan, determining two of the three dimensions in space, is well studied, beautiful in proportions, with a proper distribution of piers, thickness of walls, logically disposed and with good circulation, there will be no structural difficulties, and that this principle has obtained ever since the dawn of architectural history. The plan lends itself to thinking in three dimensions. When the plan looks well, it builds well, constructs well, so that we find we need very little of the analytical mathematics to assist us excepting as a mere matter of verification. Until modern times, architects knew but little about analytical mathematics as compared with what we are now given to learn, but they knew their stereotomy better than most of us do today. They knew but little about the strength of materials, but they understood constructive principles, for after all analytical mathematics is a comparatively modern science. They knew their descriptive mathematics based upon geometry. While there existed graphical rules for the approximate determination of the thrusts from arches as early as the thirteenth century, yet it is practically only within the last century that the correct principles of constructive analysis have been fully developed. Until recently architects probably never calculated the strength of their materials or the thrust of arches and vaults. The drawings that were necessary to execute the fan vaulted ceiling of stone 85 ft. span in Kings College Chapel at Cambridge, or the ceiling in your beautiful Henry VII Chapel at Westminster Abbey, must have required a knowledge of stereotomy far more thorough than most of us possess today. We so seldom have an opportunity to build stone vaults so intricate in design.

"If an arch or a bridge looks well, it will build well, when it is the outcome of a well studied plan. There must have occurred many serious calamities in the past because of bad art and no analytical means of verification, but just as nature is beautiful when fit to survive, so the great buildings and monuments of the past that have survived are beautiful in plan, form, and proportion. It is really architecture and well proportioned masonry versus engineering and iron, a comparatively new profession and a new material; each has its use but they are not interchangeable. Good construction is intelligence rather than ingenuity. I believe that buildings have stood for centuries solely because their plans as seen on paper were so thoroughly artistic and beautiful. Rheims Cathedral has stood for more than 700 years through all the wars that raged about it. As a matter of fact, it had been respected and spared by the soldiers of the middle ages, Barbarians, so-called, and it remained for the army officers of our time, men supposed to be cultured, to commit the present-day ruthless deed of destruction. It stood in the after glow of its hundreds of years, seeing generations pass away, bidding welcome to new ones, it stood a source of inspiration to the world, it breathed a spirit something hardly seen, something felt. And today it is to lovers of the beautiful as though some one had forever eliminated the colors of the setting sun. We pride ourselves upon our enlightenment and advancement—we have pointed with derision to the unenlightened dark ages, yet this destruction has been encompassed by a period that vaunts its culture. So that what remains of the Cathedral stands not only a monument to modern civilization; but having withstood like a fortress in its structural lines the onslaught of modern bombardment, it beautifully illustrates the splendid

strength of construction well planned with beauty and economy. We are told that the cell of the bee is built at that angle which gives the most strength with the least wax so that the line of beauty is the result of perfect economy. Emerson realized the truth when he said it is a rule of largest application, true in a plant, true in a loaf of bread, that in the construction of any fabric or organism, any real increase of fitness to its end is an increase of beauty.

"These same principles of planning a building apply in the planning of a park or in the guiding of the evolution and growth of a great city. If there be beauty in the plans of our cities and in the buildings which adorn our public squares and highways, its influence will make itself felt upon every passerby. Beauty in our buildings is an open book of involuntary education and refinement, and it uplifts and ennobles human character. It is a song and a sermon without words. It inculcates in a people a true sense of dignity, a sense of reverence and respect for tradition, and it makes an atmosphere in its environment which breeds the proper kind of contentment, that kind of contentment which stimulates true ambition. We Americans too little realize that we really come to Europe in a large measure because of what man has done with art to beautify Nature. As music is more beautiful than any merely natural sound, so Nature is generally either greatly enhanced by the human interest when man has made his impress upon it, or it is cruelly and unnecessarily sacrificed.

"Art and a proper artistic sense of the fitness of things complete the picture. When far away from civilization surrounded by primeval nature, a man, if in his normal state of mind, soon longs for the warmth and color of fertile fields, the thrift of farms; he thinks of forests interwoven by winding roads or vistas intelligently conceived. The pageantry of sea and sky, the starlit night, the rising or setting sun, the rugged mountains or deep crevices, the bewildering beauty of the flowers, can never awaken the same human emotions and sympathy as when with Art they are made more beautiful, wedded to weather-beaten walls, the castle or the shrine, or the distant romantic village nestled in the crevice or perched on the mountainside. There is of course much beauty in nature unadorned, for beauty is as boundless as space is infinite in its variety. I have said that I believe it to be a law of the universe that the forms of life that are fittest to survive—indeed the very universe itself—are beautiful in form and color, and that nature's selections are beautifully expressed. Ugliness, deformity and self-indulgence are synonymous. And so it is in every economy of life—what would survive must be beautifully expressed. It is equally true that one trained in the understanding of beauty can more profoundly fathom the laws of Nature than one who has neglected to develop this side of his education. Indeed if the way of the artist is undertaken with philosophy and humility, the things that are divine, God in the universe, will, I believe, be more clearly revealed to him, more impressively, more convincingly, than when approached by way of theological discussion or scientific research. The horizon of his vision contains more, within a larger circle, with visions of things more ennobling, more uplifting.

"And so in Literature as in Art, the subject matter must be expressed or presented with beauty in order to survive and firmly impress itself upon successive generations. It is the art in story telling which gives real life and human interest to the characters and which makes the fancy and imagination of the author outlive his own generation. Words may have color as full and luminous as may be found in any school of painting, and form as subtle and radiant as may be revealed in the art of the sculptor or the architect, and music as beautiful and melodious as a song. Truth or precept, as well as fiction, will only penetrate the human heart and demand respect and obedience when clothed in beauty. The proverbs, the bywords of the ages, are only familiar truths beautifully expressed with forceful simplicity and precise epigram; even mathematics have a beauty of their own, and while in some ways allied with beauty in art, both are different phases of what we might call generalized beauty. Every mathematical equation has a certain quality of beauty because it is orderly and complete in its visible expression of a truth. All the natural lines of stresses and strains in a solid are things of beauty, and every structure built to these true lines, *ipso facto,* is beautiful. Newton's laws of motion, so simple, so fundamental, so inclusive in their scope could only be enunciated with such elegance of expression to make them endure forever! The divine word of God as it has been revealed in any enduring philosophy or religion has always been enshrined in language immortal. There is beauty everywhere and there is no such thing as poverty if only we realize the universal ownership of beauty in Nature and Art.

"You may own the land but not the landscape! You may have physical possession of a great picture or a building but if they are really great the man who truly owns them is the man who most appreciates its beauty. In the light of this truth in written word, in painted canvas, or chiseled stone, or in the harmonies and melodies of sound and in the beauty of nature all around, the richest man in the world is he who thinks right and best understands.

"May we more and more realize that the true way to educate the public to appreciate beauty is to teach it how to think and discriminate for itself. While I realize that the true and legitimate instruments of the artist are the brush and the palette,

and the T-square, triangle and compass, in view of the present-day influence of literature upon art and the apparent authority which accompanies ignorant assertions when seen in print, I do not feel myself justified in coming to you tonight and asking you to look forward to the day when more artists, with more literary ability and greater authority, will respond to such opportunities as are offered to speak for themselves, for their fellow artists, and for the love of art and the beautiful, to add something of what they have learned from their working experience toward diagnosing the situation and toward counteracting the ill effects of illegitimate fault finding, and thus to supplement much of the refining and uplifting influence of true and serious literary criticism."

The Four Courts building, Dublin, Ireland, burnt during recent civil warfare. Designed in 1776 by Thomas Cooley and completed by James Gandon

(From The Architects' Journal, London)

STUDY FOR FIRST NATIONAL BANK, JERSEY CITY, N. J.

ALFRED C. BOSSOM, ARCHITECT

(From the original pencil sketch by L. J. Keimig)

·EDITORIAL·COMMENT·

IT WOULD FILL ALL THE PAGES of one issue of THE AMERICAN ARCHITECT to reprint the editorial allusion in London architectural papers to the presentation to Mr. Thomas Hastings of the Royal Gold Medal of the Royal Institute of British Architects. Mr. Hastings has received the very finest courtesies from the architectural press; his work and that of the firm of Carrere & Hastings have been splendidly illustrated, and throughout there have been the finest expressions of professional appreciation of the development of architecture in this country and the men who have so largely contributed to the success of that development. We may not forget these things. They are the ties that bind. They show so fine a professional attitude from men whose good opinion it is worth while having, that we are filled with sentiments which reciprocate these kindnesses.

Three Americans have thus far received the Royal Gold Medal of the Institute,—Richard Morris Hunt in 1893, Charles Follen McKim in 1903, and now, Thomas Hastings.

In the period of almost 30 years since Richard Morris Hunt received this distinction, the profession of architecture in the United States has achieved results that only those who have closely followed development can appreciate. Men of broad vision and scholarly and artistic abilities, have studiously blazed the way that culminates today in the fine appreciation by the president of the R. I. B. A. in his splendid address of presentation of the medal to Mr. Hastings.

And in his reply, Mr. Hastings has with much clarity and a proper use of words, indicated just what in his judgment has most influenced the progress of American architectural development.

* * *

COMMENT HAS BEEN previously made in these columns of a discussion on ethics in business relations as set forth in the May volume of the Annals of the American Academy of Political and Social Science. Included in this volume is an article by Professor Emil Lorch of the University of Michigan, on The Architectural Student and His Relation to Professional Practice. Professor Lorch very ably traces methods of architectural education from the apprenticeship system, or "articled" student, as in force in England and also the system early in force in this country, and points out that the beginning of architectural schools was coincident with the beginning of the American Institute of Architects.

We are not inclined to concur in the statement that in large offices the old bond between master and pupil is uncommon. If by "bond" is meant that early social relation when the "articled" student became a member of the "master's" family, the contention may be true, but if it is meant that the heads of well conducted offices have ceased to watch over and guide the progress of the young men who come to them from architectural schools, we believe we can prove that this fine attitude of paternalism still exists.

No one may question the value of the "documents" issued by the Institute, so warmly commended by Professor Lorch, but it may be possible to debate his contention as to their strong value to architectural students. A university education in architecture, if correctly carried forward, teaches the student to *think* in terms of architecture. What he needs in addition to that properly developed faculty, is how to *act* in terms of architecture.

Much of the criticism of architectural education is based on a contention that it does not teach both. And, until it can, a post graduate experience in a well organized office will be essential to the thoroughly practical mental equipment of every student.

If the architectural schools are compelled to receive students whose previous education has been only through common or high school courses, too great a part of the four years must be spent in preparing the student for the elements of his architectural education. Large numbers of enrollment are sought and the standards of admittance are now too low. If these standards are raised, and maintained by all architectural schools, the misfit will be eliminated, and the student's four years be one of strictly architectural education and not so largely given over to a preparation for it.

If any element of weakness exists in the arguments of those who head our architectural schools, it lies more largely in the magnification of ethical relations, ultra artistic attitudes and theoretical aspects of practice.

It may be conceded that the Institute through its Committee on Education, is accomplishing the things Professor Lorch claims for it. But, while its reports do accent some of the æsthetic features of architectural education, they also urge, and very properly, the introduction of wider opportunities on the part of the student for practical observation, and do not favor that he shall first come in contact with these practical elements when he takes up work in an office after graduation. It may not be unreasonable to assume that daily association

with men, who, like himself, are engaged in a study of all the arts, will teach the student the ethics, not only of his profession, but of his relations to the world at large.

Time spent on too prolonged a discussion of topics that are part of all professions and the daily habit of honest men, might be applied to a more practical association with the actualities of building, on the part of a man whose purpose is to become a master builder as well as an artist.

* * *

UNDOUBTEDLY WE WOULD more intelligently and more quickly realize our artistic ideals in this country if matters pertaining to art could be decided by competent persons. But, when projects are contemplated involving a large expenditure, there at once appear the politician and all the uncertain elements that contribute to incompetency.

Just now in New York there is a project afoot to construct a memorial arch and swimming pool in Central Park. This "inland Coney Island," as it has been correctly called, with the possibilities of large expenditures of money and later trading in concessions, has received the approval of Tammany Hall, as represented in the person of Mayor Hylan. It means nothing to "his Honor" that all of the important art societies in New York strongly oppose the scheme. What is more important is the opportunity to pose as the friend of the poor people with the added possibility of good campaign material at coming elections.

Central Park, at one time and another, has for years been threatened by political interests who saw fine opportunities for personal gain. These proposed encroachments have been successfully opposed, but now a proposition is presented so insiduously proclaimed as for the benefit of the classes for which the park is supposed to be maintained, as to secure among unthinking people a clamorous approval.

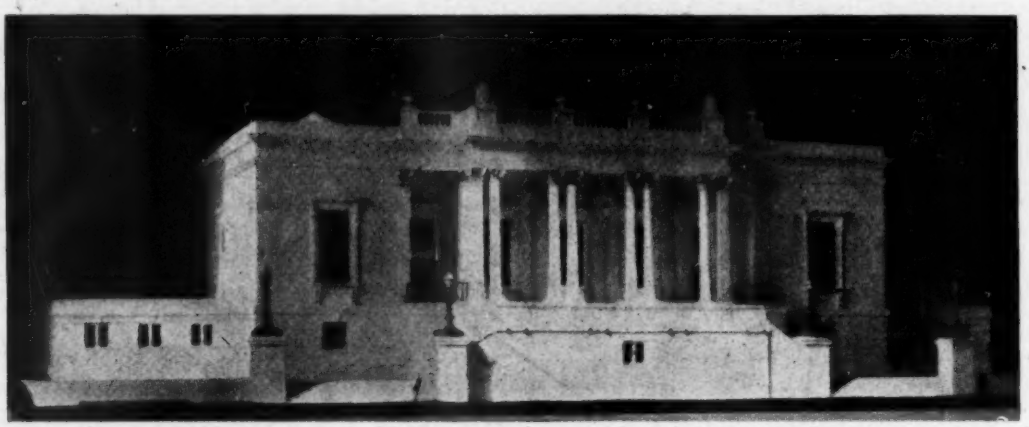
Central Park, as pointed out in these pages some time ago, while located in the very center of the best resident section of Manhattan Island, has become the playground of the people of the congested areas on the East Side. Fifth Avenue from 59th Street North has more large and pretentious houses than any other section. Central Park South,—59th Street between Fifth and Eighth Avenues,—is lined with hotels and apartment houses of the best types. And on this part of the border of Central Park there will probably be located the proposed new Art Center. Central Park West, from 59th to 110th Streets, is also the location of many important churches, theatres and apartment houses.

Mayor Hylan proposes to erect exactly in the center of this fine district, a memorial arch and a swimming pool, that will be more largely patronized by a class whose daily domestic lives have no part with those of the large body of people whose homes border on the park.

We are strongly in favor of any scheme that will afford the largest opportunities for recreation for all the people. But even the casual observer knows the reckless disregard for civic decency that characterizes the present use of the park by people who come long distances from congested sections, thus to a large extent, causing those who live nearby to abandon it as a recreative spot.

To popularize the park to this class by the proposed plan, is to create in Central Park identically the same conditions that led to zoning regulations in New York to prevent the invasion of certain well maintained districts by types of buildings that ruin complete neighborhoods.

Why not extend the zoning regulation to Central Park, and thus for all time prevent the attacks of political interests that, masquerading under a profession to serve the people, more largely serve their own selfish schemes?



Model of British Pavilion, Rio de Janeiro, Brazil Centenary Exposition
Jno. W. Simpson and Maxwell Ayrton, Architects
(From The Architects' Journal, London)

HOUSE AT FAR HILLS, NEW JERSEY

CROSS & CROSS, ARCHITECTS

HOUSE AT FAR HILLS, NEW JERSEY

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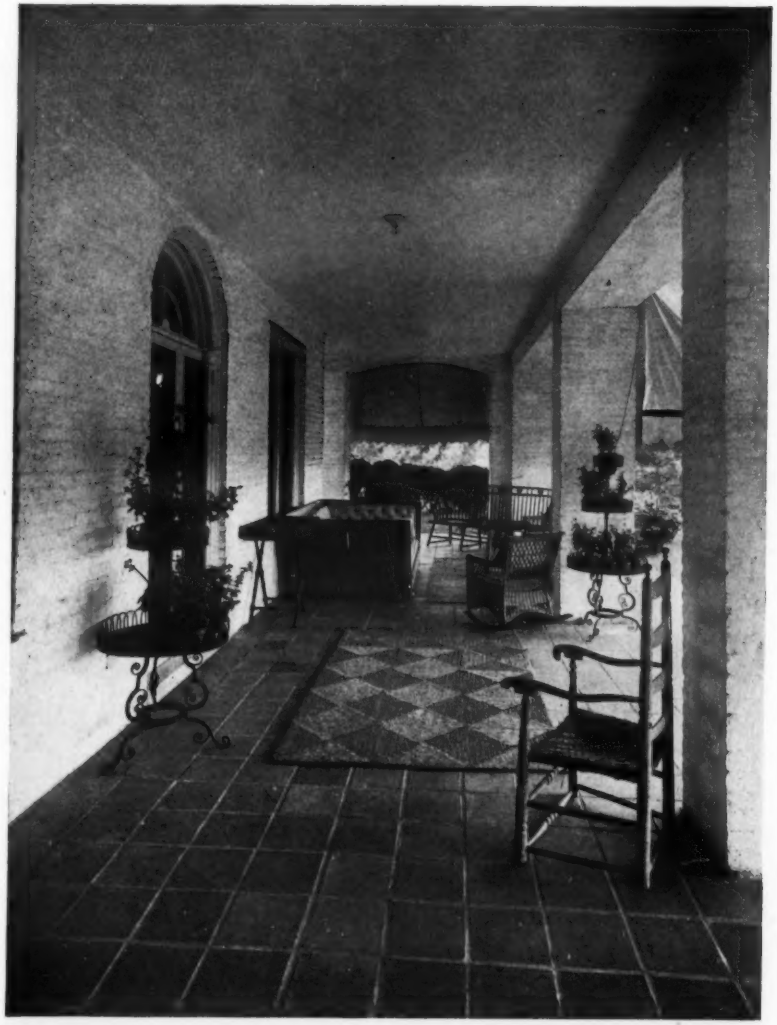
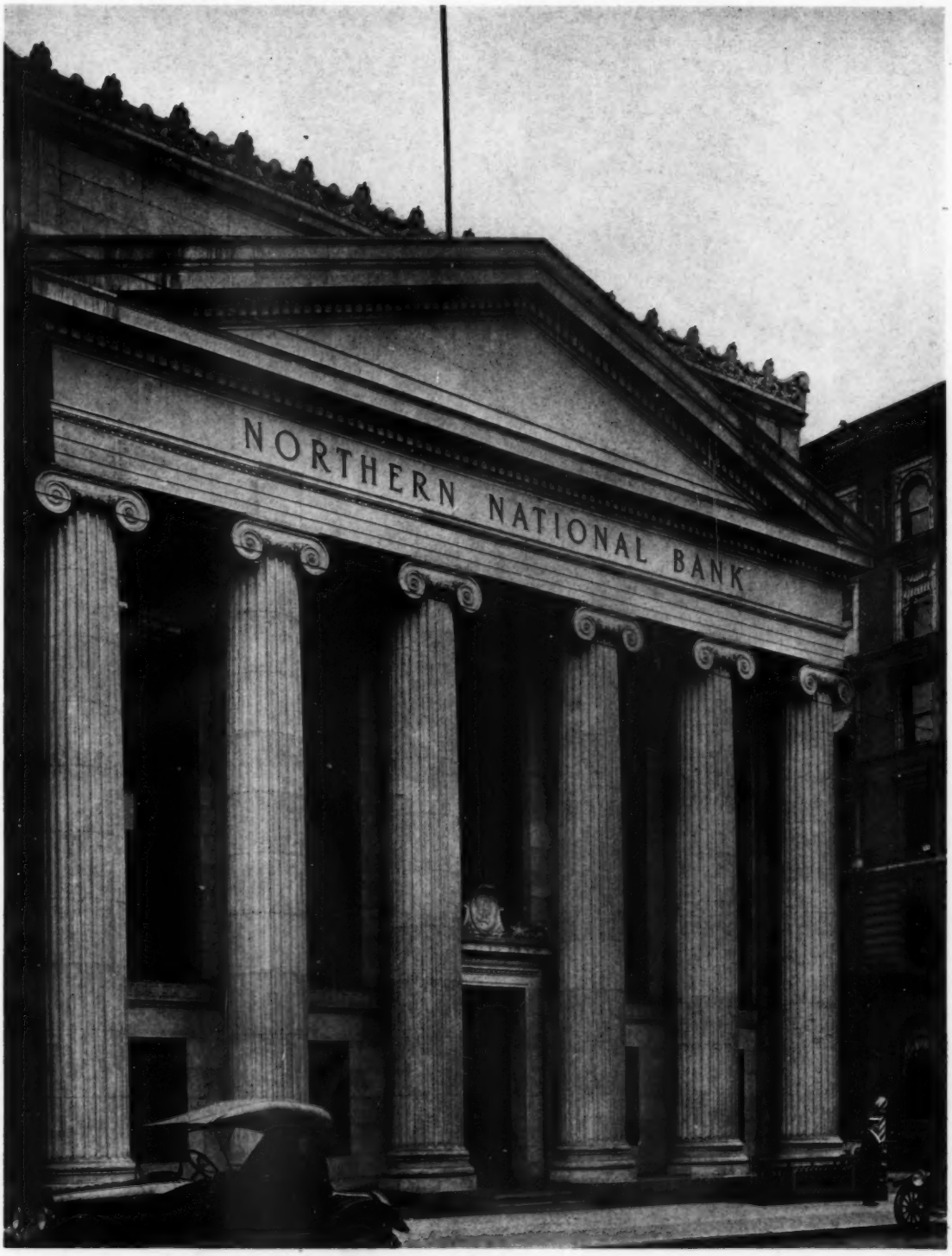


HOUSE AT FAR HILLS, NEW JERSEY

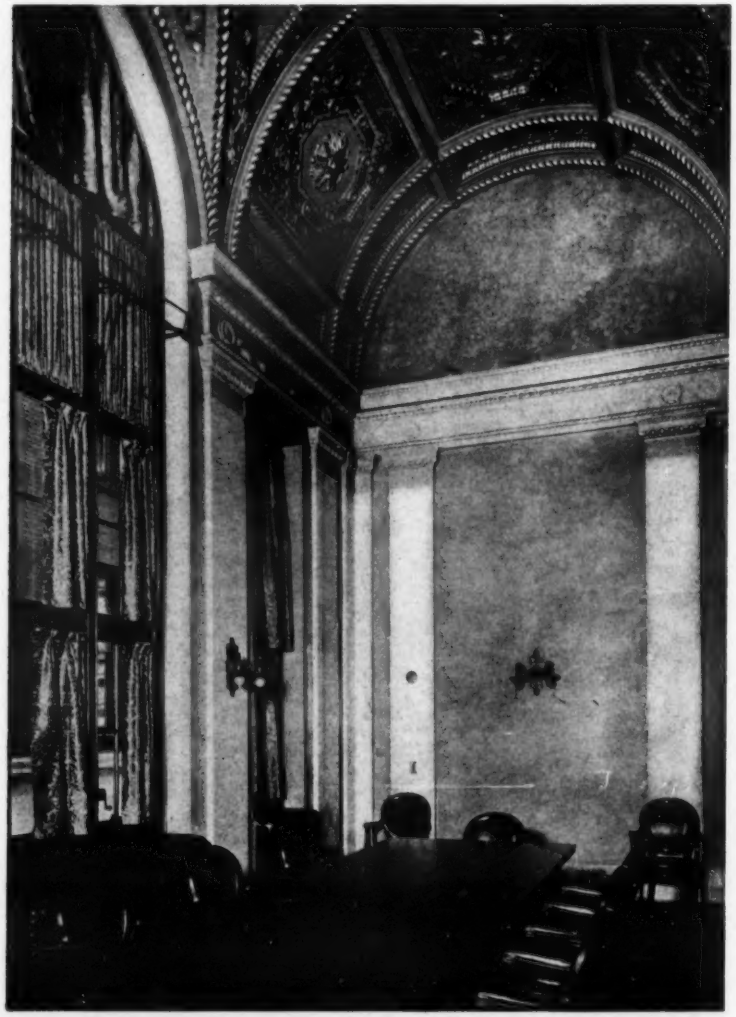
CROSS & CROSS, ARCHITECTS



NORTHERN NATIONAL BANK, TOLEDO, OHIO

MILLS, RHINES, BELLMAN & NORDHOFF, ARCHITECTS

VOL. CXXII, NO. 2399 AUGUST 2, 1922



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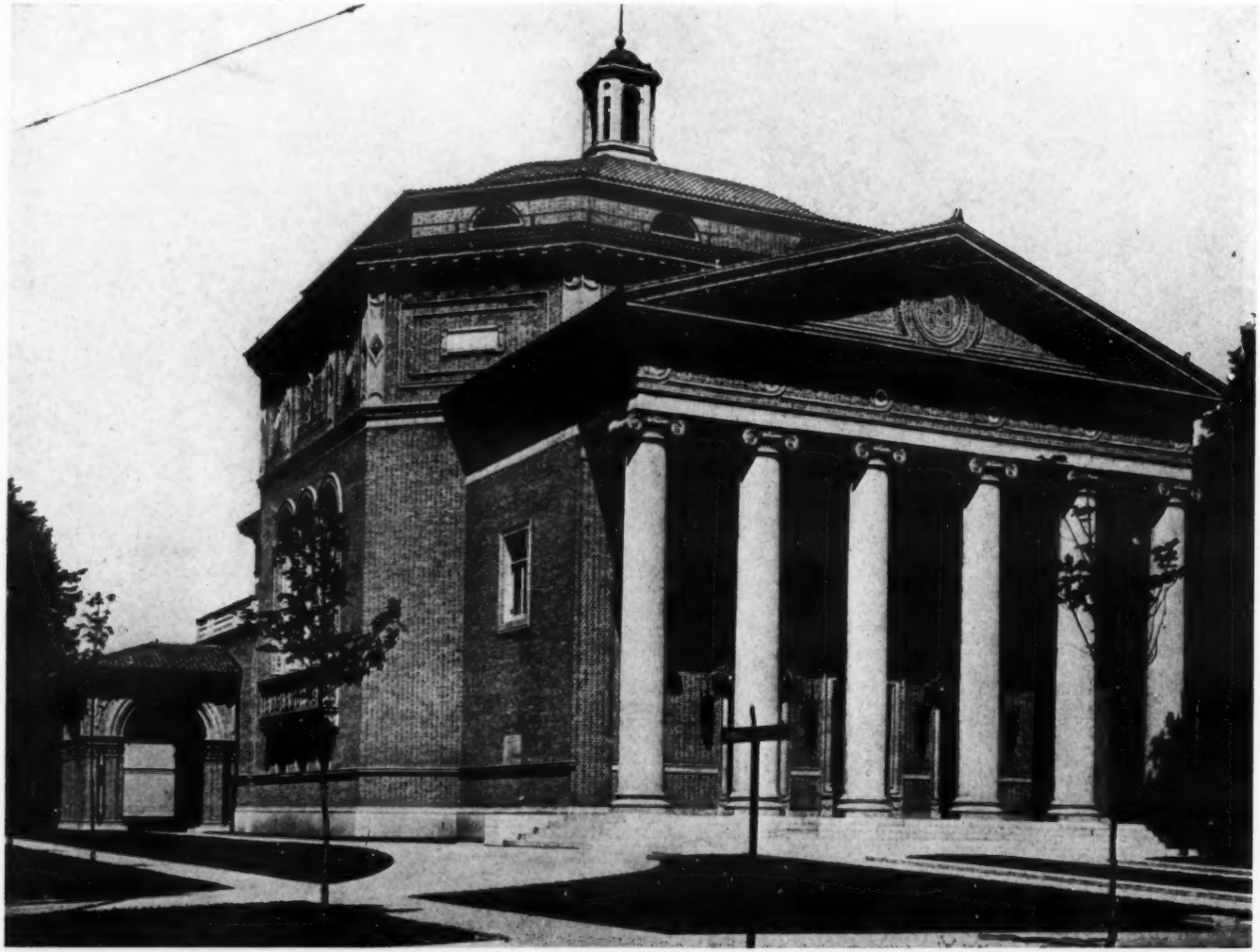
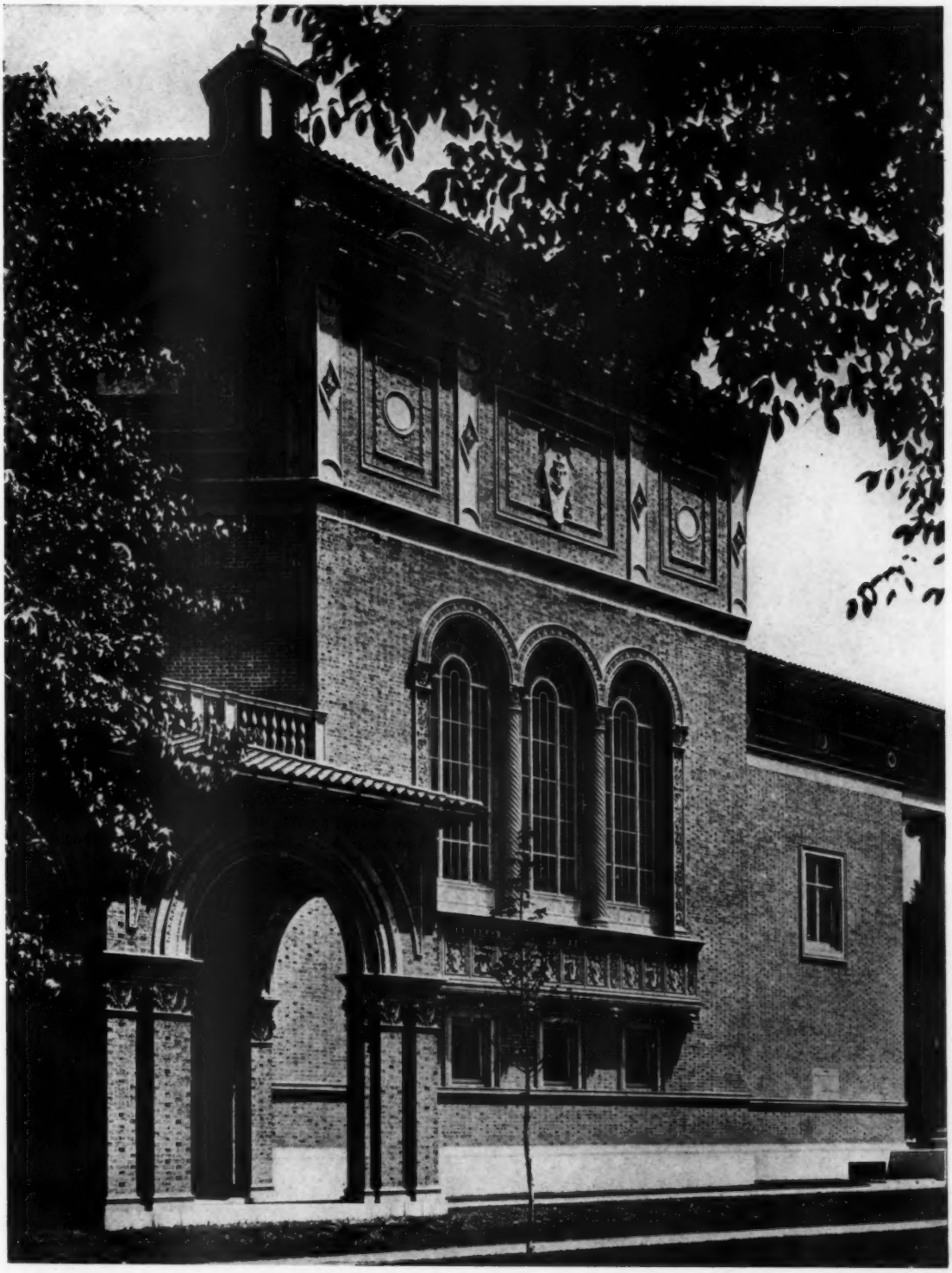


FIRST CONGREGATIONAL CHURCH, TOLEDO, OHIO

MILLS, RHINES, BELLMAN & NORDHOFF, ARCHITECTS



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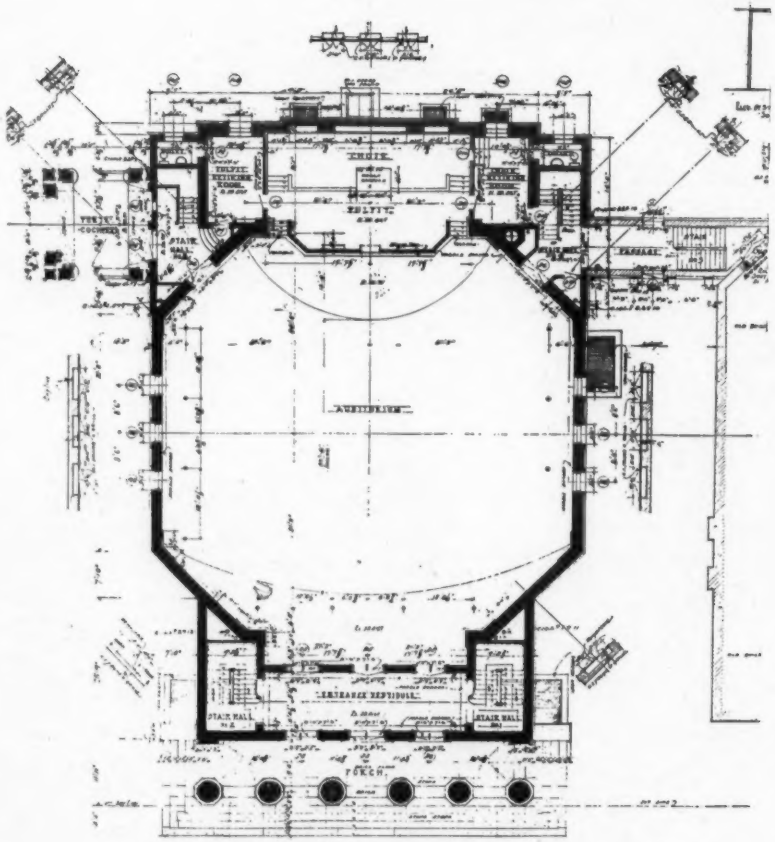

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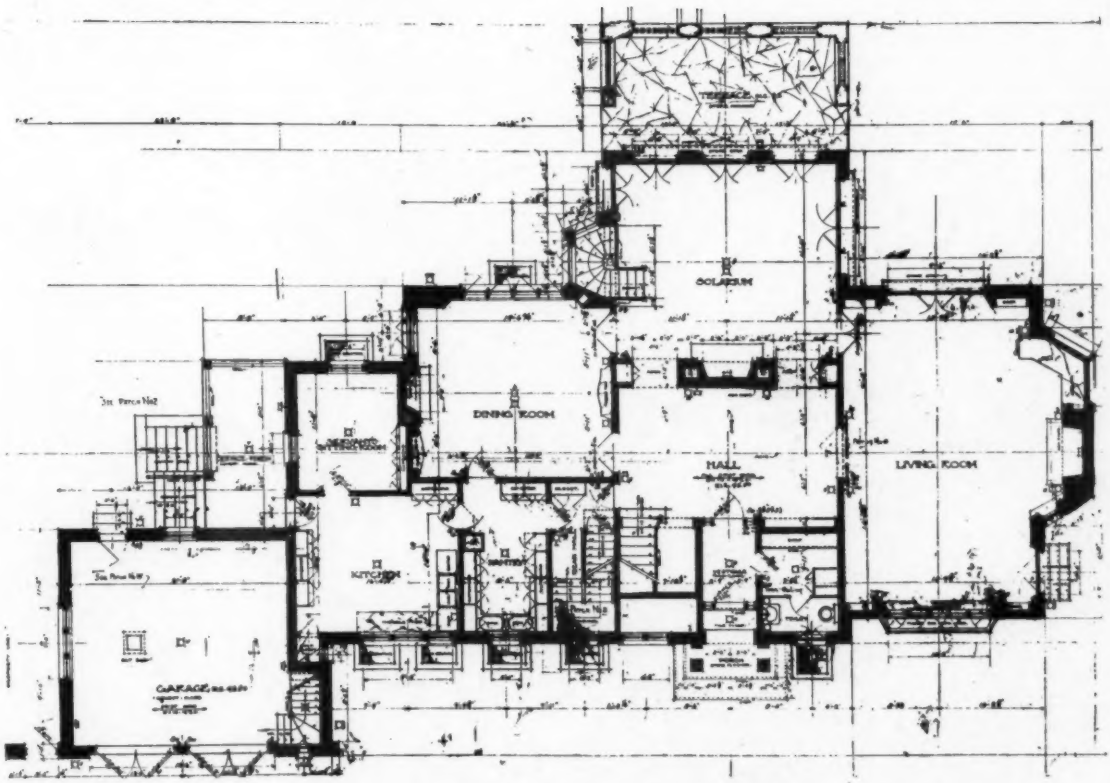
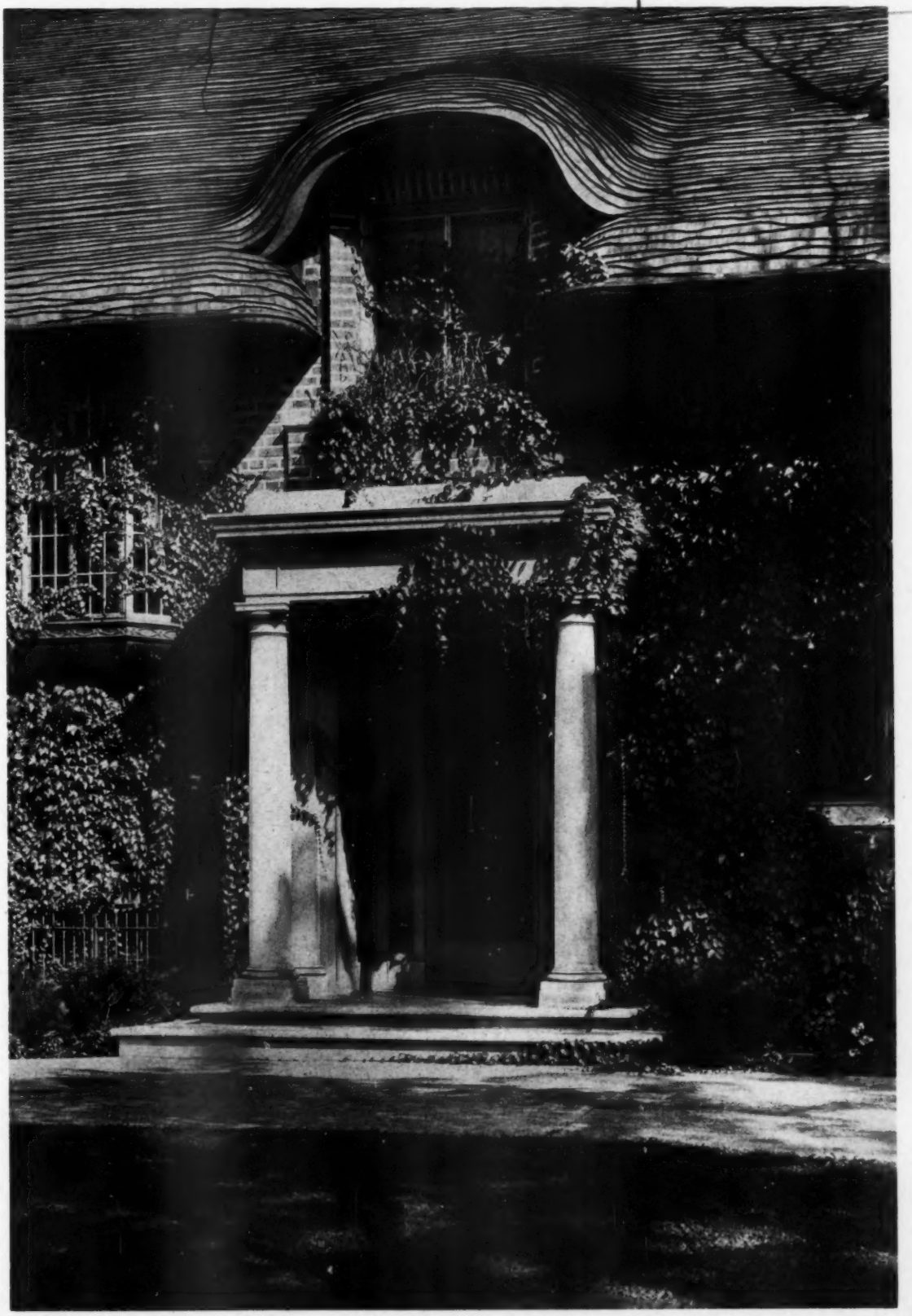


HOUSE AT TOLEDO, OHIO

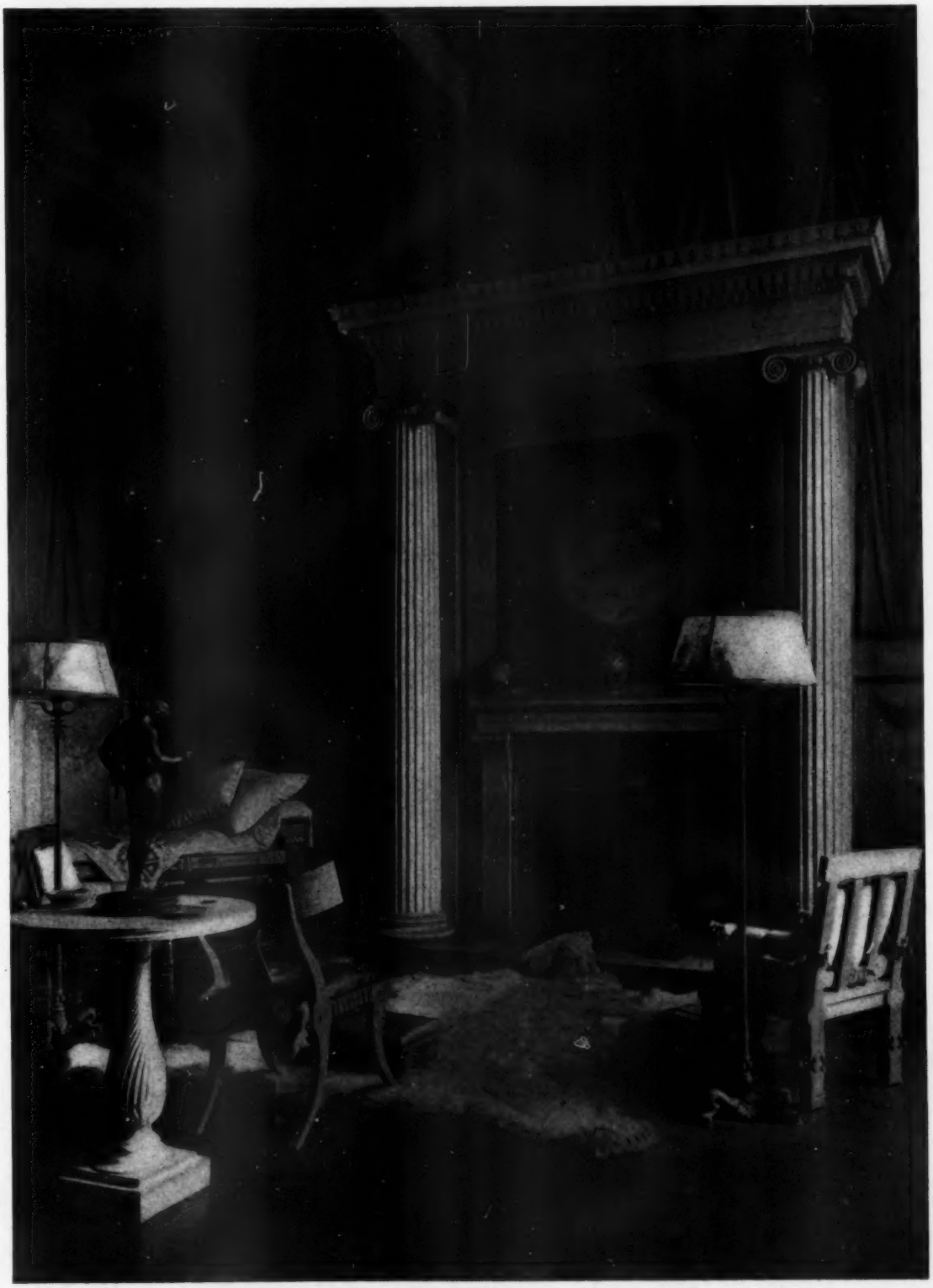
MILLS, RHINES, BELLMAN & NORDHOFF, ARCHITECTS



ENTRANCE DETAIL

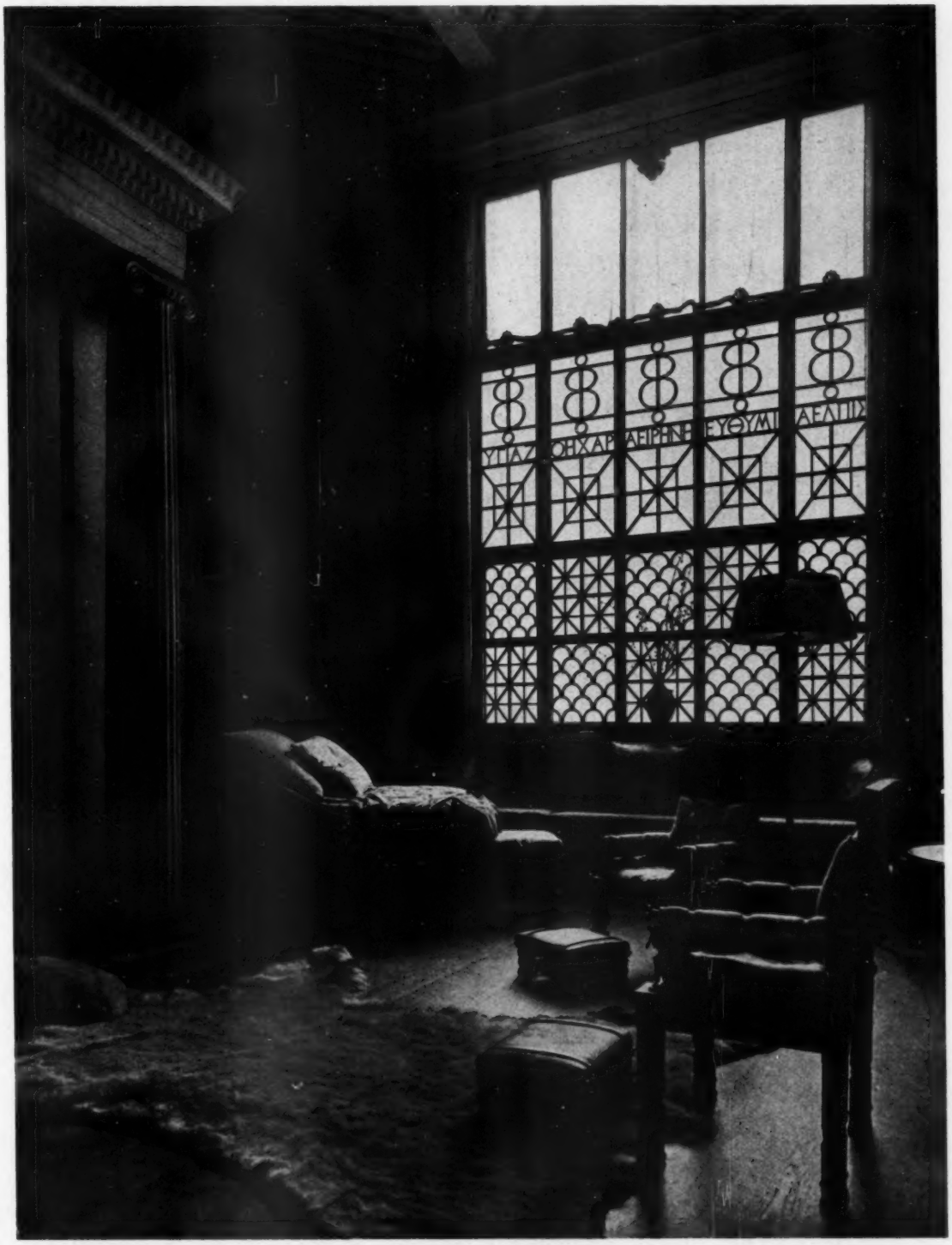
HOUSE AT TOLEDO, OHIO

MILLS, RHINES, BELLMAN & NORDHOFF, ARCHITECTS



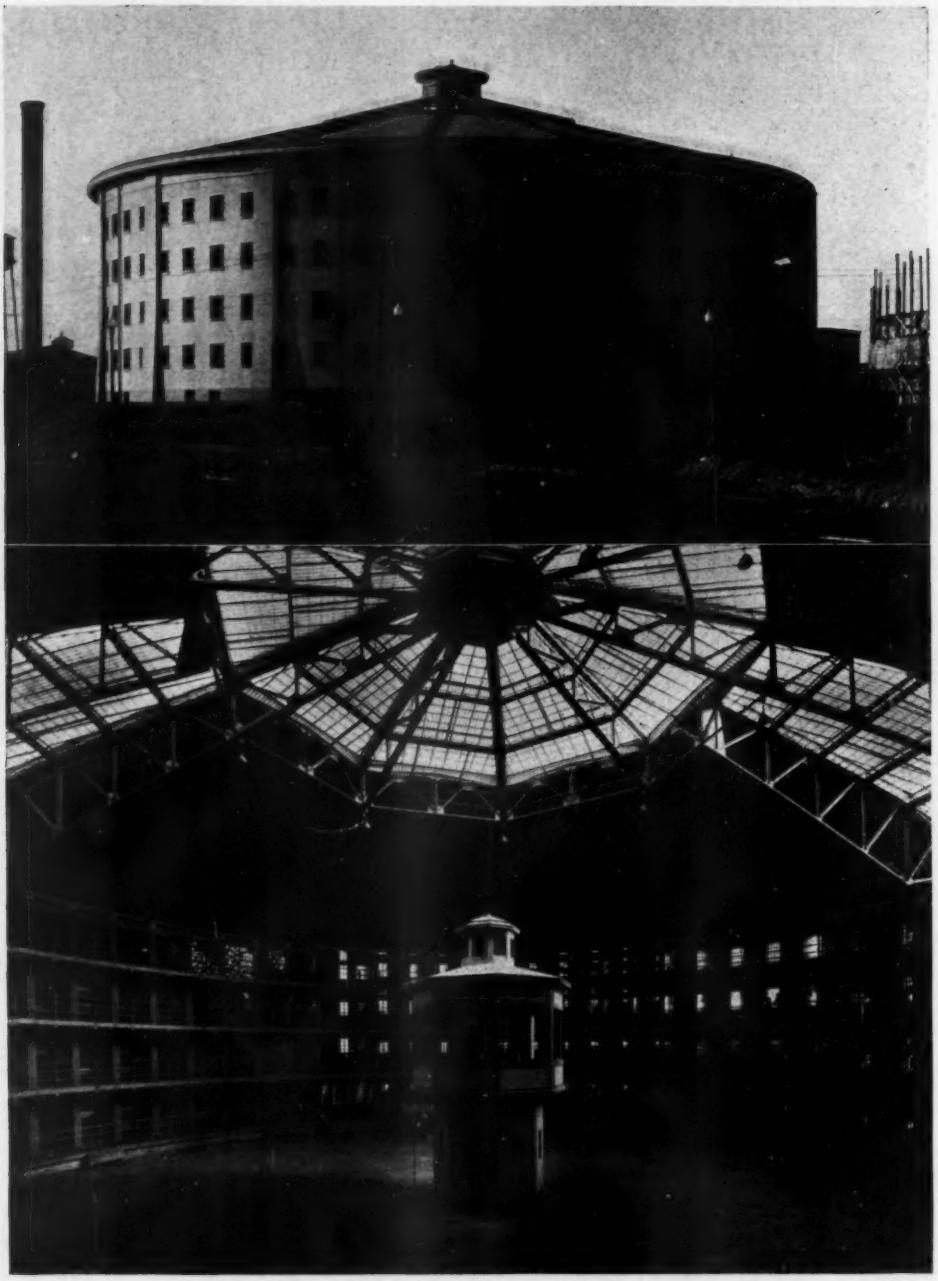
INTERIOR VIEW, HOUSE OF WELLES BOSWORTH

WELLES BOSWORTH, ARCHITECT



INTERIOR VIEW, HOUSE OF WELLES BOSWORTH

WELLES BOSWORTH, ARCHITECT

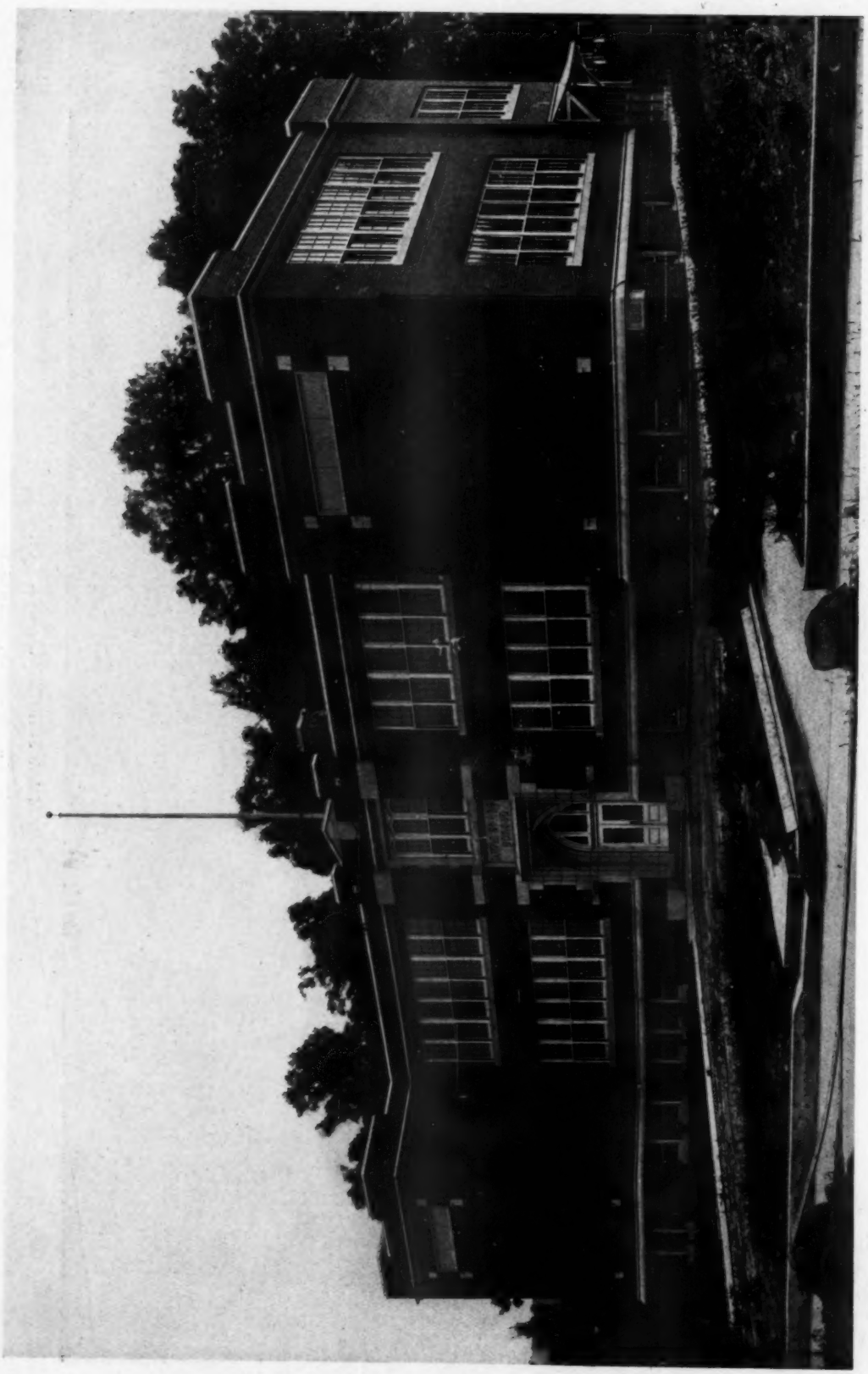


NEW ILLINOIS STATE PENITENTIARY

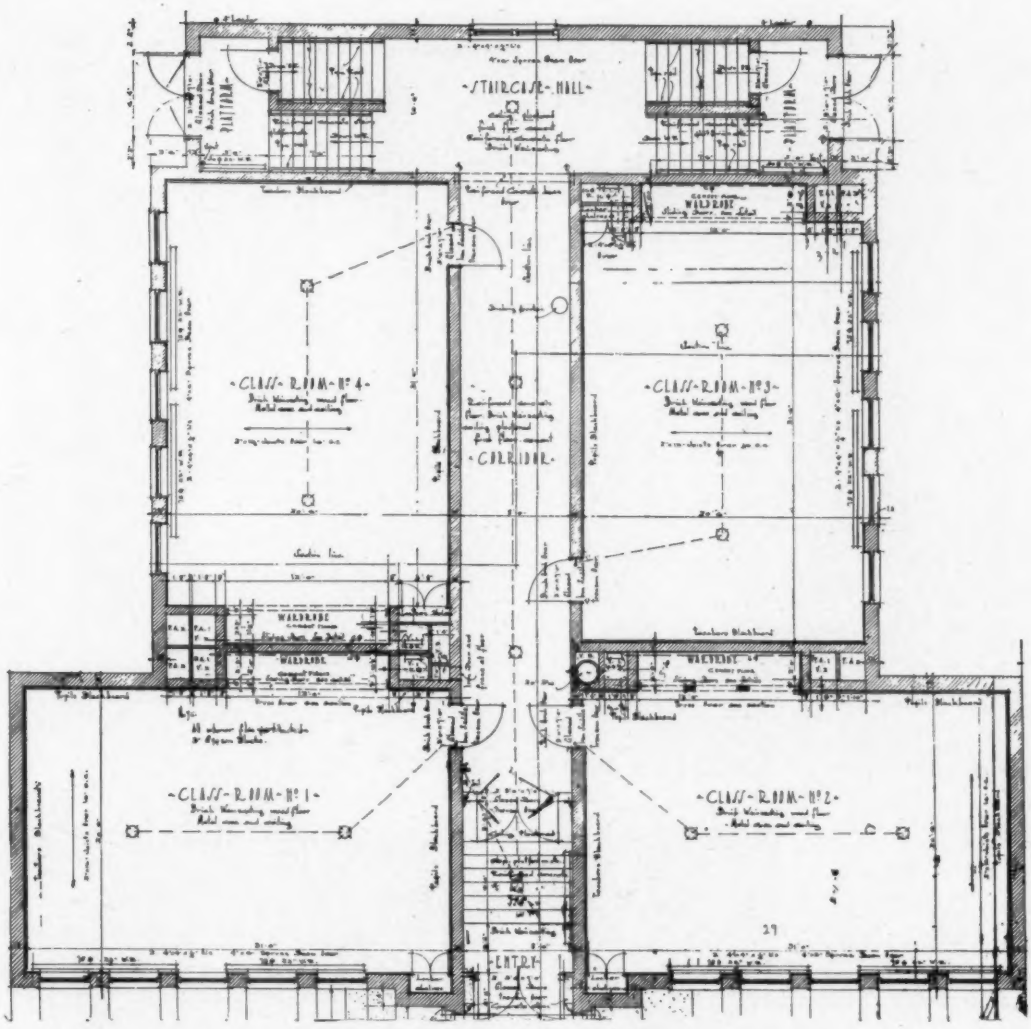
ZIMMERMAN, SAXE & ZIMMERMAN, ARCHITECTS

(From the Chicago Architectural Exhibition)

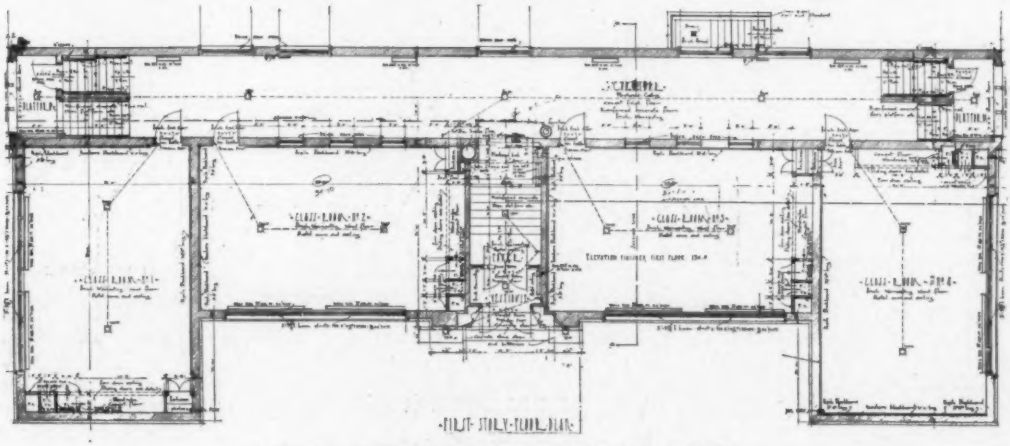
GRAMMAR SCHOOL, HAMDEN, CONN.
BROWN & VON BEREN, ARCHITECTS



DAVIS STREET SCHOOL, WESTVILLE, CONN.
BROWN & VON BEREN, ARCHITECTS



FIRST FLOOR PLAN, GRAMMAR SCHOOL, HAMDEN, CONN.



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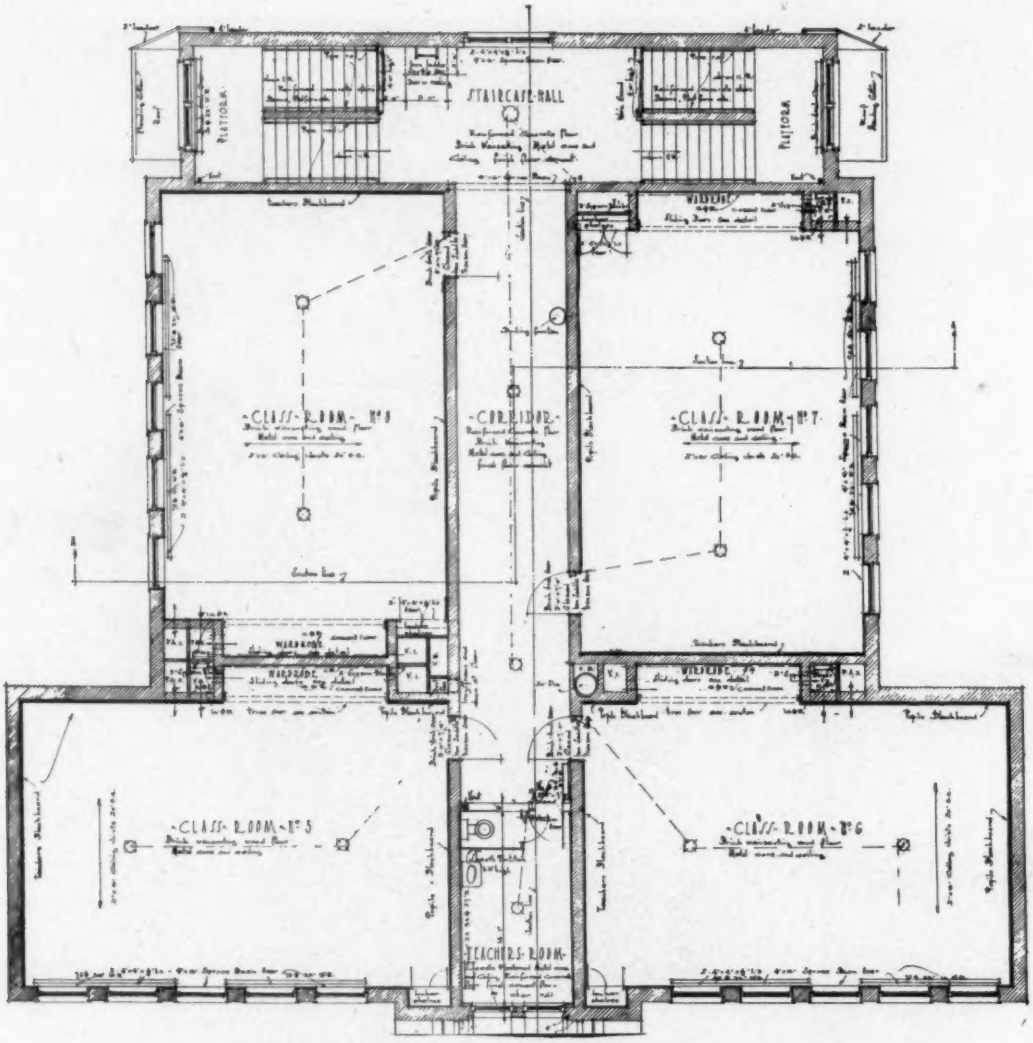
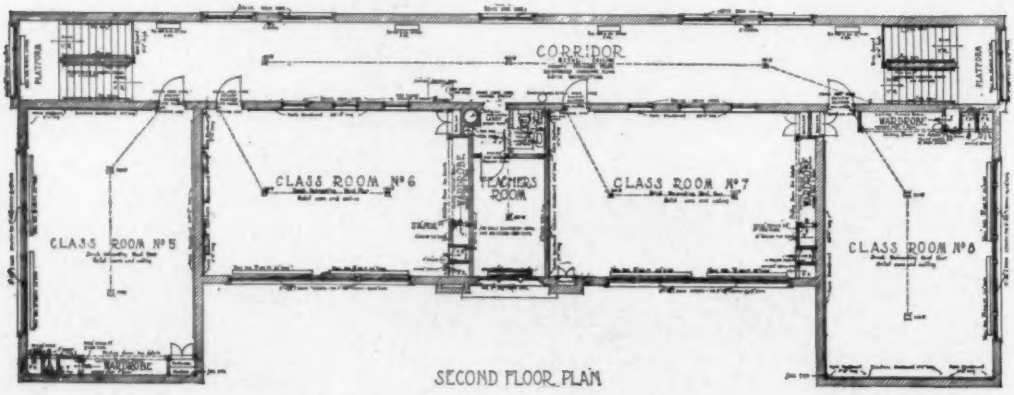
BROWN & VON BEREN, ARCHITECTS



SECOND FLOOR PLAN, GRAMMAR SCHOOL, HAMDEN, CONN.



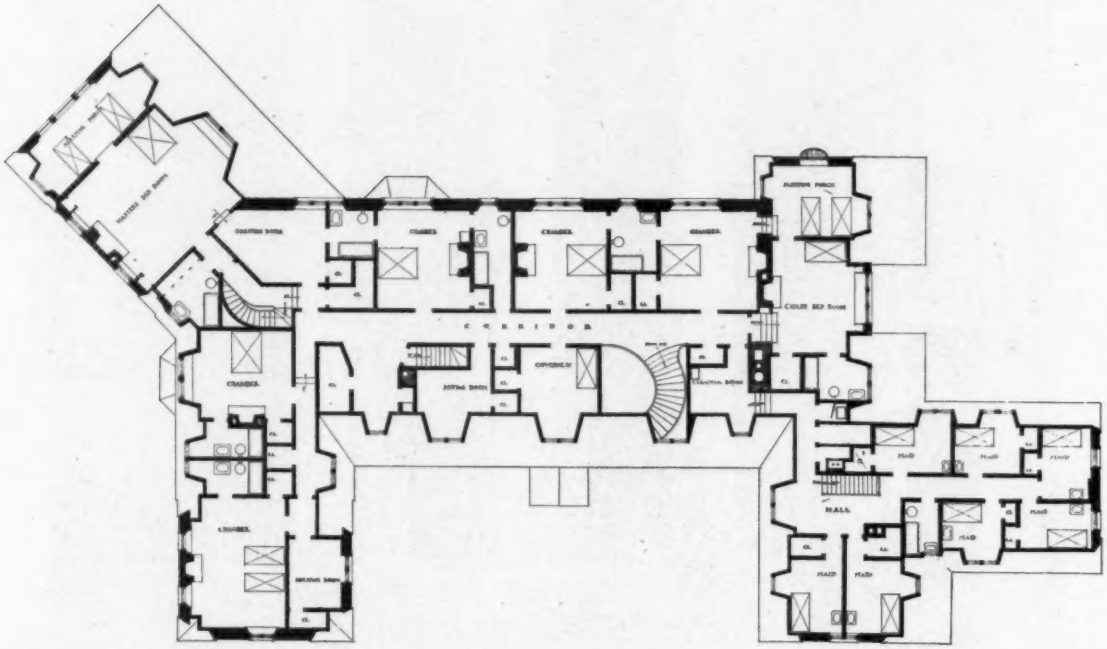
DAVIS STREET SCHOOL, WESTVILLE, CONN.

BROWN & VON BEREN, ARCHITECTS

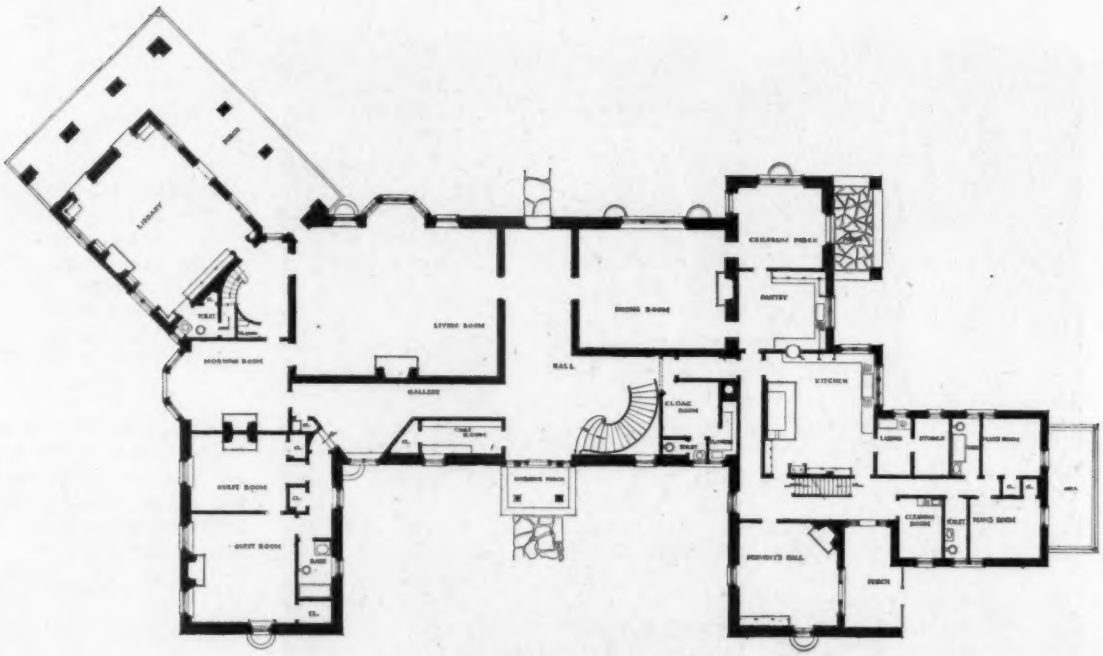
In the above fine example of two dimensional motion picture architecture the massive columns are skillfully camouflaged profile supports and the entire set as viewed in the picture has only a "front" to identify it with architecture.

In the lower picture there is neither stone, marble nor brick. It is built of wood and canvas. Even the trees, plants and grasses are mere decorative effects.

TWO DIMENSIONAL ARCHITECTURE AS SHOWN IN TWO "SETS" MADE FOR A SPECIAL PRODUCTION OF RICH MEN'S WIVES, BY PREFERRED PICTURES, INC., LOS ANGELES, CAL.



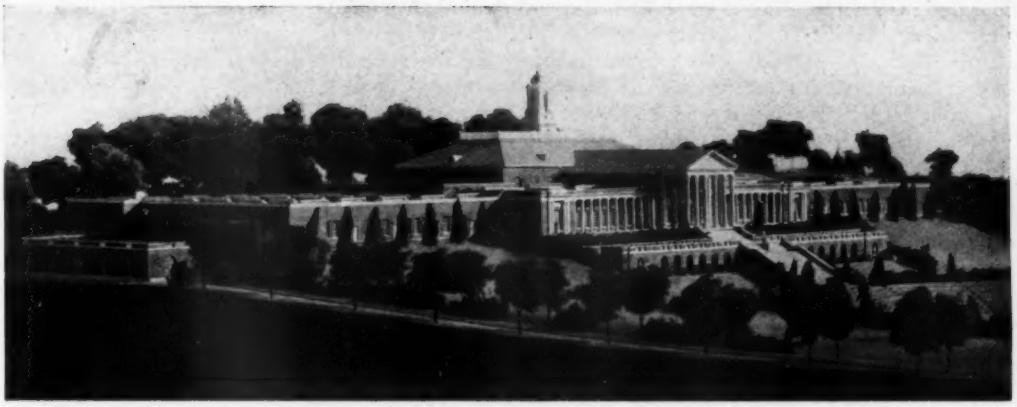
SECOND FLOOR PLAN



FIRST FLOOR PLAN

HOUSE AT FAR HILLS, NEW JERSEY

CROSS & CROSS, ARCHITECTS



Detail of model of The Handley Schools at Winchester, Va.
Walter R. McCornack, Architect
Model is nine feet long, made in three sections at the scale of 20′ = 1″

CARDBOARD MODELS—I

BY LEROY GRUMBINE

THE one thing that distinguishes an architect from others engaged in the building business, is that his work must primarily possess beauty and harmony of form and color. The architect is an artist, first and foremost, or he is not a true architect. He works, however, on a different basis from the painter, sculptor, poet, musician, or dramatist. He applies his art, instead of creating it for its own sake. His work has a practical excuse for existing that predominates over its artistic merit. The practical side of architecture gives the weak artist a crutch and places obstacles in the way of architecture that other arts do not have.

The architect, according to the A. I. A. schedule, receives six per cent of the cost of a building, for his services, one-fifth of which is for preliminary studies. It is in the preliminary studies where architecture has its opportunity to express itself as an art. Working drawings, specifications, and superintendence, are almost entirely a matter of engineering. So we find that only a little over one per cent of the money expended on a building, is spent for *architecture.* Yet the works of architecture are perhaps more enduring, and are certainly more displayed, than those of any of the other arts. In all the other greater arts, most of the money expended, if not all, is for the art itself. Not even in the lesser applied arts, or in anything where there is an endeavor to make a thing beautiful, is the proportion of money expended for the beautiful so low as in architecture. The reverse ought to be the case, for the more costly and enduring a thing is, the more study it should receive to make it beautiful.

Not only is the architect handicapped by receiving meager returns for his *architectural* services, but he is met with difficulties in selling his work. It is the custom of his profession to sell first and produce afterwards, while the painter, poet, or composer, usually produces first and markets afterwards. This means that the architect is dependent on his reputation, and it is a very slow process for an architect to build up a reputation. It is a long period from preliminary studies to the completed building, and only occasionally does the completed building represent the architect's abilities, for it is seldom that the architect has free play and that his ideas are not more or less marred by the client's commercial instincts and lack of artistic comprehension.

Authorities on salesmanship say that very few people can be sold on reason. By far the great majority are "sold" by appealing to their appetites or senses. The buyer of a painting sees the beautiful picture and wants it. The picture occupies his attention and if he can, he buys it. The most prominent thing that occupies the attention of a buyer of architectural services, is six per cent. The psychological effect is the opposite, and some scab "architect" usually is the gainer, and the owner and neighborhood of the new building, the sufferers.

The usual means of presenting a design to a client, is ambiguous and far from convincing to the lay mind. Even the most thorough presentation in perspective form fails to tell the story completely. The client is undiscerning and suspicious, if not of the architect, then of his own ability to understand the presentations.

Poor designs are often faked, sometimes through carelessness or inability to illustrate correctly, but much too often the reprehensible practice of deliberate "faking" and "dolling up," is resorted to, in order to win the client and land the job. The client sees the fancy drawing, not the design.

Even though the client employs the very best architectural services procurable, personal tastes enter into all arts so largely, that it is the client's right to be shown before he agrees to buy.

A small portable colored cardboard model is a great assistance in overcoming all these disadvantages. It shows the artistic merits of a design almost, if not quite, as effectively as the completed building. Form, color, relation, proportion, composition, and harmony, are all shown, just as they will appear on the finished building, and these can be studied from every possible viewpoint.

It gives the architect opportunity to express his ideas unrestricted, and to display them to his client. That is, it gives the architect an opportunity to create first and market afterwards.

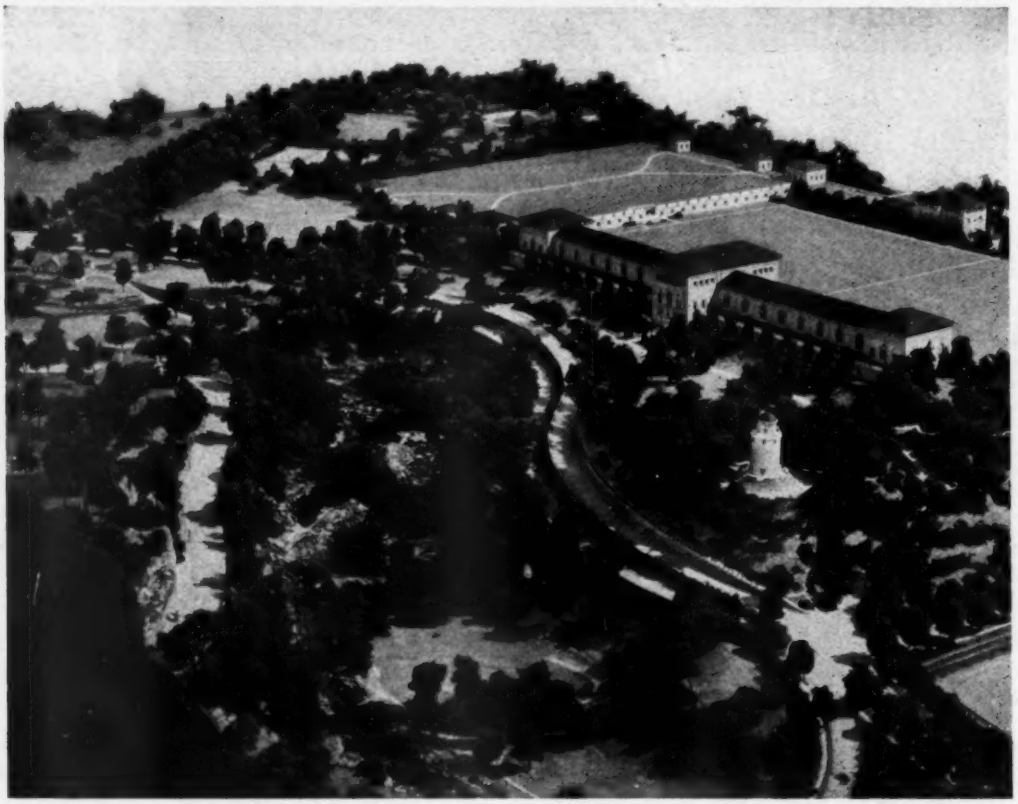
It appeals to the senses of the client, takes his mind away from six per cent, and focuses it on the article itself, reversing the psychological process from negative to positive.

It gives the architect a means of effectively demonstrating all his talking points.

It makes him less dependent on the necessity for waiting to build up a reputation.

The best design has a much better chance of winning in competition with others, when presented in model form.

A model gives the client confidence because he sees beforehand what he is obligating himself to pay for, and he is therefore much better satisfied.



Detail of Model of The Baldwin Filtration Plant and Ambler Park, Cleveland—Scale 40′ = 1″

Models are practical for all kinds of buildings. They need not be expensive, and can usually be made for from one-tenth to one-half of one per cent of the cost of a building, or about what two or three perspectives would cost.

Is it not better wisdom to purchase an article at a store where you can see it first, even though the price is a little higher, than to order it by mail, cash in advance?

The architect, not the client, should provide the model. It is just as foolish for an architect to ask a client to furnish a model, as it would be for an

automobile dealer to ask a prospective customer to pay for a demonstration. Of course the auto buyer pays for the demonstration, but he is not asked to, has no choice in the matter, and does not think about it.

The time is coming very shortly when it will be the customary thing for the architect to illustrate his design for a proposed building, with a small scale model, which, together with floor plans, will constitute his "preliminary sketches."

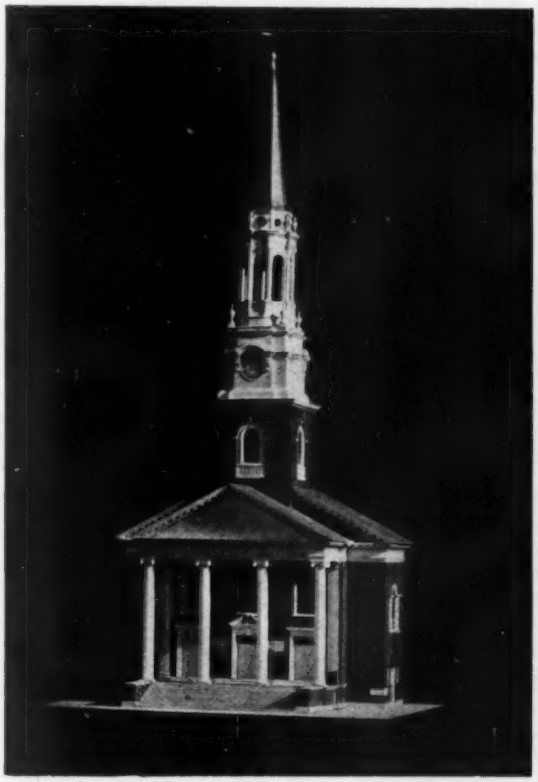
If the architect displayed his goods rather than the price, to the prospect, he would often be more successful in getting the price. We are living in too fast an age to depend on old-fashioned professional methods and time-consuming reputation building.

The same principles apply to scale model making that apply to drawing and painting. It is not the painstaking literal portrayal of minute details that gives merit to a pencil or water color drawing, but rather the correct relationship of the different parts.

Models should be made by one specially qualified and experienced in the making of models. It is an art in itself and the model maker should be an artist rather than a craftsman. He bears a somewhat similar relation to the architect that a pianist or singer does to a composer. He must know how to interpret the architect's ideas. He must be familiar with drafting room practice and the principles of architectural design and with architectural details. Someone has said that "nothing lies like facts" and this in a way is true in model making. Literal exactness and a multiplicity of details often befog the expression of truth rather than assist it. This does not mean faking or camouflage. Art, in order to be real art, must express a beautiful, noble, or truthful idea, or an experience of life, in a harmonious manner, and he who can do this in the simplest, clearest, most direct way, is the greatest artist. Therefore the modeler must know how to select, what to show and what to leave out, and how to combine.

Color is as important as form. A model that is not properly colored, does not correctly illustrate the design.

Models, like drawings, can be studies, sketches, or exhibits. A study model is for the architect himself, or for the architect and client. It is made in the simplest and quickest way, and as far as possible, so it can be altered. Permanence is not considered.



¼ Scale Model of front of Plymouth Church, Shaker Heights, Cleveland
Charles S. Schneider, Architect
Constructed entirely of cardboard except that the columns are made of plaster, the urns of wood and the windows of celluloid

Sketch models show just enough to illustrate the essential features. If properly made, they can be just as artistic as sketch drawings. They are useful to present designs of buildings of moderate cost, or two or more models can be made of the same building, showing alternate designs.

An exhibition model is made of a design that the architect has satisfied himself is the best solution, to exhibit in a more or less public way. The model is made in a more painstaking way and more complete in detail.

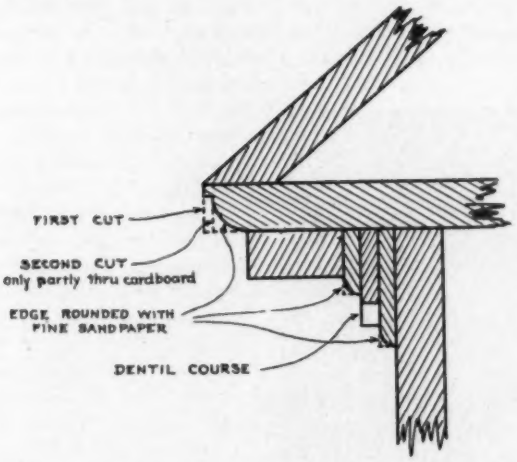
A study or sketch model is made to develop the building as it is to be; an exhibition model to get the order to proceed.

Models might be classified according to their subjects, as building, landscape, group, interior, and detail. Here again a model is like a picture, and it is a mistake to try to show too much on one model. It is less expensive and more effective to illustrate two ideas with two different models than to try to show both on one model.

A model of a building should be between one and two feet long. Its purpose is to show the general design, composition, proportion, mass, central feature, color, etc. Only a few inches of grounds should be included.

A landscape model should not be over three feet wide. One-sixteenth or one-twentieth of an inch to the foot is usually the most practical scale. For extensive grounds, smaller scales should be used.

Sometimes it is advisable slightly to increase the vertical scale of the grounds, to give a more true effect for gullies, valleys, or hills, but this must be done with caution, or incongruities will result, especially where there are buildings. For detail work and formal gardens one-eighth or three-



METHOD OF BUILDING UP A CORNICE
DRAWING ABOUT FOUR TIMES ACTUAL SIZE

sixteenth inch scale works very well. A larger scale makes it difficult to show trees.

There is nothing gained by making a group plan model over four feet wide.

Group plans and landscape models do not show architecture nearly so completely as individual models of the buildings, because many important views are cut off. For group plans, study models are especially valuable, and much work can be saved the architect. The various units can be moved about forming all possible arrangements, in a much shorter time than to make drawings of the various schemes.

When it is desired to illustrate the details of some particular feature, such as a doorway or cornice, it is much more practical to make a separate detail model of this portion at a larger scale, than to execute the entire building at a scale large enough to show the detail. It is a useless extravagance of labor to duplicate a modillion a hundred times, or a window trim forty times.

Although the interior and exterior of a building can be combined in one model, less labor is involved and better results are obtained by making two separate models. A model showing the interior of an auditorium, theatre, or church, should be constructed in six sections, so that each one of the four walls and the ceiling can be removed independently, leaving the other five sections intact. Such a model need not be over two feet long. This gives every possible viewpoint of the whole interior, and is much superior to the usual method of having an expensive and cumbersome plaster model made, where one has to crawl under and stick his head up through a hole in the floor, and then only obtains views from one point, and no check on the seating arrangement is afforded.

Cardboard modeling is an art that is still in its infancy. It is receiving a lot of attention and the near future will undoubtedly see a marked development. As soon as the public — the artistic public—learns that it is practical for architects to furnish scale models with preliminary sketches, it will demand that they do so, and will choose the architects that furnish them even if their fees are higher.

(*To be continued*)

Sketch Model of a house in Bloomfield Hills, Michigan
Albert Kahn, Architect
The modeling of minor detail was omitted, such as rafter ends, flower boxes, shutters, Spanish tile on roof, etc.

STAINED GLASS—III (Concluded)
DECORATIVE POSSIBILITIES

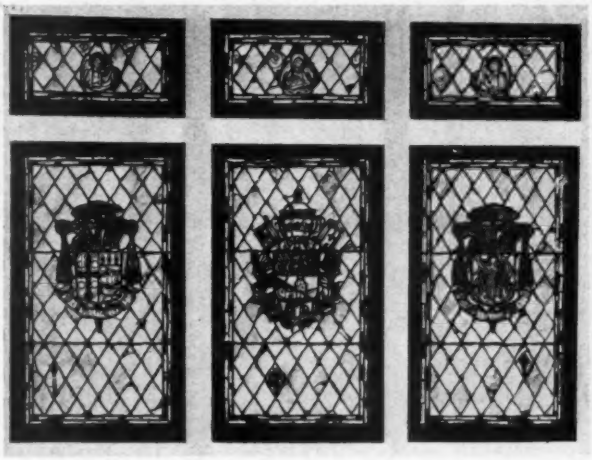
BY JOSEPH G. REYNOLDS, JR., Craftsman

Principles Governing the Designing of the Ideal Window

LET us now consider some of the principles governing the designing of the ideal window. As stained glass is pre-eminently the greatest medium for the expression of beauty in terms of translucent color, therefore color is of primary importance. It is an obvious fact that a window may be masterly in drawing and painting and yet hopelessly bad if the color combinations are inharmonious. "A stained glass window is decorated light. It should therefore be, and is in all the best examples, a design of colored light." This "design of colored light" implies a most careful arrangement of color spots. The aim should not be to get harsh glaring contrasts of color and value throughout the window. Such a scheme produces restlessness and is very trying to the eyes. Each separate color should be chosen not for its individual brilliancy but for its relation to the pieces that surround it. Merely selecting so many pieces of a brilliant greenish blue and so many pieces of a bright purplish blue and mixing them haphazard throughout a robe or background is not likely to produce rich harmony.

A stained glass window, being a part of the wall surface, should be made to look at, not to look through. In a residence, it may be desirable to look through as well as to look at the glass, but in a church, never. Therefore if this principle is adhered to, a pictorial landscape window ought never to be made. For such a design implies an attempt to create the illusion of looking through the window opening at a distant landscape. And carrying this principle still further, the pictorial rendering of actual objects should never be attempted. This eliminates all use of color or shadows or modelling in order to make details look natural. For it should always be remembered that a window is a "design of colored light." And if in designing "Christ's Entry into Jerusalem," considerations of color proportion and balance demand that the donkey be made bright blue, it should be done. To be influenced by pictorial considerations would mean ruining the design.

One of the problems confronting the craftsman in glass is the insistence on the part of the general public that the heads of the figures must be drawn very carefully and made very beautiful. There is no quarrel with the idea that the heads should be beautiful—so should the drapery, and all the details of ornament, and the combinations of color, be beautiful. The difficulty is in the ideal of beauty that the average person holds.



Heraldic Window

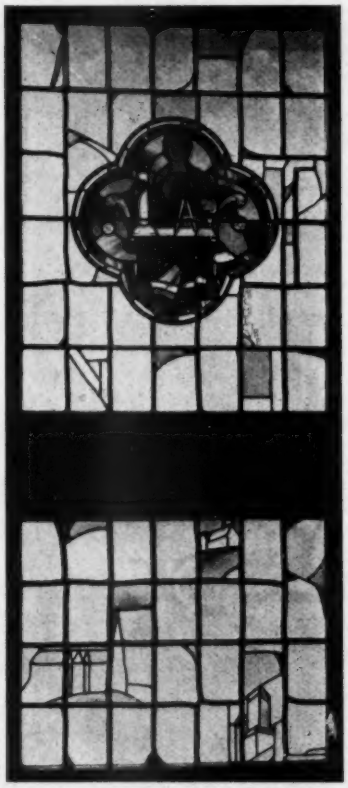
Library of Rt. Rev. Thomas M. O'Leary, (R. C.), Bishop of the Diocese of Springfield, Mass. Jno. Wm. Donohue, Architect

Heraldic devices in pure color are here placed on diamond quarries of varying tints and textures, designed to admit a flood of light, but to exclude the vision of objects outside

Many people who have seen and enjoyed mediæval glass think that it is barbarous and clumsy in drawing. They seem to feel that if the heads and faces were drawn as Raphael and Titian would have drawn them that they would be vastly improved. But such is not the case. "Indeed, the earlier artist with his simple methods of drawing does more in the way of expression than the later with all his superior delicacies; just as Massaccio designs a Madonna who is the Queen of Heaven, where Raphael paints a pretty peasant girl. And this difference is not only in the capacities of the artists; it is also in the methods they employ." Practically every modern restoration of an old window proves this. Oftentimes in replacing a broken head the drawing is "corrected" in accordance with pictorial ideas of good drawing, and the resulting effect is invariably weak and commonplace. A face or hand, like any other part of the window should take its place as an integral part of the design and attract no more attention than any other detail.

Many writers agree in condemning the Byzantine style as belonging to a period of art in which there was an almost complete lack of spontaneity and p r o g r e s s—when traditional forms and symbols were mechanically repeated. Be that as it may, these very shortcomings, if they be shortcomings, can, and should be made use of by modern workers in stained glass. The reasons for their use are as follows:

The emphasis on line and the silhouette; the isolation of figures against the background; the stiff angular forms of drapery; the conventional, inexpressive types of faces rather than individual portraits of real people with faces defining emotion; the simple color schemes with the color disposed in flat masses and these masses broken up by ornamental detail; the absolute lack of perspective, both linear and aerial, so that all the elements of the design are in one plane,—all these mannerisms of form peculiar to Byzantine art are especially adaptable to stained glass, and when these principles are applied by a master of the craft, not mechanically but purposefully, the greatest possibilities for beauty inherent in the material are developed. For it must always be remembered that glass is a medium that is markedly limited in its range of expressive power.



Stairway Window
Office of Allen & Collens, Architects,
Boston, Mass.

Again, the idea of symbolical as opposed to pictorial representation is a most important one. For, as has been pointed out, while "pictures" in glass cannot be successful decorations, symbolical representation is the nöblest means of expressing ideas in decorative art. We are accustomed to think of symbolism as a method of expressing ideas that are decidedly antique. But as Dr. Richard C. Cabot has pointed out in a series of newspaper articles entitled, "What Men Live By," symbolism plays a very important part in our lives today. To quote him: "Most of us hear of symbols in algebra or religion, but have no idea of meeting them in play. Yet to my mind play without symbolism is like music without notes, or verse without words. A symbol is a representative, standing for something greater than itself. The golden balls stand for the pawnbroker, the striped suit for the convict, the cross for Christianity. Increasingly, civilization rests on symbolism, as commerce rests on credit. Yet to the uninformed, all symbols are meaningless. * * * The great value of symbols is that they enable us to handle or to express what would otherwise be too great for us. * * * Symbols are precious because they convey a wealth of meaning in compact form. Despite their convenience they are quite arbitrary and ridiculous to those who do not grasp them. * * * Respect for vital but intangible meaning behind a reasonable law, which baffles or defeats our will, is a training in the use of great symbols and so in the exercise of spiritual muscles. * * * Our moments of success or of defeat are not merely what they seem on the face of them. They stand as symbolic representatives of what the law and the invisible powers of the world have put up to us. They are interpreted like words or coins, by remembering what stands behind them, out of sight."

If then, symbolism is still a vital force in our lives, let us today make use of it and develop its great resources.

Decorative Possibilities of Stained and Leaded Glass

Though it is true that stained and leaded glass has always been employed to a greater or less extent as an important element of decoration in cathedrals, churches, and the various edifices associated with religious work, nevertheless the splendid possibilities for the decorative use of this material in secular buildings have only begun to be realized in this country.

It is but comparatively seldom that the craftsman in stained glass gets an opportunity to design a window for a state or city institution, such as a public library or an art museum or a capitol, and when this does happen his work is generally confined to a skylight or to small openings in a dome. And then, oftener than not, he is instructed to use only tints of white glass with perhaps a little soft green or gold. But if planned for in the beginning, what splendid jeweled effects might be attained! Geometrical ornament, for instance, can be made exceedingly beautiful and full of interest. Schemes that are appropriate for mosaics and mural decorations are, in a general way, appro-

Stairway Window
Residence at Warren, Rhode Island
Harold Buckley Willis, Architect

priate for stained glass, and they can be made, if properly handled, far more effective in color—especially if the work is to be seen at a distance.

In times past, no doubt the architect has hesitated (and perhaps with good reason) to entrust the beauty of the interior of his public buildings to the hands of the glass worker. For while it is true that stained glass may be infinitely beautiful, it may also be indescribably ugly. A piece of wrought iron work, or even a panel of mural painting may be poorly executed or bad in color, but in the very nature of things they are bound to be less conspicuous than a stained glass window illuminated by the strong clear rays of daylight. But with the revival of interest in the craft many sincere workers are proving their ability to solve successfully whatever problems are presented to them, and consequently faith in their abilities is increasing.

The hospital is one type of public and semi-public building in which stained glass has been used but rarely. And yet there are very important reasons why it should be used always. How many people have lain in bed in a hospital, unable to sleep, and have been forced to gaze hour after hour at the bare gray wall before their eyes? One such patient testified that her eyes sought for some relief from the absolute blankness of the opposite wall and persisted in tracing the outlines of the cracks in the painted plaster. Her disordered imagination, induced no doubt by fever, turned these cracks into hideous, grinning faces and unspeakably revolting things. She endured this kind of torture until a friend, realizing the situation, brought to her room a richly colored stained glass medallion and hung it in the window. The beneficial effects were immediate. The patient at once expressed her joy in seeing beautiful color, and during the remainder of her illness she never tired of gazing at it. The explanation is simple. Beautiful color, like beautiful music, has a tonic effect; it lifts one out of the physical into the spiritual world.

Many hospitals now have leaded glass set in steel casements. Surely it would not add noticeably to the cost of the building to glaze a colored medallion into the leaded glass in each of the windows in the private rooms and the public wards. And the expenditure would be well worth while.

However, examples of our craft are being used more and more frequently in railroad stations and steamship offices, in club houses, in the better class of private residences, and also in apartment houses, cottages, and even in shop fronts. There are endless possibilities for the decorative use of leaded work in the form of geometric glazing, colored medallions or cartouches—perhaps heraldic in form—and in the use of white or clear glass of contrasting textures which may be used simply to produce an interesting surface in a window that is intended to be seen through, or to secure an attractive translucence in the place of the unpleasant vista that would meet the eye if that particular window were made of clear glass.

Conclusion

Churches everywhere throughout this broad land of ours all have windows. And when the tourist, be he of the laity or of the cloth, visits the great French cathedrals and there sees for himself the glorious masterpieces of mediæval glass, he cannot help comparing them with the tawdry creations that fill many of the religious edifices at home.

Must we then, make slavish copies of mediæval windows for our churches? Assuredly no. If we make dull and lifeless imitations of a bygone day, a sudden artistic death will be our just reward. As some one has said, "The artist must go with the spirit of his own time or be strong enough to lead it." But should we quarrel with a man because we think his work too closely resembles that of the thirteenth century or the fourteenth or the fifteenth? Not necessarily. Is his work beautiful; does it charm; is it convincing; is it an honest expression of the things he cares most for in glass; does it fulfill its purpose of beautifully decorating the space for which it was designed? These are pertinent questions. Let his work be praised or condemned according to these standards. An architect is not condemned because his building resembles the Classic Greek, or the thirteenth cen-

tury Gothic, or the English Tudor. No more, then, should the craftsman in glass be condemned for gaining his inspiration or even his motif from the genius of another day.

And so, if after study and contemplation of the great achievements of the past we build our work upon the same fundamental principles and create combinations that are new, beauties that are real, we then know we have been true to ourselves and that we have done something worth while. And those of us who have seen the vision of the marvelous and infinite possibilities for beauty that lie in living, glowing color, will continue to go back to the great periods for inspiration.

True it is that we are not living in the middle ages. We are living in the twentieth century; and whether we will or no, our work is an expression of the times in which we live. We cannot be thirteenth century men if we would. Let us, therefore, express ourselves freely and honestly by doing the things that we believe in and feel most worth while, pausing to look back perhaps for inspiration, but then pressing forward toward that great ideal which beckons us ever onward.

Let us, then, all co-operate to the end that stained glass may be worthy not only of the great traditions of the past, but that by expressing the highest ideals it may again achieve its rightful place as one of the noblest of the arts.

(THE END)

House at
Hampton Lucy,
England

From the
Photograph
by Robert M. Blackall

DEPARTMENT OF SPECIFICATIONS

THE last discussion in this department completed the series on specifications for concrete. The outline given herein will be found to be more complete in some respects than has been the discussion on the text of the specifications. It is believed that merely by inserting suggestive references in the outline the reader will be able to understand the reasons for the mentioning of such items and will be able to deduce reasons for further investigation with respect to any operation or to amplify the references as his judgment dictates. It will be found that certain references in this outline are repeated from references given in the outline for foundations. This repetition will be found in succeeding outlines and is done only for the sake of making the outline as complete as possible.

The reader will undoubtedly find it convenient to expand this outline to his own peculiar needs. It is realized that it is well nigh impossible to arrange an outline to meet the universal use and at the same time be capable of governing the construction of a specification for major operations as well as minor operations.

It may be well to direct the attention of the reader once more to the discussion given some time ago respecting the compilation of a master outline and checking list. The preparation of such helps will be an illuminating procedure for many of those who have been accustomed to write specifications on the basis of old specifications with the hope—often in vain—that everything has been taken care of as it should be.

Specification Outline for Concrete Work

I. General Conditions
   a. A paragraph referring the reader to the General Conditions that will be made a part of the contract and which should be read by all bidders. This should be a standard clause.

II. Scope of Contract
   a. Extent of the work, given in brief outline, to be followed by
   b. A schedule of general items that are to be included in the work. This schedule should be roughly drafted from the general outline or master specification and should be completed only when the specifications are finished, when the paragraph or sub-division captions may be used. This schedule, in tabulated form, will improve the clarity and business-like appearance of the document.
   c. Work of a similar character that already has been done by other contractors. This to be in tabulated form.
   d. Work of a similar character that will be done by other contractors concurrently with or subsequent to this contractor's work. This to be in tabulated form.

III. Examination of Site
   a. Caution bidders of the necessity for making visual examination of physical conditions of the site and the work that already has been done by other contractors, so the expenses easily foreseen may be anticipated and included. Do not assume that work or difficulties that cannot be anticipated by the architect should be foreseen and included by the contractor.

IV. Drawings
   a. Schedule the drawings that will be made the basis of the contract, giving the number of each sheet and its title.
   b. A statement that further drawings, explanatory of those scheduled in the preceding paragraph, will be available at later dates.

   Note: It is probable that the General Conditions used will have clauses covering the drawings, but the information suggested above will prove invaluable to everyone interested in the specifications. For instance, the bidder will know whether or not he has been furnished all of the drawings he should have.

V. Quality of Materials
   a. Each material that the contractor will be required to furnish should be listed here and the standards of excellence that will determine their acceptance or rejection should be specified. This grouping is suggested here so that all readers of the specification will know where to turn to when looking for materials and their required qualities. All physical characteristics that will be considered should be mentioned, such as grade, weights, gauges, etc.
   b. Give a general clause stating the general excellence that is required, keeping in mind available local materials or those "foreign" materials that would, most likely, be used. This must be in correlation with any clause of a similar nature that is in the General Conditions. Since it is a debatable question whether or not the customary clause that "materials shall be of the best of their kind" is suitable for all occasions, the specification writer

should not be afraid to specify second grade material where its use is not of a detrimental character and is more efficient, economically, than another and better grade.

c. List all materials entering into the required work, somewhat as follows:

1. Cement
   A. S. T. M. standards
2. Sand
   Or other fine aggregate graded by sieve size
3. General
   Graded by sieve sizes
4. Crushed Stone
   Graded by sieve sizes
5. Slag
   Graded by sieve sizes
6. Other coarse aggregate
7. Water
8. Lime
   Hydrated
   Quick
9. Integral waterproofing compounds
10. Surface applied or membrane waterproofing compounds
11. Forms and centering
    Wood
    Metal
12. Reinforcing steel
    A. S. T. M. standards
13. Accessories for reinforcing steel
    Tie wires
    Chairs
    Spacers
14. Concrete inserts
15. Wrappings for fireproofing of structural steel work
    Plain wire
    Metal lath
    Patented types
16. Hanging wires
    For suspended ceilings or other hung work
17. Special bonding agent for work planes, etc.
18. Paint for structural steel
    Graphite
    Basic Chromate of Lead or Zinc
    Sublimed blue lead
    Other kinds available
19. Sidewalk vault lights
20. Other items

VI. Samples of Materials

a. If samples of any materials are to be submitted for approval before delivery, state so, in order to avoid later unpleasant experiences.

VII. Inspection of Materials

a. If certain materials are to be inspected by testing engineers, state so, laying down all conditions that the contractor will be required to meet.

b. It is suggested that testing engineers be employed and paid by the Owner direct.

c. If the specifications for concrete construction are to be based on the Joint Committee report or on the specifications of The American Specification Institute the matter of inspection of materials will, of course, be gone into more thoroughly.

VIII. Delivery and Storage of Materials

a. If materials are to be delivered over switch track close to or on site, state so. If it is believed that all materials will be delivered by truck it may not be necessary to use this paragraph unless conditions out of the ordinary are present.

IX. Contractor's Design Drawings

a. If the specifications require the furnishing of fabricated items or other work for which the contractor is to prepare design drawings for the approval of the architect or his engineer (either consulting or testing) the governing conditions should be stated.

b. Shop or fabrication drawings based on the contractor's design drawings should, of course, be submitted for approval where the controlling design drawings must meet approval.

X. Construction Plant

a. It is a debatable question whether the specifications should attempt a very great control over the construction plant although, for some operations comprising extraordinary phases, there may be occasions demanding some specification control.

b. Erection machinery should be so disposed that little interference will be given the work of contractors not concerned with the use of these particular appliances.

c. Erection machinery that is to be placed on structural concrete structures should not be located without the approval of the designer of the structural framework, else damage may be done to the structure.

XI. Hoisting of Materials

a. The matter of hoisting of materials often causes a bit of grief on the work, through loose construction of the specifications.

(Continued on page 16)

DEPARTMENT OF ARCHITECTURAL ENGINEERING

TRUE NET SECTIONS OF RIVETED TENSION MEMBERS*

BY C. R. YOUNG

Associate Professor of Structural Engineering, University of Toronto

COMPARISON of the net areas of square and zigzag sections across a riveted tension member and the selection of the least, does not form the correct basis for arriving at the capacity of the member. Nevertheless, this method is commonly followed. In a number of structural handbooks there are tables for ready use giving the stagger required to maintain net section, and the rule for their application is that if the stagger is ever so little less than this critical one, the entire area of the second hole must be deducted. Thus referring to Fig. 1 (a), if s is less than $(2gh + h^2)^{\frac{1}{2}}$, two full holes must be deducted, whereas if s is greater than $(2gh + h^2)^{\frac{1}{2}}$, only one hole is to be deducted. Similarly, for the case shown in Fig. 1 (b), three full holes are to be deducted if s is less than $(2gh + h^2)^{\frac{1}{2}}$.

Apart from the illogical procedure involved in deducting a full hole when the stagger is but slightly under the critical one for maintaining equal sections, the existence of a component of shearing stress on each diagonal section renders the familiar handbook method incorrect. This shearing stress, when combined with the normal stress on the section, produces a resultant stress greater than that on a right section of the same area.

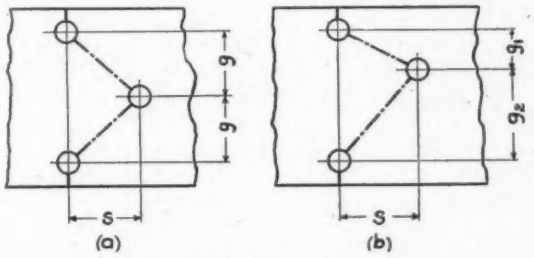


Fig. 1. Stagger ratio to maintain net section

Several writers have already pointed out the theoretically correct method of computing deductions and its agreement with actual experiment. Victor H. Cochrane, in *Engineering News* of April 23, 1908, indicated the method; T. A. Smith, in *Engineering News* of May 6, 1915, submitted a diagram based on true maximum stresses, from which the number of holes to be deducted for 7/8-in. rivets could be determined; and D. B. Steinman, in *Engineering News-Record* of June 14, 1917, proposed two alternative approximate rules for calculating the correct deduction. The formula for determining the theoretically correct deduction may be conveniently established in the following manner.

Let a flat tension member of breadth b and thickness of one unit be subjected to a tensile stress, which for a right net section AF or GK through any rivet hole (Fig. 2), has an *average* value of f lb. per sq. in. Let the gauge lines be g in. apart, the rivet stagger be s in., and the diameter of holes for deduction purposes be h (diameter of rivet plus 1/8 in.).

The apparent total stress on the strip CE is then fg, but since the resistance on the portion DE may be lowered by the proximity of rivet 2, the average intensity of stress on CE must be

$$f \times \frac{g}{g - xh}$$

where x is some fraction of one hole. For equalized strength on a right section passing through hole No. 1 and on a zigzag section such as A12K, the value of x should be such that the normal stress on CE should not be exceeded by the maximum diagonal stress on the inclined section C′H′.

The intensity of stress on C′H′ parallel to the axis of the member, must be such that this area

* *Reprint of Section, No. 5, Bulletin No. 2, 1921, School of Engineering Research, University of Toronto, Toronto, Canada.*

will resist the total stress on the strip CE, that is fg lb. It, therefore, equals

$$f' = \frac{fg}{\sqrt{g^2+s^2}-h}$$

The normal stress on C′H′ is then

$$f_n = f' \times \frac{g}{\sqrt{g^2+s^2}} = \frac{fg^2}{g^2+s^2-h\sqrt{g^2+s^2}}$$

The tangential stress on C′H′ is

$$f_t = f_n \times \frac{s}{g} = \frac{fgs}{g^2+s^2-h\sqrt{g^2+s^2}}$$

But in accordance with the well known principle of compound stress the maximum stress on the section C′H′ is

$$f_m = \frac{1}{2}(f_n + \sqrt{f_n^2+4f_t^2}) = \frac{f_n}{2}\left(1+\sqrt{1+4\frac{s^2}{g^2}}\right)$$

Introducing the value of f_n found above,

$$f_m = \frac{fg(g+\sqrt{g^2+4s^2})}{2(g^2+s^2-h\sqrt{g^2+s^2})}$$

But this maximum intensity of stress on C′H′ should, if the proper rivet hole deduction has been made, be equal to the intensity on the right section CE, that is

$$f_m = f \times \frac{g}{g-xh}$$

Solving for x, we obtain

$$x = \frac{g}{h} - \frac{2(g^2+s^2-h\sqrt{g^2+s^2})}{h(g+\sqrt{g^2+4s^2})} \quad \ldots\ldots(1)$$

If more than two gauge lines are used, the deduction for a rivet on the third gauge line would be calculated in the same manner. The total number of rivet holes to be deducted from the gross right sectional area of a tension member to give true effective section is, therefore,

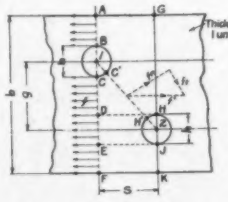


Fig. 2. Relation of Stresses on Right and Inclined Sections

$$n = 1 + x_1 + x_2 + x_3 + \quad \ldots\ldots(2)$$

The terms x_1, x_2, etc., represent the fractions of successive holes that are to be deducted in addition to the whole of the first hole on the section considered. Their values are found from Eq. (1) by the insertion of the appropriate values of g and s.

Formula (2) is to be applied to alternative sections, the successive terms representing the deductions for successive holes considered in a chain across the member. The particular group of rivets to be considered is that which will give the greatest total deduction, whether the rivets lie on adjacent gauge lines or not.

The theory considered above is fortunately well supported by experimental research. Tests made on riveted tension splices by the Deutscher Eisenbauverband, and reported in 1915, showed that the strength of net sections was in entire accord with the indications of this theory.

Approximate Rules

The labor involved in applying formula (1) to alternative sections would preclude its use in the form given on all except the most important work. Fortunately, it is possible to devise approximate rules based on the correct theory which will give results sufficiently accurate for most purposes.

Early efforts to frame specifications so as to take account of the observed tendency of joints to fail along zigzag lines unless a certain excess of material were provided along such sections resulted in rules such as the following:

"Deduct from the gross transverse section all holes either in a transverse line or in a diagonal line when the net section of the latter does not exceed the former by more than 30%." (Greiner's *General Specification for Bridges,* 1911).

"All rows of rivet holes shall be deducted unless so staggered that the net section along a zigzag line, taking all distances in a diagonal direction at only three-fourths of their value, exceeds the corresponding net section taken square across the shape or plate." (Quoted by D. B. Steinman.)

Such rules are unsatisfactory in character. In the first the percentage increase is required on all portions of the zigzag section, regardless of their inclination to the axis of the member. Obviously this procedure is 30% in error for right sections and only a little less so for those that are nearly normal to the axis. The rule, as a whole, is consequently too severe. The deduction of 25% from the diagonal distances provided in the second rule is also excessive, since application of the correct theory, now amply supported by experimental investigation, shows that for the critical diagonal section which makes an angle of 55° with a right section, the effect of shear is to increase the stress by only about 16%.

A popular form of specification recognizing, although inadequately, the weakness of diagonal sections is one such as the following:

"The greatest number of rivet holes which can be cut by a transverse plane, or come closer than 2 in. of it, are to be deducted from the gross area of the section."

Whether the exact distance specified be 2 in. or some similar dimension, the rule is dangerous in

that it takes no account of the effect of gauge, or distance between rivet lines. While it is safe and proper to neglect entirely a second ¾-in. hole staggered 2 in. with respect to a first when the gauge is 1½ in., it is not correct to neglect the second hole when the gauge is over that amount. When it is 3 in., 0.56 of the second hole should be deducted, and when it is 6 in., the portion is 0.87. If the holes be 1 in. diameter, a stagger of 2 in. with a gauge of 2 in. would require the deduction of 0.40 of the second hole, while with a gauge of 6 in. the deduction would be 0.90 hole. To give, therefore, a rule which is independent of gauge is to lead to serious error, particularly where the gauges are large.

Graphical Comparison of Rules

In order to establish a rational basis for an approximate rule for net sections there have been plotted in Fig. 3 curves giving the correct deductions required in certain critical and in certain typical cases. The most serious spacing of rivets, so far as deductions are concerned, is that pitch which will cause the rivets to be the minimum allowable distance apart, say 3 diameters, center to center. Accordingly, there have been plotted in Fig. 3 curves giving the correct deductions for ⅞-in. and ¾-in. rivets for minimum diagonal pitches giving stagger ratios varying from 0 to 1.60 and from 0 to 1.57 respectively. The gauges vary from 1.88 in. to 1.0 in. and from 2.63 in. to 1.4 in. respectively. The curves thus represent the correct deductions for the full range of applicable stagger ratios with the diagonal spacing always at the permissible minimum. Curves have also been plotted, giving the correct deductions for ⅞-in. rivets for the appropriate range of stagger ratios with gauges of 3 and 6 in. Corresponding curves for ¾-in. rivets with gauges of 3 and 6 in. are also shown.

From an examination of these curves it is evident that

(1) For a given stagger ratio and a given gauge the fraction of a hole to be deducted is greater for large than for small rivets.

(2) For a given size of rivets and stagger ratio, the fractional deduction is greater for small gauges than for large ones.

With Fig. 3 as a basis it will be useful to examine some of the approximate deduction rules that have been proposed in order to ascertain whether they are sufficiently accurate to be satisfactory.

Some recognition of the influence of the stagger ratio on net area is contained in the deduction rule adopted in the 1920 specification of the American

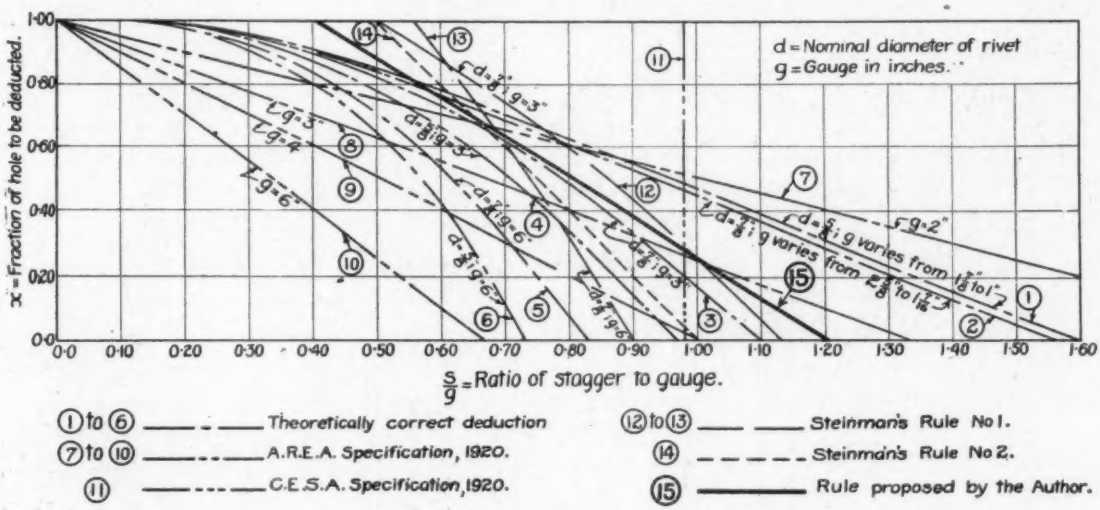


Fig. 3. Comparison of Approximate Deduction Rules

Railway Engineering Association. This rule is as follows:

"The net section of riveted members shall be the least area which can be obtained by deducting from the gross sectional area the areas of holes cut by any perpendicular to the axis of the member and parts of the areas of other holes on one side of the plane within a distance of 4 inches, which are on gauge lines one inch or more from those of the holes cut by the plane, the parts being determined by the formula:

$$A = (1 - \frac{p}{4})$$

where A = area of one hole,

p = distance in inches of the center of the hole from the plane."

In Fig. 3 there have been plotted for various

stagger ratios the deductions required under this rule for gauges of 2, 3, 4, and 6 in. Comparing the lines so drawn with the curves for correct deductions it is seen that for all gauges with moderate stagger ratios the deductions are too small. For the smaller gauges and larger stagger ratios the deductions may be too large. It should be noted that the number of holes to be deducted is independent of the size of the rivet.

An approximate rule established in the specifications for steel railway bridges of the Canadian Engineering Standards Association is as follows:

"There shall be deducted from each member as many rivet holes as there are gauge lines, unless the distance center to center of rivets measured in the diagonal direction is at least 40% greater than the distance between the gauge lines."

except where 85% of the distance is less than the square projection, in which case the latter shall be used instead."

This rule, which will be referred to as Steinman's rule No. 1, may be plotted with respect to various stagger ratios so as to give necessary deductions from the right section. Such has been done for $\frac{7}{8}$-in. rivets and gauges of 3 and 6 in. in Fig. 3. It is thus seen that the rule gives a close approximation to the deductions where the gauge is small, but deductions that are too wide of the mark for the larger gauges. It is rather more difficult to apply than rules which depend wholly on the relation of stagger to gauge, by reason of the necessity for calculating the net section along diagonal lines.

Dr. Steinman proposed a second, and more readily applied, although a more approximate, rule

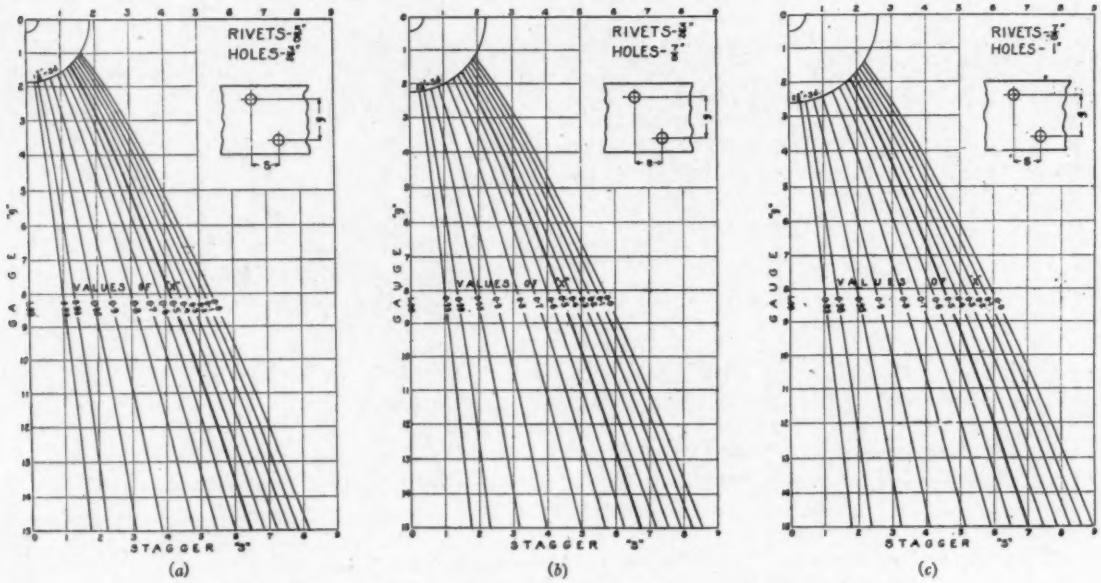


Fig. 4. Theoretically Correct Deductions of rivet holes for various Gauges and Staggers

This rule, which requires the deduction of a full rivet hole in every case, where the stagger with respect to the last rivet would give a diagonal distance less than 140% of the gauge, is needlessly severe. It means, as will be seen from Fig. 3, that whenever the ratio of stagger to gauge is less than 0.98 a full second hole must be deducted, and when this ratio is greater than 0.98 no part of a second hold need be taken away.

A rule proposed by D. B. Steinman in *Engineering News-Record* for June 14,1917, also based on calculating the section along diagonal lines is as follows:

"The net section of a plate or shape shall be defined as the least section obtainable across the rivet holes, square or zigzag, taking every net distance in a diagonal direction at 85% of its value, which was stated as follows:

"After deducting the first hole, each successive hole is to be deducted if its stagger s, with respect to the proceeding hole, does not exceed one-half the gauge g, and no deduction is to be made if the stagger equals or exceeds the gauge. For intermediate values of the stagger ratio, a fraction of the hole is to be deducted as may be obtained by interpolation, that is, deduct $2(g - s)/g$."

Comparing the graph of this rule, Fig. 3, with the curves giving theoretically correct deductions, it is seen that for close spacing of rivets it gives deductions that are too great for the smaller values of the stagger ratio and deductions that are too small for large values of this ratio. It gives deductions that are too great for the larger gauges with all applicable values of the stagger ratio. The re-

sults given by it, however, represent a fair average between those obtained for the usual range of gauges by rule No. 1. For a simple, easily applied working rule, to be applied in cases where great accuracy is not required, Steinman's rule No. 2 is very satisfactory. It is, for such cases, much better than any of the others mentioned.

Since any single deduction rule intended for general use with various sizes of rivets and gauges should be based rather more on the worst conditions than on the average ones, it is believed that such a rule should conform more closely to the conditions existing with large rivets and small gauges than does Steinman's rule No. 2. With this in view the writer would propose the following rule:

"The fraction of the area of a rivet hole that must be deducted for the second of any two longitudinal rivet lines shall be calculated by the formula:

$$x = 1.50 - 1.25\,\frac{s}{g}$$

where x = fraction of the rivet hole in question to be deducted,
s = stagger of rivet with respect to rivet on last gauge line,
g = distance between gauge lines.
The deduction for any one rivet is in no case to exceed unity."

This formula, when plotted in Fig. 3, shows close conformity to the conditions likely to obtain in riveted work with close spacings. The curve lies reasonably near those for small gauges for the higher stagger ratios and approaches them for the lower stagger ratios more closely than the curves for the other approximate rules.

Deductions by Diagram

To obviate the large amount of work required in solving formula (1), the diagrams of Fig. 4 have been prepared. These give the theoretically correct deductions for any usual ratio of stagger to gauge. The curves have been drawn for $\frac{5}{8}$, $\frac{3}{4}$ and $\frac{7}{8}$-in. rivets, for staggers up to 9 in. and for gauges up to 15 in.

The use of the diagrams is simple. Thus, suppose it is desired to find the required deduction for a $\frac{3}{4}$-in. rivet on a second gauge line 9 in. from the first gauge line and having a stagger of 5 in. with respect to the preceding rivet. From Fig. 4(b) it is seen that the deduction for the second rivet should be 0.4 hole. Adding this to the first hole the total deduction would be 1.40 holes.

The saving in time effected through the use of diagrams for true effective section will be evident from a study of Fig. 5. The weakest section in this case can be precisely determined only by comparing the deductions on sections A B C D, A B F C D, A B F C I J, A B F G, A B F I J, E F C D, E F G and E F I J. Of course it is usually possible to eliminate some of the zigzag sections by inspection. In the present case, for example, it is evident that the deduction along sections A B F G, E F G and E F I J are less than along A B C D. These sections, therefore, need not be considered in making the comparison.

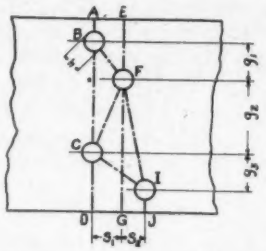


Fig. 5. Comparison of Alternative Sections

To take a numerical case assume the following values for the indicated dimensions of Fig. 5:

$g_1 = 2\frac{1}{2}$ in. $\quad s_1 = 2$ in.
$g_2 = 5$ in. $\quad s_2 = 1\frac{1}{2}$ in.
$g_3 = 2\frac{1}{2}$ in. $\quad h = 1(\frac{7}{8} + \frac{1}{4})$ in.

By making use of Fig. 4(c) the deductions that apply to such sections as cannot be eliminated by inspection can readily be set down. It is found that the total deductions in the various cases are then as follows:

A B C D = 1 + 1 =	2.00	holes
A B F C D = 1 + 0.55 + 0.85 =	2.40	"
A B F C I J = 1 + 0.55 + 0.85 + 0 =	2.40	"
A B F I J = 1 + 0.55 + 0.96 =	2.51	"
E F C D = 1 + 0.85 =	1.85	"
E F I J = 1 + 0.96 =	1.96	"

Thus the most dangerous section is found to be A B F I J, for which 2.51 holes should be deducted.

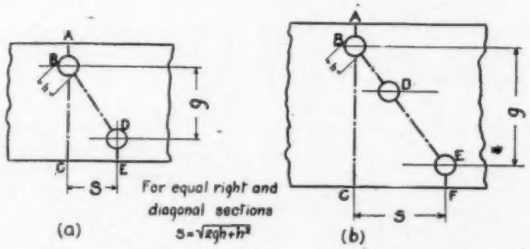


Fig. 6. Stagger to give Total Deduction of Two Holes

It is to be remembered that the formula on which these diagrams is based is so fashioned that the deduction is to be made from the gross right section of the member. If an 8 by $\frac{1}{2}$-in. plate contained two 1-in. holes on a 5-in. gauge and 2-in. stagger the net effective area to be considered in design would be $(8 \times \frac{1}{2}) - (1.85 \times 0.5) = 3.08$ sq. in.

In design it is often desirable to determine the necessary stagger in order that the true deduction may be exactly one hole, or two holes. Thus, for

the case shown in the upper right hand corner of Fig. 4(b), assuming ¾-in. rivets, the stagger required to make n, the number of holes to be deducted, $= 1$ is found by noting on Fig. 4(b) the horizontal scale reading of the point where the proper gauge line intersects the curve $x = 0$. For the case shown in Fig. 6(a) the value of s required to make $n = 2$ is found, if the rivet be ¾-in., as before, by reading from Fig. 4(b) the stagger corresponding to the point where the gauge line intersects the curve $x = 0.5$. Where the situation is as illustrated in Fig. 6(b) the stagger necessary to make the total deduction equal to exactly two holes, is found by noting on the horizontal scale the reading for the point where a vertical intercept between the gauge lines representing g_1 and g_2 is bisected by the curve $x = 0.50$.

In order to apply the methods described, to the calculation of net sections in angles or channels, it is only necessary to consider the angle or channel developed. If, for example, there is one line of rivets in each leg, of an angle, both the gauges are g_1 and the thickness of the angles is t, then the angle would be equivalent to the plate shown in the upper right hand corner of Fig. 4 (a), g being equal to $2g_1 - t$.

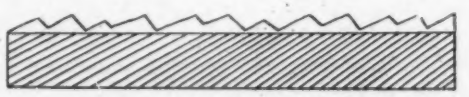
BUILDING A PAINT FILM

Some suggestions on the preparation of factory made paints and the application of paint to surfaces

THE average paint film is less than 1/300 of an inch thick, and of necessity it must be of such character as to withstand the action of the elements, varying from the hottest summer sun to below-zero weather. Ample allowance must be made for contraction and expansion of both surface and film, and the paint must retain its fresh appearance as long as possible. Likewise it must be so made that it will wear down evenly over a period of years, in order that the surface may be in proper condition for repainting.

From close inspection and comparative tests of two characters of paint films, one made with a properly treated linseed oil and the other with an untreated oil, it is found that the place where the film breaks first is in the tiny crevices left by the brush bristles. As a chain is no stronger than its weakest link so the weakest point in a paint film is in the hollows left by brush marks, as shown on right.

The film at (b) Fig. 1, will not retain as much dirt and dust as the film at (a), and will therefore keep its fresh appearance longer. It affords better protection to wood and metal surfaces, for moisture cannot easily penetrate it. It also has much more gloss, which it retains well during its whole life.



(a). Cross-section of wood covered with an untreated linseed oil paint film

(b). Cross-section of a properly built paint film

Fig. 1. Comparison of paint films

The vehicle content of a properly built paint is pure linseed oil, with just enough high grade drier properly to dry the paint. As raw linseed oil dries very slowly a drier is necessary in the paint, or it may be used as "boiled oil" which dries more rapidly. Boiled oil is no longer boiled for the process is costly and darkens the oil greatly. So-called "boiled oil" is made today by heating a small quantity of oil with lead and manganese oxides to form a drier which is subsequently added to the raw oil.

A paint manufacturer says the pigment content should contain 90% lead and zinc and 10% inert material. Of the 90% lead and zinc, 55 parts are lead and 35 parts zinc, which as a whole is in the proportion of approximately 60 lead to 40 zinc. This is much the best proportion from the standpoint of hiding properties and service, as distinguished from mere covering.

The lead content is a mixture of pure Carbonate and pure Sublimed or Sulphate of Lead, both of which have intense hiding qualities, and produce a film far superior to that obtained through the use of but one lead content, no matter which it may be.

Of the 10% inert material used, one-half is Asbestine or Magnesium Silicate. This serves to keep the paint in suspension, for although it is very finely ground, under the microscope it has an elongated appearance, and like hair in plaster, it knits the pigments together. One-fourth consists of Calcium Carbonate, used primarily to offset any acidity in the linseed oil, and to keep the paint in proper condition in the package. One-fourth is pure water-floated Silex which lends "tooth" to the paint, helping the first coat to adhere to the surface, and the succeeding coats to each other. Silex also helps the spreading or surface covering qualities in the paint. While very finely ground, each particle of Silex is like a needle point and per-

forms a definite function. These small quantities of varied inert material help paint as tungsten or vanadium helps steel.

Mr. G. B. Heckle mentioned several of the largest properties in the world which have adopted and adhere strictly to the use of paint made with more than one pigment for the protection of their property. For example, the New York Central, the Pennsylvania and the New York, New Haven and Hartford railroads are said to have long ago selected paint prepared with a combination of pigments as being superior to the single pigment variety.

Dr. C. B. Dudley, late Chemist of the Pennsylvania Railroad, stated his belief regarding lead and zinc as follows: "The value of either is enhanced by the addition of the other . . . and if to this combination is added a proportion of inert pigment . . . the paint will be not only further improved but will be more economical in its consumption of solid color to produce a given tint."

Mr. G. B. Heckle is further quoted as follows: "Paint manufacturers hold that the addition of zinc reduces the tendency of the lead to chalk, while the addition of lead to zinc prevents excessive hardening." Dr. Dudley amplified this when he stated that he had no reason to question this conclusion, but that in practice he and his associates always added a rather high percentage of inert pigment. He also stated that "where lead or zinc alone is used a percentage of inert pigment should also be ground with them."

A properly made paint film may be quite correctly likened to concrete—the different parts, properly compounded, make a perfect whole, and while the film is extremely thin, it may be truly said that it is scientifically "built."

Distinguishing Characteristics of Mahogany

ONLY true mahogany from tropical America, "African mahogany," and "Philippine mahogany" are commonly sold as mahogany in this country, but at various times over 60 different species of timber have been sold under that name. Although all of these species resemble each other in varying degrees, tropical American mahogany and "African mahogany" possess one important characteristic in common. This is the occurrence of dark amber-colored gum in many of the pores. The gum does not fill the pores but is recognized as dark specks or streaks in the pores as seen on end or side grain. This gum is barely visible to the naked eye, but is easily seen through a hand lens with a magnification of 10-15 diameters. In preparing the end grain of the wood for examination, a very sharp knife should be used to make a smooth cut.

Some other woods have similar dark masses of gum in the pores, but none of these are commonly substituted for mahogany. Among them are crabwood and sapeli, species imported from South America in small quantities only, and the Cedrelas (Spanish cedar, etc.), which are rarely sold as mahoganies, and are easily recognized by their odor.

True mahogany has fine, continuous, concentric lines on the cross section usually from ⅛ to ½ inch apart, which distinguish it from "African mahogany" in which these lines never occur.

"Philippine mahogany," although not marked by the black masses of gum, is distinguished from true mahogany and other so-called mahoganies by the presence of fine, white, tangential lines ⅛ inch to several inches apart, readily visible to the naked eye, and showing under a lens as rows of small openings filled with a white substance.

A more complete key and description of mahogany and so-called mahogany, which describes common species in detail, may be obtained from the Forest Products Laboratory.

Insulation Problems

A CAREFUL study of Heat Transmission, Corkboard and Air Spaces by Arthur J. Wood and E. F. Grundhofer is the subject of Bulletin No. 10, The Engineering Experiment Station, State College, Penn. In the case of a good insulation, as used for a cold storage room, internal conduction is the essential factor, while in the case of a poor insulator, as used in a boiler tube, good conduction is necessary and the surface transmission becomes all important. Between these extreme conditions, the relative importance of conduction and surface transmission varies with each case considered. The Bulletin gives in detail a number of tests and is a valuable contribution to the literature on the subject. It also contains a bibliography of 268 references to, and short abstracts of, articles on heat transmission.

Safety Code for Conveyors and Conveying Machinery

THE introduction of mechanical conveyors in many industries has eliminated a large proportion of the accidents resulting from the manual handling of materials, but it has at the same time introduced new hazards. An important step toward the solution of these new accident problems has just been accomplished through the decision of the American Engineering Standards Committee that the development of a Safety Code for Conveyors and Conveying Machinery be undertaken.

All interested national organizations will be asked to co-operate in the formulation of the code, which will be intended as a guide for the safe operation and maintenance of conveyors and conveying machinery coming under the following main divisions: gravity, belt, chain, flight bucket,

apron, screw and jigging conveyors, car hauls, aerial cableways, overhead trolley, and pneumatic tubes.

All shafting, pulleys, belts, link belts, chains, gears, sprockets, couplings, clutches, etc., used on and in connection with conveyors and conveying machinery will be covered in the Mechanical Power Transmission Code now in preparation.

The Yellow Stain on Hardwood

A TROUBLESOME defect often found in hardwood lumber is that recognized as yellow stain. It is usually distinguished by a pale yellow color, occurs generally in streaks, and is detected most easily when the wood is surfaced, although at times it is present without any discoloration of the wood. Its first symptom may be a moldy appearance of the wood. Yellow stain has been observed by the Forest Products Laboratory, says *Technical Notes*, in hickory and maple tool handles, in birch veneer, and in oak airplane propellers and wheel spokes. It is classified in the *Pencillium divaricatum* group of fungi, and resembles one of the fungi which damage wood pulp.

The only damage that yellow stain is positively known to do is to mar the appearance of the finished product, since it usually penetrates the wood so deeply that it cannot be surfaced off. It is probable, however, that the fungus actually weakens the wood, and the use of yellow-stained lumber for airplane construction or similar purposes where strength is important is to be discouraged until more is known about the action of the fungus on wood structure.

Lumber can be protected from attack of the yellow-stain fungus by seasoning the stock without delay after it is cut, storing it in a dry place, or treating it with preservatives.

The Ignition Temperature of Coal

IN connection with the storing of coal in piles the ignition temperature takes on a real significance. Coal is actually burning at all times and even at low temperatures. If the heat thus produced is sufficiently confined and air is supplied to the coal at the proper rate the temperature of the interior of the mass will rise. Bulletin No. 128 of the Engineering Experiment Station of the University of Illinois, "The Ignition Temperature of Coal" by R. W. Arms makes a study of this problem with the object of determining the influence of the temperature of ignition of the various coals upon the liability to fire while in storage.

Chilled Car Wheels

OWING to the desirability of obtaining definite information concerning the magnitude and distribution of stresses in chilled car wheels and of determining the limits of these wheels as used today, and with a further view of improving the chilled iron wheel in order to meet future requirements, a co-operative investigation was entered into by the Association of Manufacturers of Chilled Car Wheels and the University of Illinois. Bulletin 129 of the Engineering Experiment Station of the University of Illinois presents the results of the first part of this investigation.

The Architect and the Heating Problem

AT the June convention of the American Society of Heating and Ventilating Engineers, Mr. E. P. Bradley of St. Louis, Mo., in an interesting and informative address on "Mutual Responsibility of the Heating Engineer and the Architect," ended with the following criticism of past practice and recommendations for co-operation in the future.

Many of the buildings of today require the co-operation and co-ordination of the work of the heating and ventilating engineer with the architect. Many times little consideration is given to this feature of the building, and frequently too late. Boiler rooms are located in corners that cannot be used for any other purpose; if ventilation is a requirement, fan rooms are located in out-of-the-way nooks with no way to get fresh air to them or to conceal the duct system without ruining the basement; insufficient space is allowed for stacks, pipe shafts, and risers; radiators are located improperly resulting in inefficient service; fresh air inlets and vents to rooms are improperly located, resulting in drafts or poor circulation and ventilation, notwithstanding the fact that more than sufficient air may be removed to produce good results; little consideration or allowance is made for pumps, heaters and other accessories that enter into the heating and mechanical plant and they are usually remotely located from the section or apparatus with which they function.

Somehow it all works out and the plant operates, but the real problem only develops from that point on. The plant is inconvenient to operate, the cost being excessive, maintenance high, and performance disappointing. The net result is a handsome building, elegantly furnished and appointed, well thought out in plan and detail, conveniently arranged, but lacking in essential comfort.

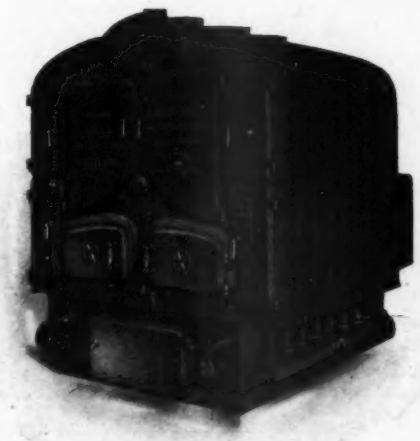
Co-operation with and deference to the experience and training of the heating engineer would assure comfort with easy and economical operation; obtain for the architect and his client the best design, and the most economical use of the materials available, would insure the selection of material and equipment best adapted to the situation, and above all secure for the architect an efficient and sufficient system at an agreeable cost, and an installation worked out in harmony with the building design and detail.

The Chevy Chase Club,

in Chevy Chase, Maryland

J. H. DeSibour, Architect Hess & Rogers, Heating Engineers

The CHEVY CHASE CLUB is heated by two 44 MILLS STEAM BOILERS. Only on rare occasions is it necessary to operate both boilers.



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The purpose, simply stated, is to afford an organization which, it is believed, will become a most important element in architectural practice and building operations, a medium through which it may, without expense to itself, reach a class of readers that are most intimately identified with the field of the activities of The American Specification Institute.

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SPECIFICATIONS for building construction work have been in the main the product of individual effort and as such have varied in many features that may be given a common denominator through the unified efforts of those who are intimately acquainted with the needs for improvement in the writing of specifications.

This does not mean necessarily that specifications should be standardized to such an extent that one would be exactly like all others. Such an attempt would, of course, be quite absurd and of practically no value through its stultifications of the individuality that is so necessary to a successful accomplishment of the desired results.

It is believed by the Board of Governors of The American Specification Institute that if the efforts of individual specification writers can be directed along lines that will lead to a more easy and more happy accomplishment of their work through the mutual study of specifications under the direction of the Specification Institute and the co-operation of all its members a very great deal of good will come from such efforts especially when participated in by all those eligible to membership.

Owing to a present lack of means for collecting and distributing information concerning specifications and the writing thereof, there is a needless duplication of study, research and labor on the part of specification writers. Since the organization of the Specification Institute a year ago last March it has been the continual endeavor of those in responsible charge to provide means for the assembling and distribution of information so that immediate results in the improvement of specification documents may be had.

Those specification writers who have had sufficient vision to analyze the problems they must meet and who have attempted to organize their work in some more or less methodical fashion have been gratified to find the time so spent has been well spent as it has come near to lifting their routine duties out of the slough of an arduous task.

Practically all other professions are so organized that the interchange of knowledge peculiar to their own work such as the deliberations of committees which formulate proposed standards for basic operations and place in publication the results of researches undertaken by scientific laboratories is effected in such a way as to result in the improvement of the quality of specifications produced and consequently in the professional and business standing of their office.

The American Specification Institute has been organized to improve all those conditions surrounding the writing of specifications and to bring to specification writers the benefits that are to be obtained from the organized efforts of men accustomed to write these essential documents. The scope of the Specification Institute has assumed a national and an even international character and

the co-operation and membership of all those specification writers who prepare specifications for building construction and equipment are cordially invited.

The kinds of specifications that are to be studied and for the preparation of which informative data is being compiled and distributed to members, include those for buildings, engineering structures, and all works whatsoever in which materials of construction and labor are used; those for the installation and use of mechanical and electrical apparatus and equipment; those for sanitary apparatus and equipment; those for the fabrication and installation of all furnishings and furniture; those for all exterior and interior ornaments and ornamentation; those for road paving, planting, embellishing, and improvement of estates and waterways, and all those miscellaneous matters and things that are produced and offered for sale under specifications written by the architect or engineer.

The plans and scope of The American Specification Institute are based somewhat on the following analysis of the problems that enter into the preparation of specifications:

1. Definition of a Specification
   - a. Qualitative—not quantitative

2. Elements of a Specification
   - a. Economic values
   - b. Limitation of alternatives
   - c. Presentation of standards
   - d. Description of materials, methods and their use
   - e. Instructions to all concerned
   - f. General conditions of contract
   - g. Instructions to bidders

3. Classes of Specifications
   For
   - a. Materials
   - b. Methods
   - c. Construction
   - d. Equipment

4. Specifications Are Necessary to
   - a. Architects
   - b. Engineers
   - c. Contractors
   - d. Manufacturers
   - e. Vendors
   - f. Labor
   - g. Owners
   - h. Buyers
   - i. Operators

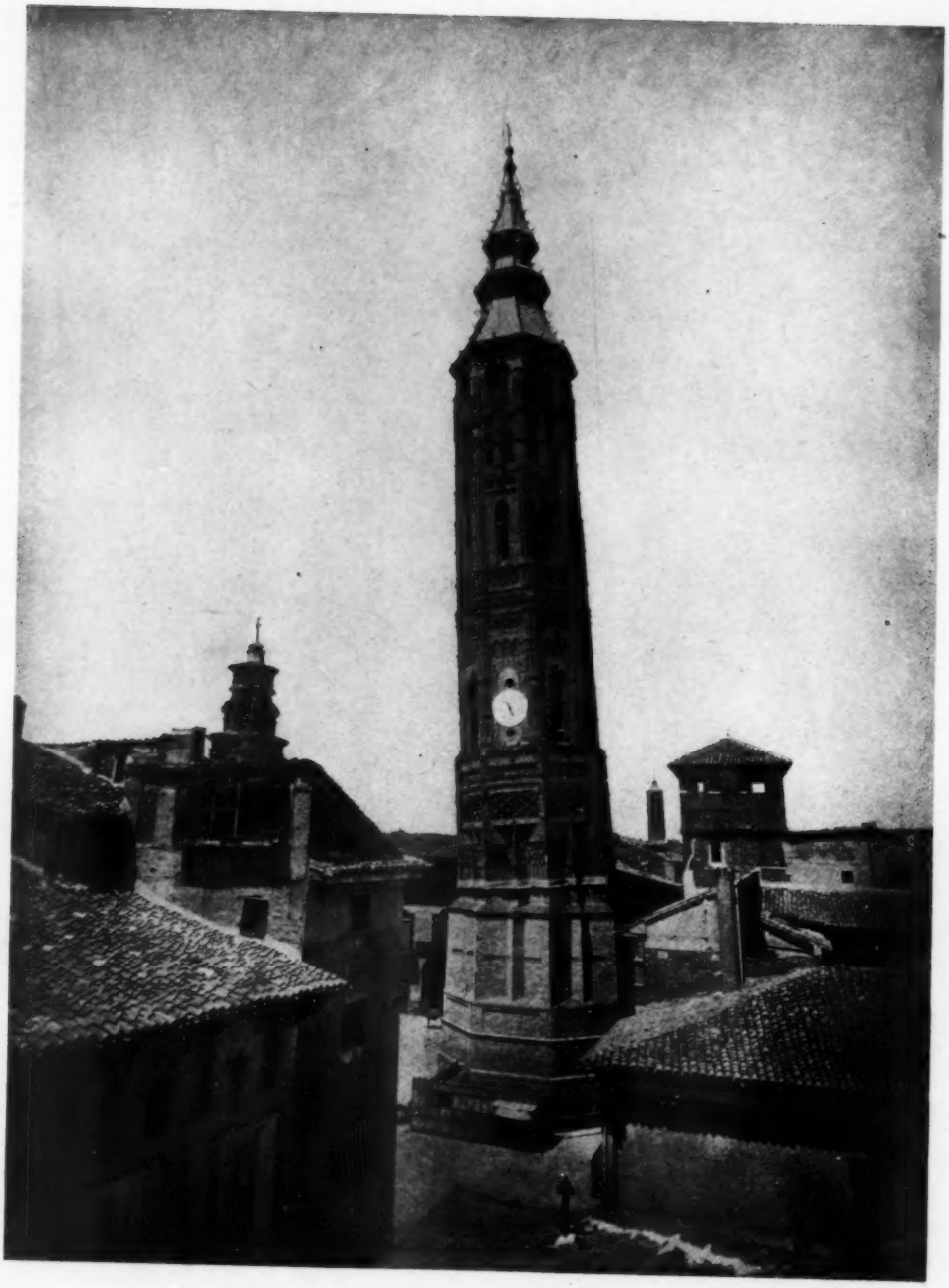
5. Reason and Purpose of American Specification Institute
   - a. To collect and distribute specification data
   - b. To increase knowledge concerning specification data
   - c. Field of specifications
   - d. Co-operation with other organizations

6. Benefits to be Obtained
   - a. The development of specification writers
   - b. The development of specifications that will eliminate cause for argument and guesswork and lower the cost of building construction by eliminating waste of labor and materials.
   - c. Professional recognition of specification writers

7. Membership
   - a. Active Members
     1. Persons who devote their entire time or a part thereof to the writing of specifications
   - b. Associate Members
     1. Testing and laboratory engineers
     2. Instructors in specification writing in architectural and engineering schools
   - c. Honorary Members
     1. Persons who have rendered distinguished service to the art or science of specification writing
   - d. Patrons
     1. Persons who contribute to the financial support of the Institute

8. Activities of Institute
   - a. Study of Materials
     1. The production and physical properties of raw materials
     2. Methods of manufacturing, fabrication and finishing
     3. Relative value based on appearance, initial cost and maintenance, effect of combinations with other materials and proper materials for various types of buildings of varying grades.
   - b. Methods of writing specifications
     1. The means of accomplishing complete co-operation between the drawings and specifications and determining

     What methods of construction and installation should be used;
     What the drawings should show or indicate;
     What should be omitted for inclusion in the specifications;
     2. The development of an outline or checking list
     3. The general contract conditions
     4. Specific requirements governed by local conditions



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