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Mathematics as a Source of Decorative Design

By CLAUDE BRAGDON

THE author of this essay once wrote a book, "Projective Ornament," all about what seemed to him a great discovery; the discovery, namely, of fresh motifs for ornament in the plane projections of the regular hyper-solids of four-dimensional geometry. Then he awaited the echoes and reverberations from a startled world, only to discover the truth of the adage that a dress suit is of no use in the desert of Sahara.

Few people read the book; still fewer bought it. Most readers confessed to a failure to understand it, and those who professed to understand, understood wrong. One authority assured the author that his patterns were all very well but if he imagined that they had anything to do with the fourth dimension he was grandly mistaken. Another declared the ornament to be interesting and highly personal (?), but the logic pretty thin. In short, the big shells failed to explode and the author was left with ammunition on his hands.

In this predicament, he must needs abandon his campaign—a thing unthinkable—or rectify his strategy; that is, try for a clearer and simpler exposition of his ideas and a more detailed demonstration of his methods.

The architectural periodical press offered an opportunity for this. Therefore in *The Architectural Review*, in *The Architectural Forum** and now here in THE AMERICAN ARCHITECT he seeks to repair his original blunder, which appears to have consisted mainly in the too frequent use of the term "the fourth dimension of space."

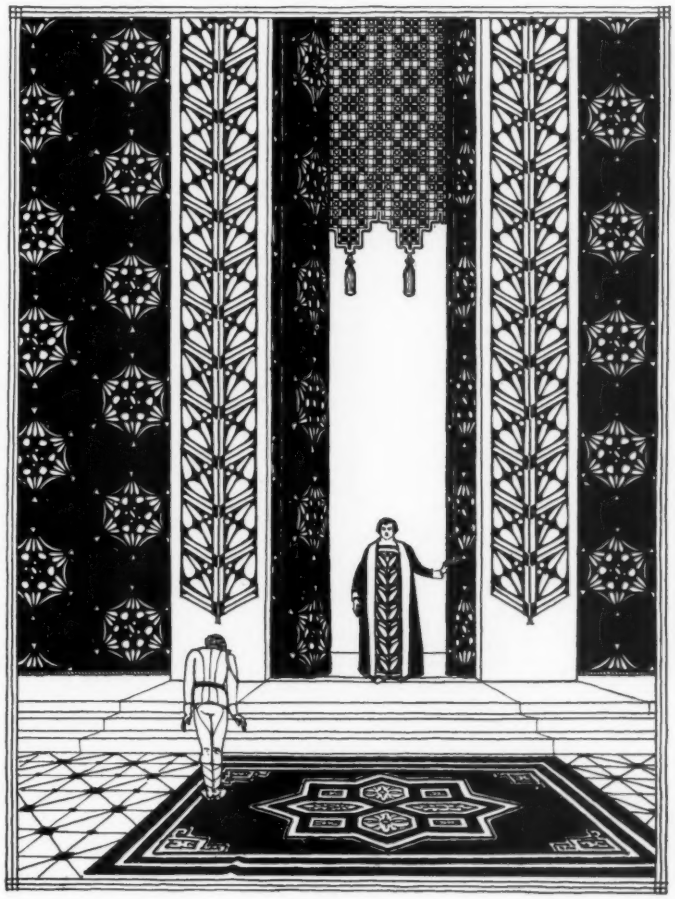

FIGURE 1

There is something about this form of words which seems to produce a sort of "mentalphobia" in some minds, rendering them incapable of perception or reason. Such people, because they cannot stick their cane into the fourth dimension, contend that it has no mathematical or philosophical validity; whereas in truth a four-dimensional space is as reasonable, and for the matter of that as "real,"

*"Art and Geometry," *Architectural Review*, March and April, 1916. "Pattern from Magic Squares," *Architectural Forum*, March, 1917.

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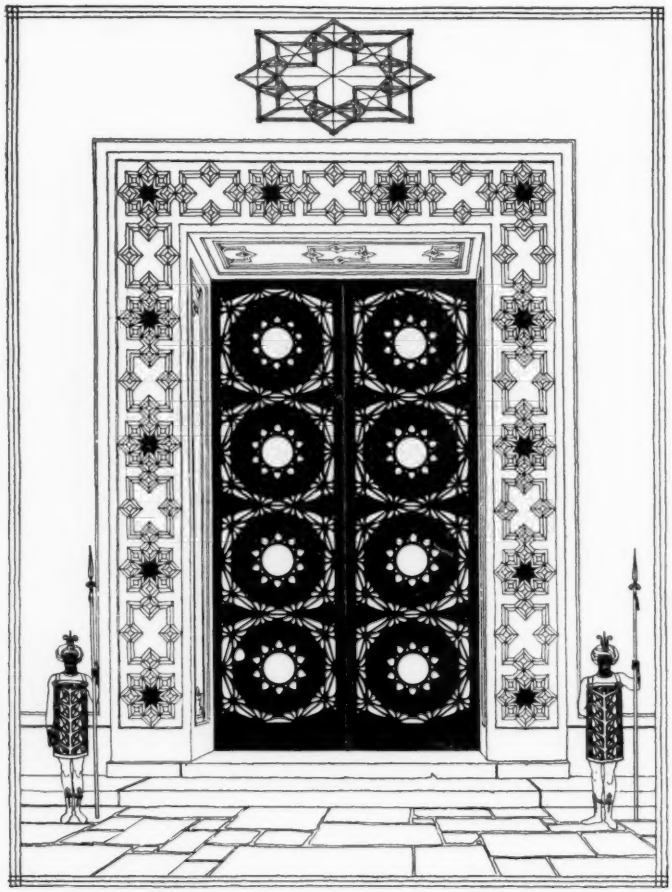


FIGURE 2

as any other. Prof. James Byrnie Shaw, in an article in *The Scientific Monthly,* is more emphatic in this affirmation than any poor artist pushed to the wall. He says:

> Up to the period of the Reformation algebraic equations of more than the third degree were frowned upon as having no real meaning, since there was no fourth power or dimension. But about one hundred years ago this chimera became an actual existence, and to-day it is furnishing a new world to physics, in which mechanics may become geometry, time be co-ordinated with space, and every geometric theorem in the world is a physical theorem in the experimental world in study in the laboratory. Startling indeed it is to the scientist to be told that an artificial dream-world of the mathematician is more real than that he sees with his galvanometers, ultra-microscopes and spectroscopes. It matters little that he replies, "Your four-dimensional world is only an analytic explanation of my phenomena," for the fact remains a fact, that in the mathematician's four-dimensional space there is a space not derived in any sense of the term as a residue of experience, however powerful a distillation of sensations or perceptions be resorted to, for it is not contained at all in the fluid that experience furnishes. It is a product of the creative power of the mathematical mind, and its objects are real in exactly the same way as the cube, the square, the circle, the sphere or the straight line. We are enabled to see with the penetrating vision of the mathematical insight that no less real and no more real are these fantastic forms of the world of relativity than those supposed to be uncreatable or indestructible in the play of the forces of nature.

Now because without its four-dimensional aspect "Projective Ornament" loses its unique originality—the thing which distinguishes it from any other kind of geometrical pattern-making—this aspect is particularly valued by its author. It is indeed the *raison d'etre* of the whole, without which the book could never have been written. Nevertheless, because this four-dimensional extension of his idea appears to confuse and alienate the otherwise sympathetic reader, the author is prepared to modify his terminology to some extent, and not too frequently and insistently remind the reader that the patterns before his eyes have relations to figures which no eye has ever seen. For the matter of that, a great deal of "Projective Ornament" has no relation to the fourth dimension, and makes no pretense of having any. For example, the patterns, almost infinite in number, which may be derived from magic squares.

Fig. 1 presents a variety of different patterns, drawn from different sources. At the top of Fig. 3 these sources are made apparent, the geometrical "web" is shown, together with the derived ornament. The pattern on the front of the robe of the central figure is seen to be based upon a succession of linked tetrahedrons in plane projection. The pattern which adorns the shaft at right and left is based on the tetrahedron, too, but differently projected, the apex falling, in this case, outside the base. The ornament on the curtains is more complicated, for it is derived from the 16-hedroid, a four-dimensional figure. This figure is made up of sixteen tetrahedrons symmetrically disposed, and with patience and intelligence they will be found to be all "there." But the finding of them is not essential to the construction of the figure. What is essential, however, for anything but a parrot-like reproduction of this one pattern is an understanding of the relation of its plane projection to the 16-hedroid itself.

Let us therefore devote our attention to this figure, undeterred by the fact that it has four mutu-

ally perpendicular axes, instead of three.

To actually construct a hyper-solid in a space of three dimensions is, of course, impossible, just as it is impossible to actually construct a solid in a plane. A solid can be *represented,* however, in plane projection, so also can the hyper-solid with which we have to deal. It is with such representations that we are alone concerned, since it is from them that our ornament is derived.

If we draw these lines intersecting at a point subtending equal angles of 60 deg. each, it is not difficult to conceive of the lines as being at right angles with one another in three-dimensional space, for the three diagonals of a cube are thus mutually at right angles, yet projected on a plane they appear arranged in the manner described. Having established in this manner three of our four mutually perpendicular axes, the fourth we will assume to pass vertically through the point of intersection so that we see it only in cross section—that is, as a point. It is important to remember that all of the angles made by the four axes at their point of intersection are hypothetically right angles, a thing possible only in four-dimensional space. Because the 16-hedroid is a symmetrical hyper-solid of four-dimensional space, all its apexes will be equidistant from the center of a hypersphere and intersect its surface at symmetrically disposed points. These apexes are established in plane projection by describing a circle (representing the hypersphere) about the point of intersection of the axial lines. Where each of these meets the circle an apex of the 16-hedroid will be established. From each apex it is now necessary to draw straight lines to every other, each line representing one edge of the sixteen tetrahedral cells. But because all of these lines fail to appear in the diagram, by reason of the fact that the two ends of the fourth axis are directly opposite one another (the point of intersection), it will be necessary to *tilt* the figure a trifle, bringing into view the fourth axis and the lines connecting these two apexes with the others. The result is that projection of the 16-hedroid shown at the left of Fig. 4.* Here is not a fortuitous arrangement of lines, but the "shadow" cast by an archetypal form upon the plane of our materiality. It is a wonder and a mystery, staggering the imagination, contradictory to experience.

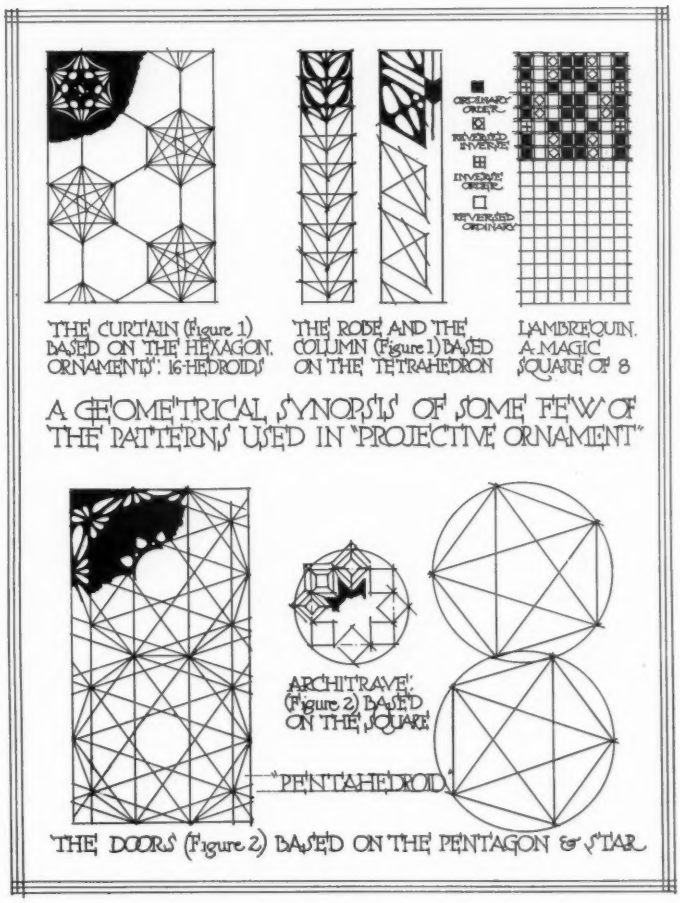


FIGURE 3

The pattern of the lambrequin (Fig. 1) is utterly different in character from the rest of the ornament, being derived from a different source. This source is not geometry, but arithmetic. The harmony inherent in a numerical acrostic (magic square) is here made palpable to the eye. A magic square, it is hardly necessary to say, is a series of numbers in the form of a square, so disposed that the vertical, horizontal and longest diagonal columns will add to the same sum.

There is a discovered peculiarity in a certain type of even magic squares which makes them usable for ornament. This consists in the fact that they are made up of four different "orders" of counting. By designating the figures belonging to each of the

*The 16-hedroid consists of sixteen cells, each a regular tetrahedron, thirty-two triangular faces (each face common to two tetrahedrons), twenty-four edges and eight vertices.

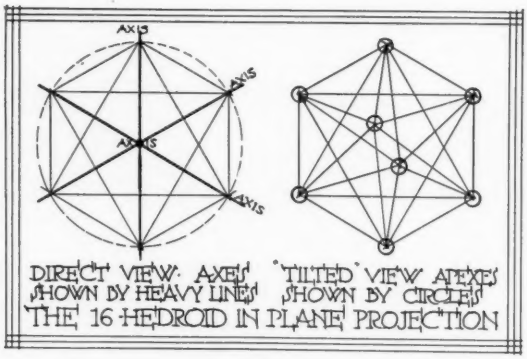


FIGURE 4

four orders by a different symbol, the latent symmetry and beauty become apparent—pattern springs to life, as it were.

Fig. 5 illustrates the method. By analyzing the magic square in question (shown in the lower left-hand corner of Fig. 5) it will be found that every number occupies its proper position in a series, and

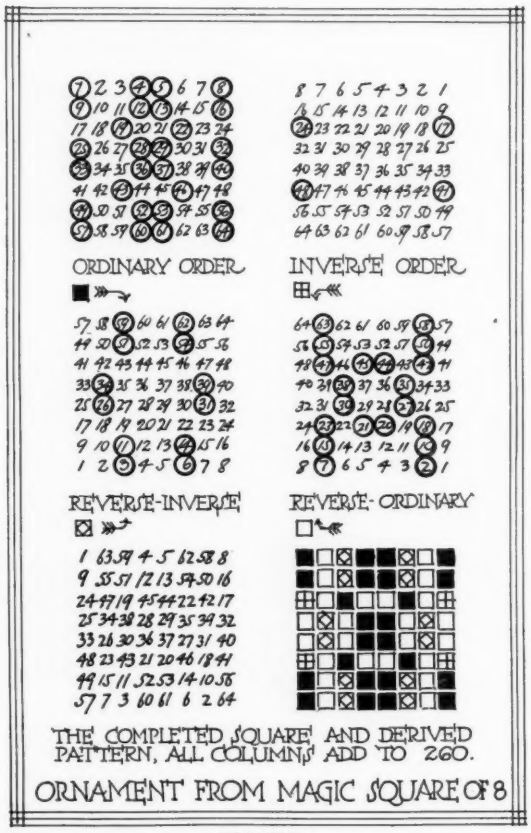


FIGURE 5

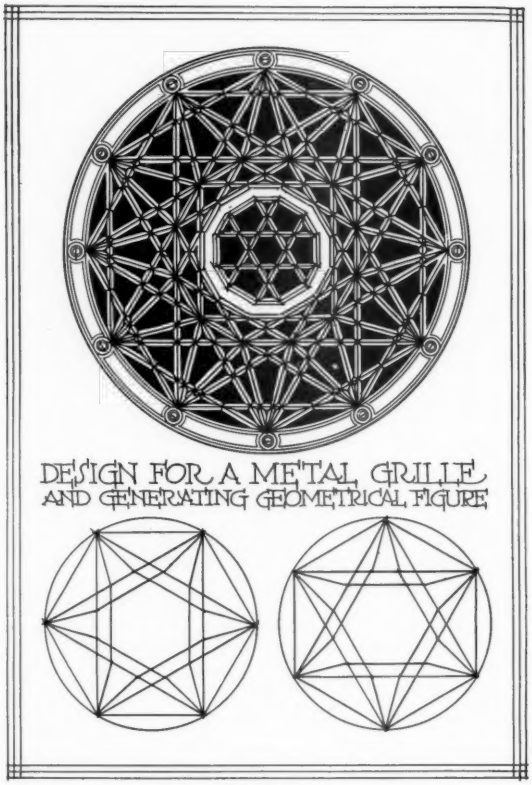


FIGURE 7

that these series are simply four different orders of counting; namely, the *ordinary* order—that is, from left to right, starting with 1 at the top; the *inverse* order, from right to left, starting at the top in the same way; the *reverse inverse*, from left to right, starting with 1 at the bottom; and the *reverse ordinary*, from right to left, starting with 1 at the bottom. Just how and why this is so we need not go into here, it would lead us too deep into mathematics; the fact suffices, for if we designate in the magic square the figures belonging to each of the four orders by a different symbol, we have, instead of a square of figures, the truly interesting design shown in the lower right-hand corner of Fig. 5, which repeated forms the pattern on the lambrequin in Fig. 1.

FIGURE 6

Figs. 10 and 13 show brick patterns developed in

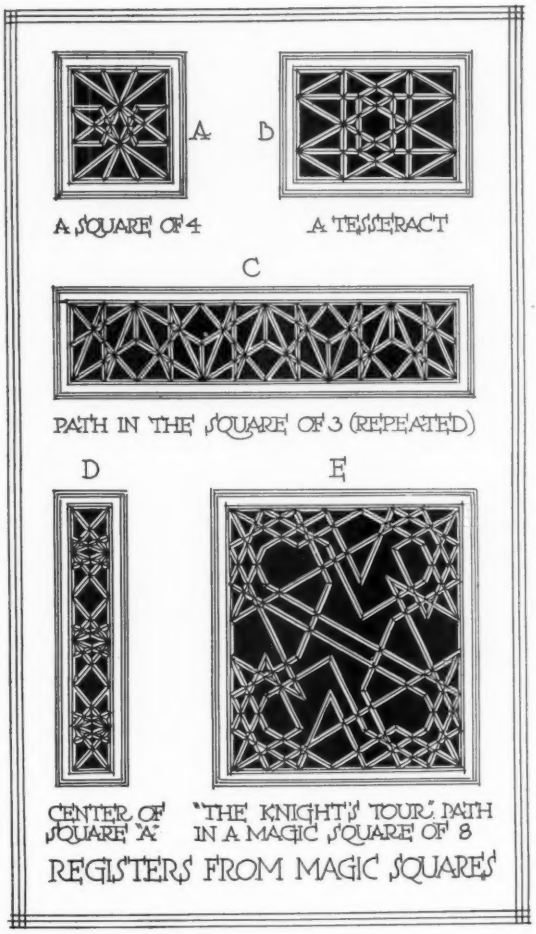
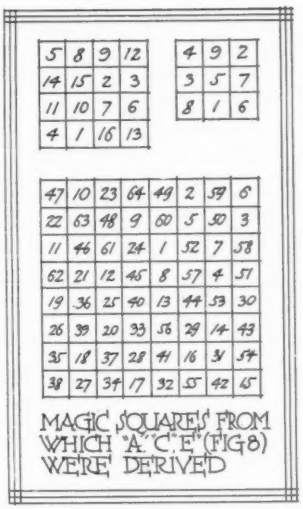


FIGURE 8

a corresponding manner, from an even magic square of 6. In each case the dark brick correspond with the numbers in their natural order. The diagonal arrangement of this is a fairly constant characteristic of this type of magic square.

Of course this elaborate mechanism of producing quite obvious and ordinary decorative motifs may seem like Goldberg's nightmare mechanics, wherein the most absurd and intricate devices are made to accomplish the most simple ends. The author is undisturbed by such criticisms. The great need of the ornamentalist is a solid foundation. Lacking that, he has been forced to build either on the shifting sands of his own fancy or on the ruins and remnants of the past. Mathematics and geometry provide this sure foundation. We may have to work hard and dig deep, but the results are worth the effort, for on such foundations may rise a temple beautiful and strong.



FIGURES 9

The ornament on the doors (Fig. 2) is derived from the hyper-solid known as the regular pentahedroid, the four-dimensional correlative of the tetrahedron in solid space and of the equilateral triangle in a plane.* If this sounds too complicated it is possible to describe the pattern as two pentagons enclosing five-pointed stars, although it would be more elegant to designate it as the plane projection of two regularly intersecting pentahedroids. The register face shown in Fig. 6 has exactly the same source. If you *must* know what Fig. 7 represents, it is icosatetrahedron inscribed within a hypersphere. All the "'orrible and revoltin' particulars" you shall be spared.

In Fig. 8 we return to magic square arrangements, but the patterns are derived by a method other than the one above mentioned. In every magic square in which the consecutive numbers are used there is a magic "path"—a line traced from cell to cell, following the numbers in their natural

*The regular pentahedroid consists of five regular tetrahedral cells. It has five vertices, ten edges and ten faces. All parts of any one kind, face angles, dihedral angles, faces, etc., are equal, for the pentahedroid is congruent to itself in sixty different ways, and every part coincides with any other part of the same kind.

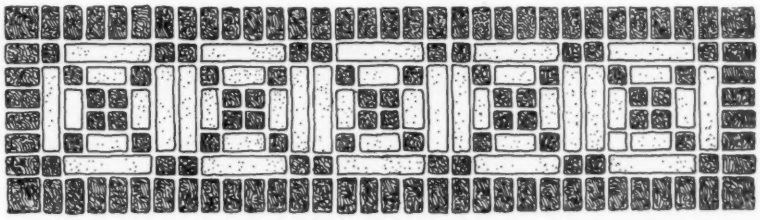
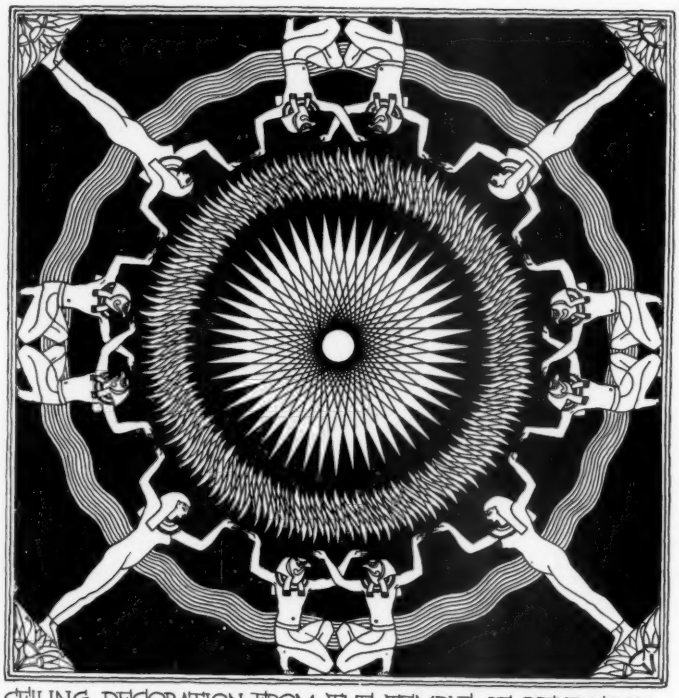


FIGURE 10

BRICK PANEL DERIVED FROM A MAGIC SQUARE

order. This continuous line sometimes weaves interesting patterns, particularly suitable for grilles or for interlaces. The squares from which A, C and E are derived are given in Fig. 9. The reader should follow the paths and develop the magic lines for himself—a mildly exciting form of indoor sport.

The confirmation of his general contention that the basis of all effective decoration is geometry, the author, in closing, desires to direct the reader's attention to Fig. 12, a somewhat modified reproduction of the famous zodiac on the ceiling of the Temple of Denderah in Egypt. A sun and its corona have been substituted for the zodiacal signs which fill the center of the original, and all hieroglyphics have been omitted, for except to an Egyptologist they are meaningless. In all essentials of composition the drawing faithfully follows the original—was traced, indeed, from a measured drawing.



CEILING DECORATION FROM THE TEMPLE OF DENDERAH—

FIGURE 12

Here is one of the most magnificent decorative schemes in the whole world, executed with an art which is the despair of the modern craftsman, and the fact that first forces itself upon the beholder is that the thing is so obviously geometrical in its rhythms that to reduce it to terms of geometry and number is a matter of no difficulty whatever. Compare the frozen music of these rhymed and linked figures with the herded, confused and cluttered compositions of even our best moderns, and argument becomes unnecessary. The fact stands forth that we have lost something precious and vital out of art, of which the ancients possessed the secret.

It is for the restoration of these ancient verities and for the discovery of new spatial rhythms—made possible by the advance of mathematical science—that the author pleads. Artists, architects, craftsmen, instead of lazily chewing the cud of current fashion, come into these pastures new!

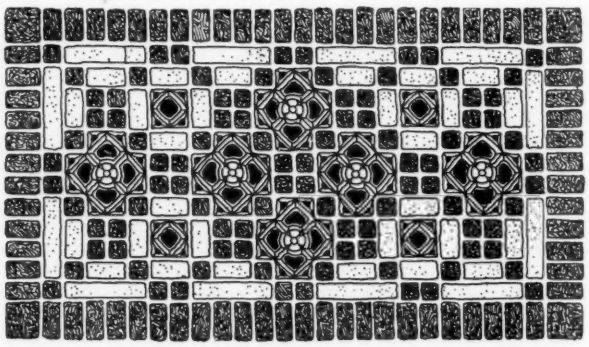


FIGURE 13

Preliminaries to Taking Bids and Letting Contracts

By Francis W. Grant

Part II—Instructions to Bidders

It is a quite common practice among architects, and particularly on large undertakings, to issue either as a separate circular or as a preliminary paragraph of the specifications, a code of "Instructions to Bidders." As good as any specimen of this character of document is that included in the Standard Documents of the American Institute of Architects, which is given herewith and will be made to serve as a text for treatment of this subject:

Proposals, to be entitled to considerations, must be made in accordance with the following instructions:

(1) Proposals shall be made upon the form provided therefor, and (2) all blank spaces in the form shall be fully filled; (3) numbers shall be stated both in writing and in figures; (4) the signature shall be in long hand; and (5) the completed form shall be without interlineation, alteration or erasure.

(6) Proposals shall not contain any recapitulation of the work to be done. (7) No oral, telegraphic or telephonic proposals or modifications will be considered.

(8) Proposals shall be addressed to the owner, in care of the architect, and shall be delivered to the architect (9) enclosed in an opaque sealed envelope addressed to him, marked "Proposal" and bearing the title of the work and the name of the bidder.

(10) Should a bidder find discrepancies in, or omissions from, the drawings or documents, or should he be in doubt as to their meaning, he should at once notify the architect, who will send a written instruction to all bidders. (11) Neither owner nor architect will be responsible for any oral instructions.

(12) Before submitting a proposal, bidders should carefully examine the drawings and specifications, visit the site or work, fully inform themselves as to all existing conditions and limitations and (13) shall include in the proposal a sum to cover the cost of all items included in the contract.

(14) The competency and responsibility of bidders and their proposed subcontractors will be considered in making the award. (15) The owner does not obligate himself to accept the lowest or any other bid.

(16) Provision will be made in the agreement for payments on account in the following words: .....

(17) Any Bulletins issued during the time of bidding are to be covered in the proposal and in closing a contract they will become a part thereof.

There is something radically wrong with the "Invitation to Bidders," "Bid Blank" or "Specifications," or all of them, if it be necessary to issue a code of instructions to bidders like the above.

Unnecessary documents should always be avoided, simplicity being the very best safeguard against misunderstanding and consequent troubles.

The writer respectfully submits that the seventeen bits of information contained in the above instructions should be severally disposed of as follows:

1. Should appear in the "Invitation."
2. Should appear in the "Invitation" and on the "Bid blank."
3. Provide blank spaces accordingly on "Bid blank."
4. Should appear on "Bid blank" (if anywhere).
5. Should appear on the "Bid blank."
6. Architect should prepare "Bid blank" accordingly.
7. The "Invitation" should be final on this point, but bidder cannot be deprived of right to withdraw bid before opening.
8. Should appear in "Invitation" and "Bid blank."
9. Should appear on "Bid blank."
10. Should be disposed of in "Specifications."
11. Unnecessary in any document.
12. Waste basket.
13. Good advice but not proper as an instruction.
14. Covered by the reservation of right to reject any or all bids.
15. Should appear in the "Invitation."
16. Provision for payments should appear under caption "Payments" in the Specifications.
17. A properly prepared "Bid blank" disposes of this.

So much for "Instructions to Bidders" as these usually appear. The bidder, however, does frequently require instructions by reason of errors or omissions in the regular documents, discovered by the bidders themselves during the competition. A clause in the specifications should provide for the submission of interrogations to the architect by the bidders up to within a certain number of days before the time set for submission of bids. These should be permitted by letter only and answered by letters in identical language addressed to all bidders simultaneously, thus forestalling any charge of favoritism or the giving of undue advantage to any bidder.

These identical letters or bulletins answering the bidder's queries should be in language as formal as the regular documents and confined strictly to the

giving of the requested information, and should not attempt to answer questions which should not have been asked. If a bidder seeks information on a point already covered completely by the drawings and specifications, but apparently not understood through incompetence, or perhaps overlooked by the bidder, it should be ignored, or if referred to at all, it should be in language that can in no way be construed as modifying the language, but not the meaning of the original expression.

Carefully avoid repetition at all stages of the transaction. It is an act of injustice to competent and reliable builders to undertake to teach the incompetent how to read drawings or construe specifications, but genuine errors should be frankly admitted and openly corrected.

In the course of the competition for that imaginary library building referred to in a preceding article of the series, several of the bidders addressed the architects, making inquiries, and following is the form of "Bulletin" issued in response:

Houston, Texas, Dec. 28, 1916.

To all Bidders on Library Building for
The Board of Library Commissioners,
Houston, Texas.

Gentlemen:—

Pursuant to inquiry by certain prospective bidders, the following is submitted as the interpretation by this office of the drawings and specifications as to the points raised in said inquiries. This communication will hereafter be referred to as Bulletin No. 1 and be of the same force and effect as though originally incorporated in the specifications:

1. Tanks for water closets and urinals shall in every instance be concealed regardless of the fact that catalog cut in the case of toilets specified for basement toilet rooms shows an exposed tank.

2. The floor in newspaper file room in basement shall be constructed as provided in paragraph No. 246 of the specifications and not as indicated on basement plan.

3. By "solid brass thresholds" described in paragraph No. 263 of the specifications is meant "cast brass," least thickness to be 3/16 in., as distinguished from sheet brass moulded to form.

Respectfully,
PIERCE & DIX,
Architects.

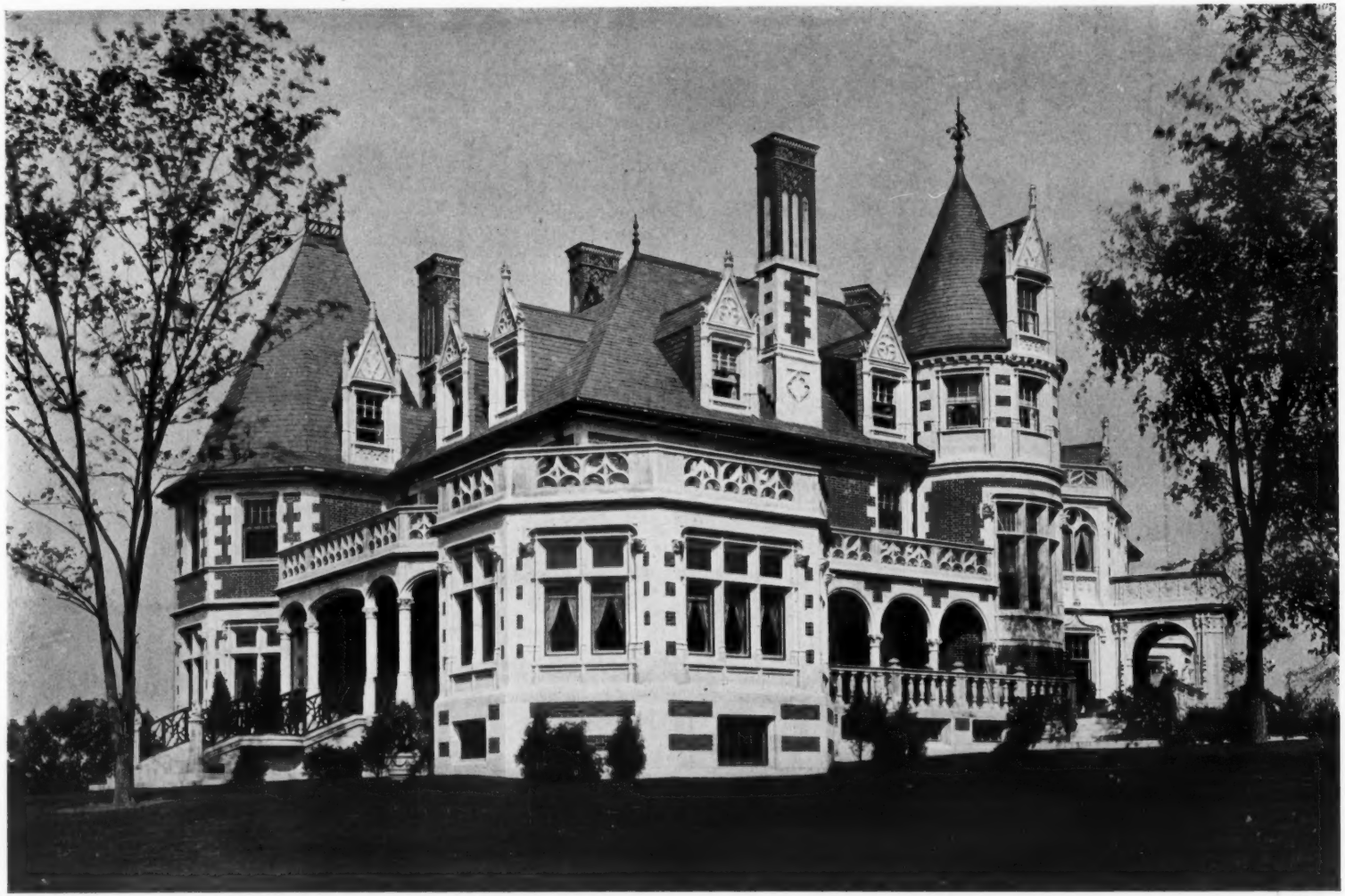
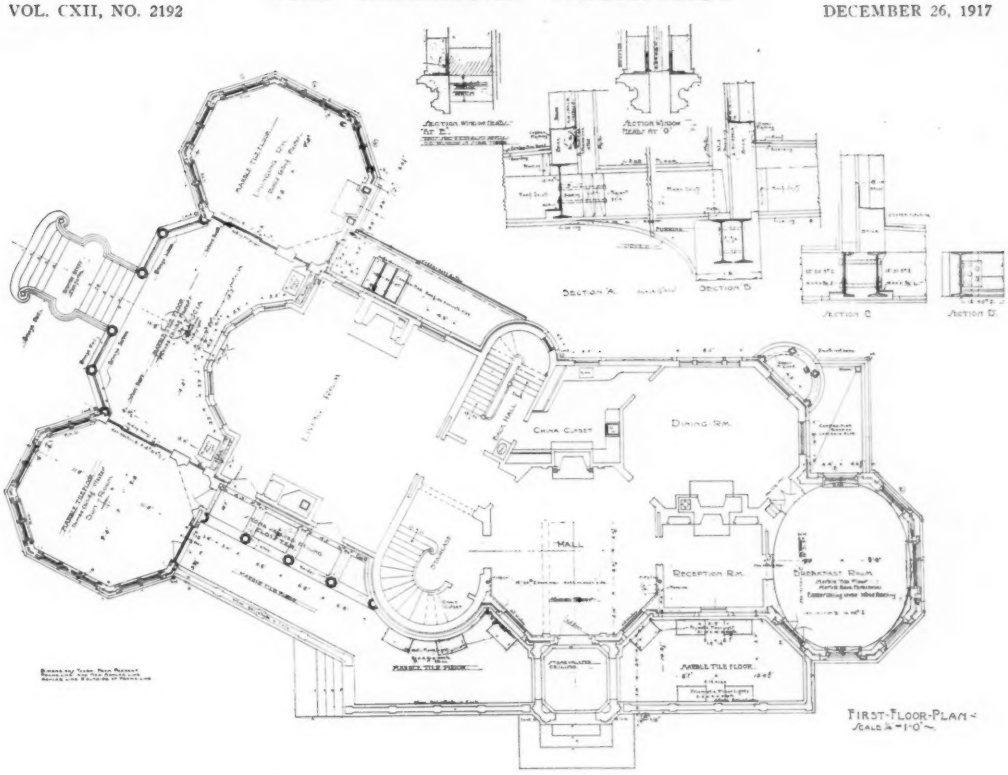


PLATE 296

ALTERATIONS AND ADDITIONS TO A HOUSE AT MANCHESTER, MASS.

BIGELOW & WADSWORTH, *ARCHITECTS;* R. H. WAMBOLT, *ASSOCIATE ARCHITECT*

XUM



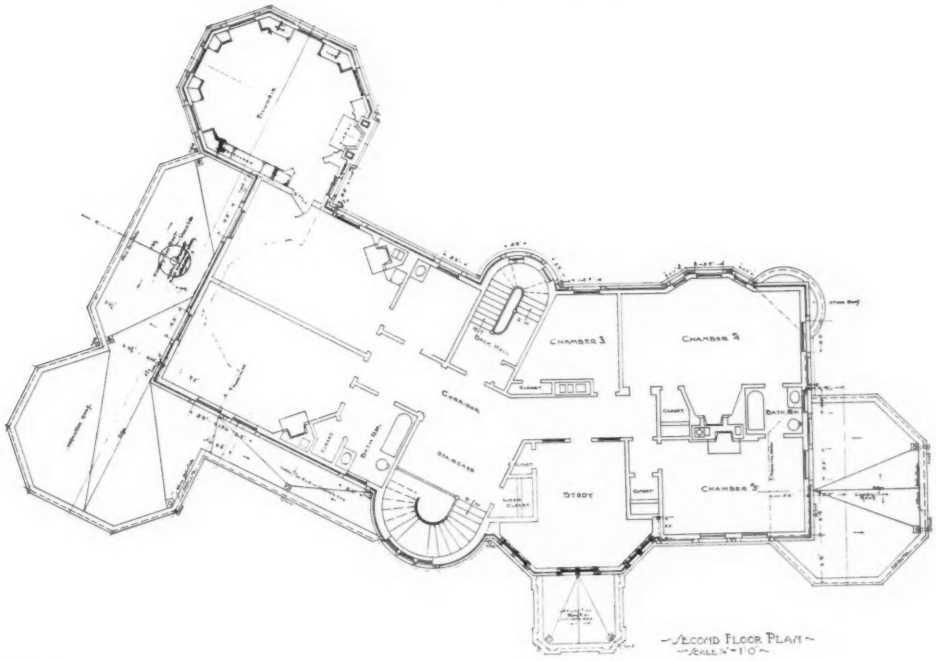


PLATE 297

ALTERATIONS AND ADDITIONS TO A HOUSE AT MANCHESTER, MASS.

BIGELOW & WADSWORTH, *ARCHITECTS;* R. H. WAMBOLT, *ASSOCIATE ARCHITECT*

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PLATE 298

ALTERATIONS AND ADDITIONS TO A HOUSE AT MANCHESTER, MASS.

BIGELOW & WADSWORTH, *ARCHITECTS;* R. H. WAMBOLT, *ASSOCIATE ARCHITECT*

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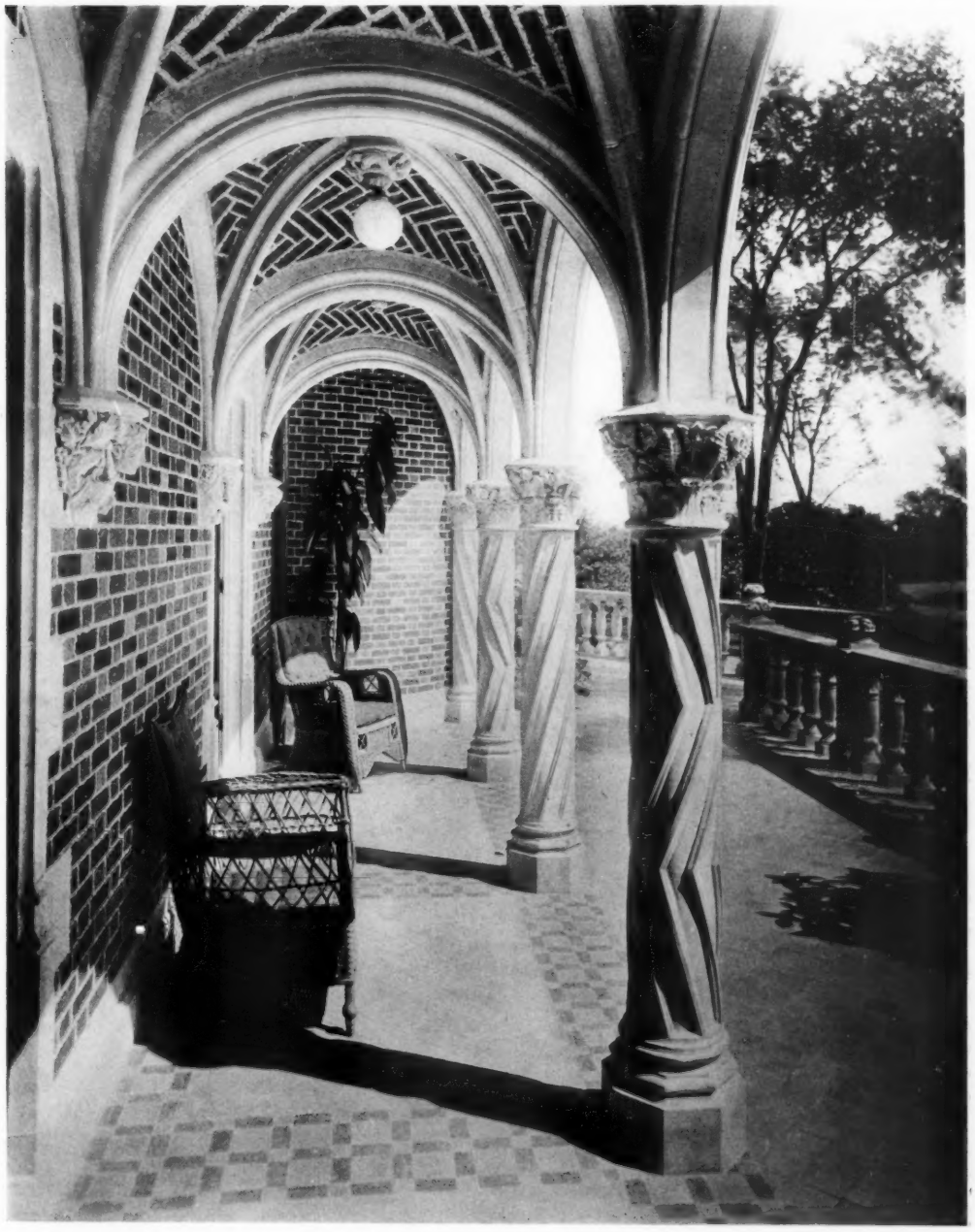

PLATE 299

ALTERATIONS AND ADDITIONS TO A HOUSE AT MANCHESTER, MASS.

BIGELOW & WADSWORTH, *ARCHITECTS;* R. H. WAMBOLT, *ASSOCIATE ARCHITECT*

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PLATE 300

ALTERATIONS AND ADDITIONS TO A HOUSE AT MANCHESTER, MASS.

BIGELOW & WADSWORTH, *ARCHITECTS;* R. H. WAMBOLT, *ASSOCIATE ARCHITECT*

XUM

PLATE 301 SERVICE ENTRANCE SERVANTS VERANDA

ALTERATIONS AND ADDITIONS TO A HOUSE AT MANCHESTER, MASS.

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PLATE 302

ALTERATIONS AND ADDITIONS TO A HOUSE AT MANCHESTER, MASS.

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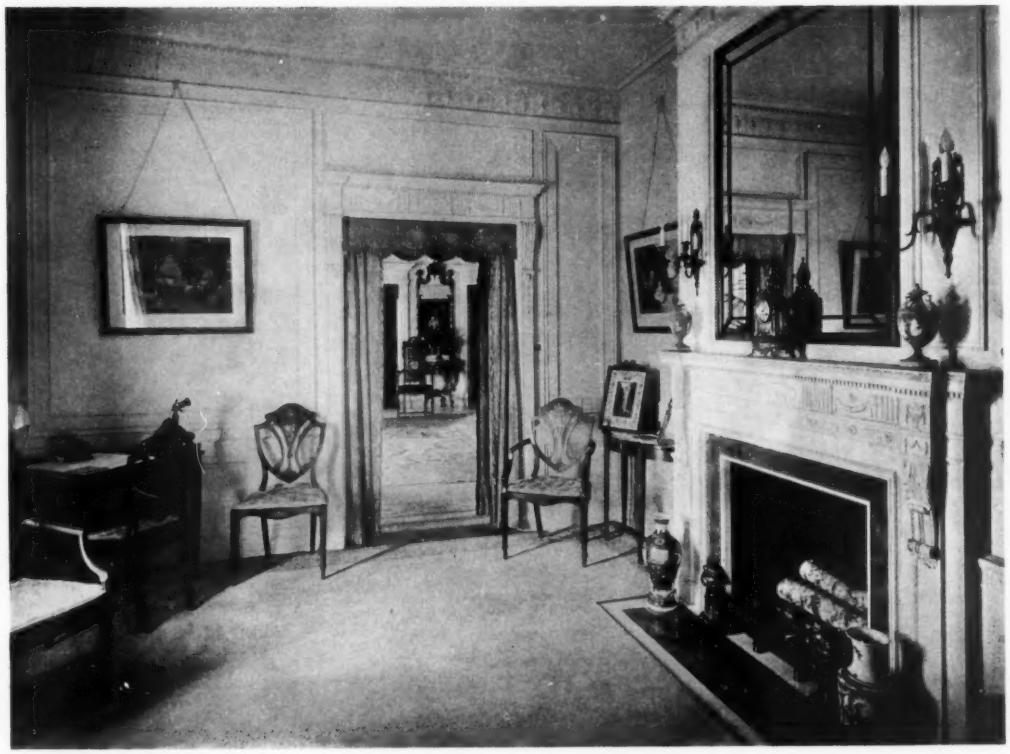
LIVING ROOM

PLATE 303 DINING ROOM

ALTERATIONS AND ADDITIONS TO A HOUSE AT MANCHESTER, MASS.

BIGELOW & WADSWORTH, *ARCHITECTS;* R. H. WAMBOLT, *ASSOCIATE ARCHITECT*

XUM



RECEPTION ROOM

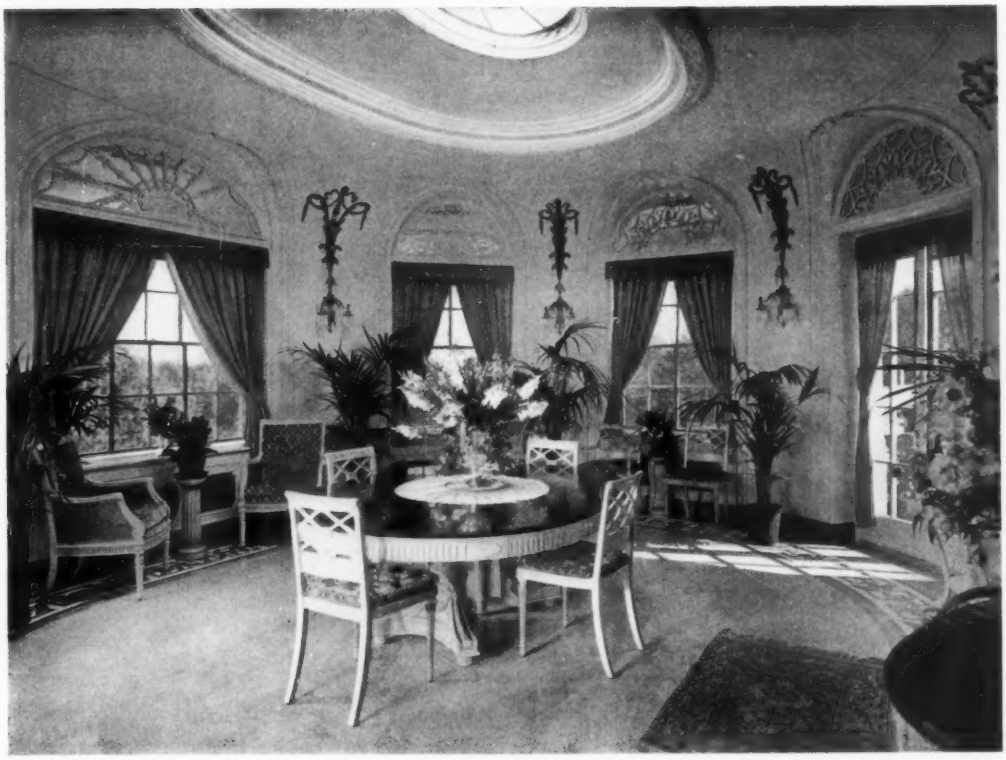
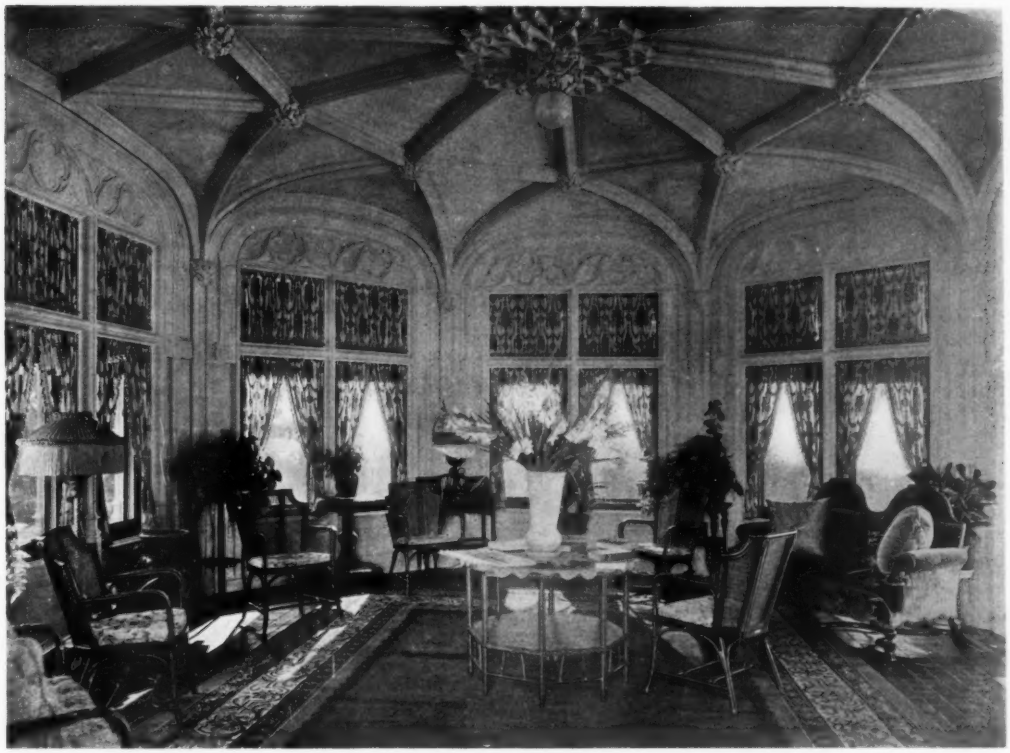


PLATE 304 BREAKFAST ROOM

ALTERATIONS AND ADDITIONS TO A HOUSE AT MANCHESTER, MASS.

BIGELOW & WADSWORTH, *ARCHITECTS;* R. H. WAMBOLT, *ASSOCIATE ARCHITECT*

XUM

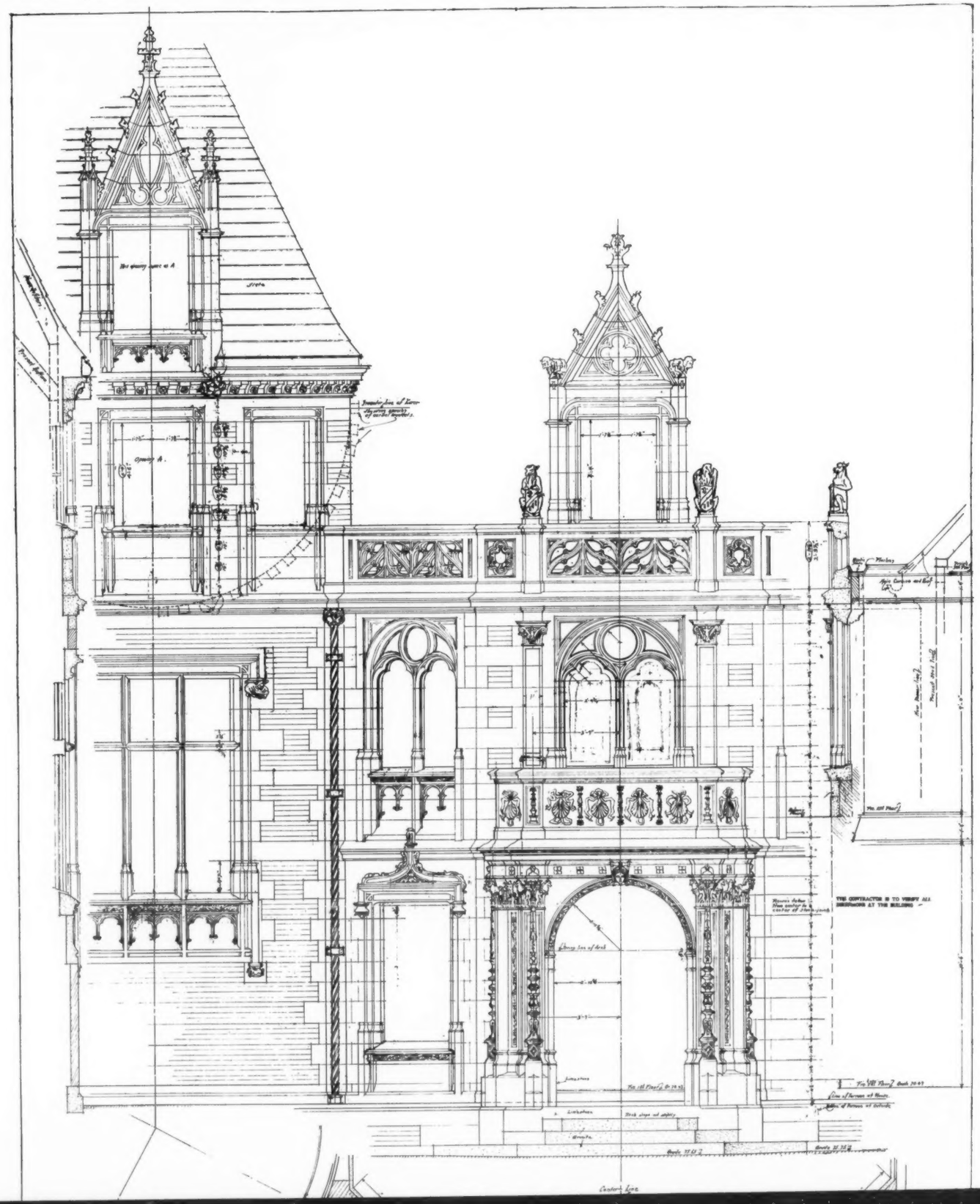


SUN PARLOR

PLATE 305 DEN

ALTERATIONS AND ADDITIONS TO A HOUSE AT MANCHESTER, MASS.

BIGELOW & WADSWORTH, *ARCHITECTS;* R. H. WAMBOLT, *ASSOCIATE ARCHITECT*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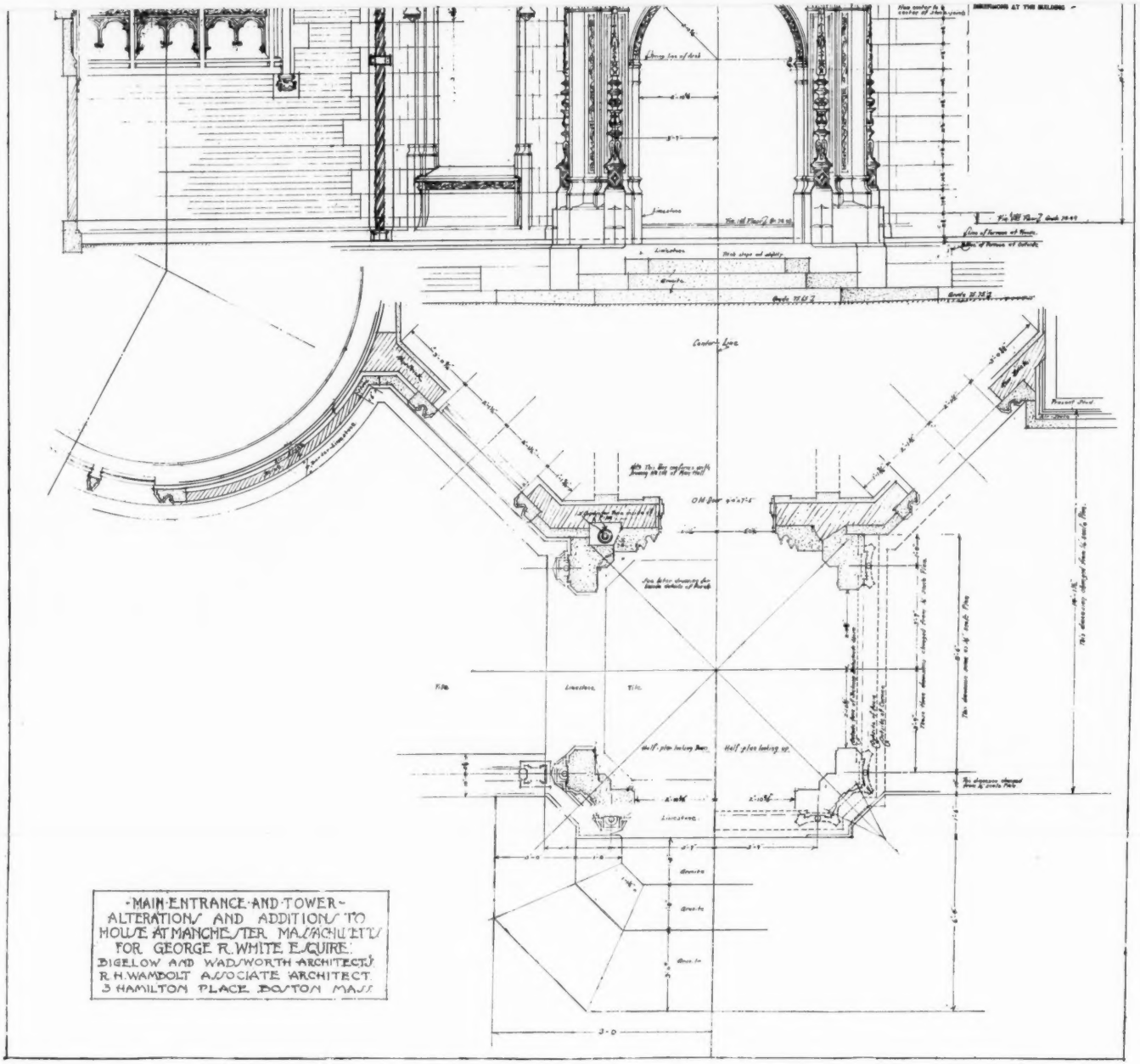

PLATE 306

ALTERATIONS AND ADDITIONS TO A HOUSE AT MANCHESTER, MASS.

BIGELOW & WADSWORTH, *ARCHITECTS;* R. H. WAMBOLT, *ASSOCIATE ARCHITECT*

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Making the Wisest Use of All Available Material

FROM time to time since the entry of the United States into the war, attention has been directed to the need for greater care in the building of industrial towns and a warning given that there is danger in the hasty methods pursued and in the selection of types of working men's houses that are being erected in enormous numbers all over the country.

The menace lies in the building of structures as if they were only intended to meet a temporary emergency, whereas they will in most cases remain for many years and unless given some degree of study constitute an eye-sore and a positive detriment to the future well-planned development of communities.

If these methods continue unchecked there are grave possibilities that the errors made will be too costly to admit of correction and that much of the well-directed propaganda by men and organizations looking to well-designed and wisely-planned industrial centers will have been wasted.

Not only is there cause for alarm over hasty and poorly considered elements in the designing and planning of these industrial developments but what may be considered of even greater moment is the fact that the general subject of location is in most cases not well studied. Numerous instances have been noted where the site of additions for groups of working men's dwellings has been very poorly considered. This makes it certain at the very outset that sanitary conditions and the possibilities of future expansion with reference to incorporation with the city or town of which these industrial housing centers will ultimately become a part are sure to need correction. This may have to be done at a price that will make the problem of solution not only costly but so tediously slow as to react dangerously on the entire community.

A specific instance in the planning of an addition to an industrial community may be cited. In a hastily erected housing addition to serve a certain model plant, the houses were erected on a side hill, where the grade was so steep that no direct approach was possible. The additional expense in providing a connecting and necessarily circuitous communicating series of roads was large and even then the tract was in a certain sense isolated from the rest of the community and the plant that it was intended to serve.

The question of town planning, particularly with reference to features of industrial housing, has for several years received the expert consideration of men who are eminently qualified to direct these operations. These men, the majority of whom are architects, could, if their services were availed of, exert the best influence in these matters.

IT is a criticism each day more loudly expressed that in our war preparation no field of qualified service has been applied in a manner to secure less efficient results than in the profession of architecture.

If the reader will turn back to earlier issues of THE AMERICAN ARCHITECT and scan the "Rolls of Honor" of the different societies, he will be able to form an opinion as to how widely scattered are the architects that have enlisted for this war.

In every branch of the service afloat or ashore will be found architects, and it will be interesting to try to discover what, in many of the assignments, could have been the reason for utilizing the services of a class of men trained as every architect has been, in a field so widely removed from his usual work. And, per contra, it will be equally interesting to learn just what are the qualifications or the reasons for assignment of other men to tasks that architects could handle with singular efficiency.

The present conditions relating to industrial housing, town planning and the many buildings erected by the Government is a case very much to

ALTERATIONS AND ADDITIONS TO A HOUSE AT MANCHESTER, MASS.
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the point. No one will doubt that these matters would have had much better supervision had they been delegated to a class of men who by education, training and experience are better qualified for this work than any other.

It is time for a better co-ordination of the valuable technical knowledge that is everywhere available.

These lessons have been learned by England and by France, but not until the cost in valuable lives had been so great as to bring home the lesson in the most forceful way. Architects will not need to be reminded of many instances where men practising in this country have been called to their respective colors in France and England. These represent men of the highest attainment, now dead or maimed to uselessness, who have left in this country as records of their ability buildings that were among the best examples of our architectural developments. These men, with the noblest patriotism, did not seek to evade the dangers of actual fighting at the front by setting up claims for commissions or assignments to relatively safe work by reason of their technical ability. They were undoubtedly of the belief that their training would be recognized and that they would be set to tasks for which they were fitted. This was not done, and so they in most cases took their places in the ranks with the "Tommies" and the "Poilus." Some are dead, some are blinded—the pity of it—all are more or less broken, unfitted to return to their professional work.

And we, in this country, are likely to find similar conditions unless trained men in the major professions are given assignments where their training will be of greatest service. The doctor always finds an assignment in the corps where he belongs, the mechanic in his, and each man in the various trades is eagerly sought out for an assignment where he will be most useful.

No architect whose patriotic impulse has caused him to join the service would lend a listening ear to any plan that would remove him from the post of danger. Each one will want to be "in the thick of it," and he can certainly satisfy his desire for hard service in an assignment along the lines of his qualification as in one where he is less fitted.

But architects find that the very billets for which their education has best trained them are being filled by others who are not always so well qualified. This condition may or may not be the fault of the profession itself, but it is a condition that has to be faced and it would seem that a very great and patriotic work could be done by the various societies in a combined effort toward a better recognition of architects and their assignment to duty more nearly in the field of their qualifications.

William Ralph Emerson

An Appreciation

By Charles A. Rich

"WHILE we were sitting at lunch last week and talking over old times, our dear friend W. R. went across the Styx!" Thus writes an old friend in Boston, and it brings up such a rush of reminiscences of old Boston days that I cannot forbear to add my wreath of sincere affection at the death of William Ralph Emerson, my first employer, with whom I spent my first years of study, under whose influence my professional life began, and to whom I have always maintained I owed a debt of gratitude which makes his memory very dear to me in this rushing modern life. But life didn't seem to be so rushing in those old Boston days, and incidents of that life arrange themselves rather methodically in my mind. That old office in Pemberton Square, center of architectural effort, now all but blotted out, and afterward Winter and Washington Streets, with Young, the portrait painter; Norton, who so vividly portrayed the sea after a regular sailor's experience; Metcalf still alive and doing splendid work, and a host of others, all these and a lot more helped to make life one of joy and contentment.

But not always was there a "shot in the locker" in those days, and particularly do I remember times of stress, painful to our patron, who couldn't help it, when work was dull, the weekly payroll lacking, the boarding-house mistress insistent, and the drawing board was our only berth in the corner of the office for many days. And dear old Mrs. Hall, the janitress of the building (God bless her), who saw and understood our dilemma, and brought down sundry blankets and things to keep us warm. Does she yet live, and can she know that we remember and bless her for her kindness?

Nor yet do I forget the opposite corner of Washington Street, where was a small café, in which at such times for many a day we negotiated for an "individual pot" of delicious baked beans, and downed all the bread and butter in sight, for it was our one possible meal of the day. And sometimes Mr. Emerson went with us, and beguiled the time with pencil and pad which soon became luminous with sketches in soft pencil, pen or—yes, a toothpick and bottle of ink—it mattered not much what. Fanciful sketches, towers, odd gables, chimneys, the study of the day perchance, from all points of view, full of delightful realism, and always wonderfully picturesque and beautiful. I wager not an Emerson office boy who reads this, but in those days possessed a score or more of them, eagerly seized after they were drawn and cast aside.

And in those days, too, I recall the visits of Mr. Hunt, the artist, then in the strength of his profession, for whom Mr. Emerson built a studio at Magnolia out of a paint shop and a barn, and it was my delight to have had it in charge; a one-story paint shop, a two-story barn moved up at right angles; a balcony along the barn side with its railing the vertebra pieces of a whale, a staircase to the loft hinged and swinging from an old cathead of a stranded schooner, and with a newel post of an old cider mill screw. And along the low balcony, Mr. Emerson painted in quaint letters: "Men that are tall keep near the wall," for Hunt must have been over 6 ft. tall, and the balcony roof not more than 5 ft. at its lowest side. How Helen Knowlton, with her art life before her, loved it after Hunt's death! Alas, does it still exist, or is it a chimera of my brain? No, for I still hold my old pen-and-ink sketch of it, like a little etching, and Mr. Emerson and Mr. Hunt laughed over its quaintness and spent hours of time in its production.

And then that large cardboard model of the H—house in Milton. In those days it was quite an innovation, and Mr. Emerson and all hands worked on it for weeks. 'Twas to be a surprise to the owner, who was in Europe, and when he returned he was to see not his plans only, but the thing itself, as large as a drawing-board, and every window and chimney and door and piazza, and even the trees and shrubs perfect in every respect. And to those of us who knew Mr. Emerson well, can you not even now see his twinkling eyes, hear his merry laugh, and his quaint exclamations, as he pulled aside the curtain, to the surprise and delight of the owner. Does it, too, still exist, dusty and forgotten, and tucked away in some attic or closet? I wonder.

And my old head draughtsman, William Ellory Channing, and Mr. Emerson's right hand for years, where are you, my dear fellow, who first taught me to properly use T square and triangle, and whom, after five years under Mr. Emerson, a year abroad, and five years in rushing New York, I found on the same stool, with the same T square and triangle—yes, I swear it; and the same Mr. Emerson leaning over the table, cigar a tilt, the long silky flaxen hair, luxuriant as ever, the same soft and gracious

eyes scanning one of his boys as I entered, and the table covered with picturesque sketches; yes, and the same hearty welcome too!

And so, as the news reached me, I could not forbear to write these few lines of affection to a memory which has always been green, with the hope that some of the old boys of Mr. Emerson's office life might see them, and know that when Frank B. wrote me that little note telling of Emerson's death, he ended by saying one of the truest thoughts of life: "Yes, there's nothing like a loving and true friend, that was he, and that we are—you and I."

CHARLES A. RICH.

What Is a Building Architect?

The need for educating the public in the duties and responsibilities of the architect has been very well shown in one important instance, described at some length in the November issue of the *Bulletin of the Illinois Society of Architects*. A member of that society, in a letter to the editor, cites a formal report made by a committee of prominent business men, who, the member states, are not only intelligent and leaders in their community, but who evidently have but little knowledge of the duties and responsibilities of an architect. Continuing, the *Bulletin* states:

Upon the completion of a large church and the presentation of the final report to the trustees, the members of the congregation voted to have the work reviewed by a committee. The committee after much labor brought forth the following report on the employment of the architect:

"We find that the architect did pass on all the extras and additions to the building that *he constructed* and that the trustees passed all his recommendations.

"We feel it our duty to say to the members that this is a very unusual proceeding. The architect was hired to *build this building*, supervise *his own construction* and then do *his own inspecting on his own work*. There was absolutely nobody to check a possible mistake in specifications and plans and we are satisfied in our interview with the trustees that they have not had enough experience in building to be competent to pass on the matter.

"Had they employed another architect to check up the work of the *building architect* it would have been far more intelligent and fruitful."

What they meant by a "building architect" is beyond our feeble imagination.

The facts of the case are that the architect after preparing plans and specifications in the usual way took bids and under the direction of the trustees prepared contracts between a number of well-known responsible contractors and the church corporation. As the building proceeded the trustees engaged their own superintendent who had charge of the building under the supervision of the architect. The work was completed by the contractors, bills checked by superintendent and trustees and final certificates issued by the architect and passed for payment by the trustees.

Four months after the opening of the building some of the members took it upon themselves, as a committee to investigate the acts of their trustees and the result was the report, a portion of which is quoted above. This report is typical of the ignorance of the average individual in distinguishing between a contractor and an architect. In this entire report no mention was made of the twenty reliable contractors who had contracts on the building and who were entitled to credit for the excellent work they had done, but instead the committee could only see what they called the "building architect."

To further illustrate this lack of information as to an architect's duties and responsibilities the editor will record an incident in his own practice which occurred quite recently.

He had been employed in a consulting capacity by a large corporation which contemplated some extensive building additions. At one conference, in addition to the officers of the corporation, there were present the entire board of directors. On the board of directors was the president of the largest bank in the city.

During the conference the banker, who was to furnish the capital for the proposed buildings, was very insistent on knowing just how the money was to be spent, and how the corporation could be safeguarded in seeing that it secured the value of its money. Various systems of awarding contracts were explained to him; the lump sum contract, awarded after competitive bids; the guaranteed cost plus per cent, etc., in all of which it was explained that the architect would be the official advisor of the corporation. But the banker wanted to know who would check the work of the architect, and wanted to know what possible safeguard the corporation could have that the architect's work would be faithfully performed. This query of the banker was answered by the editor as follows:

"Mr. ————, you as president of a large bank have no doubt during your banking experience had occasion to resort to the law courts in a number of instances. If so, did you not turn your case over to some attorney in whom you had confidence, and did you not rely upon him absolutely for the proper handling of your matters in court? Did you ever question his method of trying the case, and did you ever insist on employing someone to watch him?

"Again, you are a man of, I should say, about sixty years of age, and I take it are a man of family. I also assume that at some time you have had occasion to call in a physician to attend some member of your family. When you called in a physician did you not rely upon his professional knowledge and ability, or did you question him as to what system of medicine he practised, and insist that he advise you in detail as to the medicine he prescribed, etc.? Did you employ some druggist to check and advise you on the prescriptions written by your physician? Mr. ————, when you employ an architect you are employing a professional man, and you should and must rely upon his professional ability and integrity to represent you acceptably."

Nomination for President of the American Institute of Architects

At a vote taken by the convention of the American Institute of Architects at Minneapolis during December, 1916, it was resolved that the present officers hold over until their successors can be elected at the next convention, which it is now proposed to hold during the spring of 1918.

The Institute Journal, in its November issue, published the following nomination for president:

To the Secretary of the Institute:

For the office of president of the American Institute of Architects, which is to become vacant at the close of the present year, the undersigned members of the said Institute do hereby, in accordance with Article IX of the by-laws, submit their petition for

the nomination of Mr. Burt L. Fenner of New York City.

John M. Donaldson, William B. Stratton, D. J. von Schneider, Charles Kotting, F. J. Winter, Arthur H. Scott, William Reed-Hill, John Scott, James B. Nettleton and Hugh B. Clement of the Michigan Chapter; Edward A. Crane, John Hall Rankin, John P. B. Sinkler, E. P. Bissell and George I. Lovatt of the Philadelphia Chapter.

Powers of the State Boards of Architecture

In his annual address, Mr. J. E. Allison, president of the Southern California Chapter of the American Institute of Architects, quotes a suggestion made by a member of the chapter in a letter written to President Mauran of the American Institute that the California State Board of Architecture should require all licensed architects to observe the canons of ethics and practice of the profession as laid down by the Institute. Mr. Allison commends the suggestion to the State board for favorable consideration, "provided there are no legal obstacles."

The writer of the letter, who makes the suggestion, infers that powers to require all certificated architects to subscribe to the canons of ethics and practice of the Institute lie with the State board because the law requires that members of the State board shall be members of the Institute. He further assumes that they have the power to carry out the suggestion because the law leaves it entirely to the members of the board to make their own regulations for the examination of applicants for licenses to practice architecture.

The State board has probably not overlooked any powers which it might lawfully exercise in throwing restrictions around the practice of architecture which might inure to the benefit of the profession. In the enactment of the law the American Institute of Architects was recognized in determining appointments for the State board because its conditions for membership furnished the only tangible standard of qualifications then existent for competency in the practice of architecture. There is no law in any State licensing professional men, so far as we are aware, that imposes upon registrants the observance of the rules of any society or organization, however desirable such a requirement might seem to the members of any profession.

It is regrettable that the status of the architect is not more clearly defined in the public mind, especially since the State has deemed it expedient to enact a law regulating the practice of architecture. It is desirable that the province of the architect and the province of the contractor should be more fully and more definitely understood by the public. Whether this can be accomplished through the medium of legislation may be an open question. An enlargement of the powers of the State board is legally possible, but such an extension of powers rests with the Legislature of the State and not with the State board of architecture.

The above, reprinted from the *Architect and Engineer* of California, forcibly illustrates the lack of attention on the part of architects to the laws governing their own business. It would appear that careful consideration would suggest the impossibility of compelling by law the acceptance by any individual of the opinions or dictums of any particular class.—Editors THE AMERICAN ARCHITECT.

A Substitute for Cedar Telephone Poles

In order to demonstrate the possibility of replacing cedar telephone poles, which are becoming very scarce and expensive on account of the immense demand for that variety of lumber throughout the world, the department of operation of the forest service has taken the initiative in a project to determine the efficiency of lodge pine poles for carrying the wires of the service's system.

Nearly 600 tank-treated lodge pine poles have been placed on the line between Choteau, Mont., and a ranger station in the Lewis and Clark forest, which has just been completed under the direction of Telephone Engineer R. B. Adams. The lodge pine poles have been treated in tanks of creosote and it is claimed that they will not have to be replaced for a period of 22 years. The life of an average cedar pole now commonly used for telephone and telegraph wires is less than ten years, while an untreated lodge pine pole would have to be replaced in three or four years.

Mr. Adams believes that the lodge pine poles will be the best available substitutes for the cedar poles, the supply of which will soon be exhausted. The cost of the treated lodge pine poles will be about the same as of the cedar poles, while their life is more than double that of the timber now in use.

Construction News.

Rockefeller Site for Hospital

Fifty acres in upper Manhattan, recently offered to the city for park purposes by John D. Rockefeller, Jr., may be acquired by the United States for a great hospital base. Negotiations, it was said, are now going forward between the War Department and Mr. Rockefeller. The land overlooks the Hudson River, north of Riverside Drive, and is said to have cost Mr. Rockefeller more than $2,000,000.

A Return to the Colonial

In these days of jazz bands, bungalows, chewing gum and other nervous disorders, it is a relief to discover evidence of a return to the simpler ways of the forefathers of our country. There is no more refreshing indication of this than is shown in the renewed interest in Colonial architecture, with its well-ordered fenestration, direct plans and carefully studied detail, modern examples of which are beginning to show in the suburbs of many of our cities.

Arising as this style undoubtedly did from the classical studies of our ancestors, its culture plainly shows the opinions of their day. Housed within its simple dignity, we may imagine Thomas Jefferson, let us say, seated on a Sheraton chair, arrayed in Georgian splendor, clay pipe in mouth, and Plato's Republic in hand, dreaming of his country's future government patterned to an antique and lofty standard.

For books and living, which is mostly housing, go hand in hand—and politics and government follow —classic learning was the culture of the eighteenth and early nineteenth centuries, gentlemen of England and France priding themselves not alone on their Greek and Latin, but upon their knowledge of art and architecture as well, and we Colonials followed dutifully in the paths of our betters.

Whatever this knowledge may have been, it was probably inexact, and citing from an earlier period, we read in Evelyn's Diary his description of the long since destroyed royal manor of Nonsuch, done "in the Italian manner," it is obvious that Nonsuch was not Italian at all, but excellent Jacobean. So of the period of which we consider, we probably had a similar intent to follow older exemplars and arrived at much the same goal as King Charles' Surveyor.

Introduction to an article by Albert Farr, Architect, in the Architect and Engineer of California.

Speed and Efficiency

War contract conditions may easily teach wrong contracting ideas. The belief that speed of construction spells efficiency of construction is one. The notion that inflated wages bring better productiveness is another. The idea that multiplication of workmen is more potent in hastening work than are management and machines is a third. On these matters and others we need at the present time to hold our thoughts very straight, says *The Contractor*.

There is much to admire in war contract work. Observing this work one is inspired with the keenest pride in the manner in which contractors have met the enormous demands made by war contracts on their abilities and resources. Railways, roads, water works, sewerage systems, buildings, even whole cities are being created in periods of a few weeks. These works are not counted by ones and twos, but by tens and twenties. Contemplating the magnitude of the accomplishments one forgets to be critical of violations of construction efficiency which in normal times would condemn contracting as a well-managed business.

If we keep in mind that while normally speed is but one of the factors that count toward efficiency of construction, in war construction speed is the master of measurement. At army cantonment work recently observed orders were received in the morning for several buildings imperatively needed that night. A large force of carpenters was rushed to the task. At evening on return to the place the buildings were completed and in process of being occupied. Here was the essence of efficiency in war construction. A few figures collected and a short computation showed that each carpenter in a day had framed and put in place 165 ft. b. m. of lumber, or about one-third the daily output normally expected in well-managed building construction of that kind. Here, judged by the standards that ordinarily govern, was marked construction of inefficiency. The need for speed had prevented the precise planning and management necessary for efficiency.

Fifth Avenue Affected by the Zoning Law

Fifth Avenue, and particularly the section between Fifty-ninth and Ninety-ninth Streets, is at present the scene of a controversy in regard to the new zoning law. A number of prominent men, who constitute the Above Fifty-ninth Street Committee of the Fifth Avenue Association, favor the limiting of heights of buildings in this district to one hundred feet. Their contention is also upheld by the Board of Directors of the Fifth Avenue Association, who claim that property values will be maintained by the discouraging of further erection of apartment houses in this part of the city. Various opinions are being expressed in regard to this matter.

An Architectural School for Women

The Architectural Association of London has opened an architectural school for women. This is the first recognition the society has given to women as architects in its seventy-five years of existence, and is occasioned by the shortage of men due to the war.

A Survey of Housing Needs

In discussing the subject of how best to survey the situation as regards the probable needs for housing accommodation which are bound to result from rapid industrial expansion accompanying modern war, and also the formulation of plans for providing for the needs thus arising, emphasis was repeatedly laid upon the inherent difficulties—the impossibility—of forecasting with any degree of accuracy the location of the greatest needs, the total number of workers to be involved, and the extent to which women would be employed in various phases of fabrication.

Experience indicates that these are all variable factors which three years of experience and trial have not eliminated. The program is constantly changing as the exigencies of the time dictate; the employment of women is being constantly extended to new fields of fabrication, with the result that original calculations are constantly upset. The essential elements, therefore, to possess are: first, a central body or authority having powers to initiate and execute the details of this constantly varying program with the utmost rapidity and without the hampering conditions surrounding co-operation with many and sundry departments of the government, and also, and of equal importance, a mobile reservoir of materials and labor which can be put into immediate use.

Frederick L. Ackerman in the Journal of the A. I. A.

Valuing Professional Brains at Rate of Accepted Payment

The failure of our own Government to avail itself to the fullest extent of the rare qualifications possessed by architects in matters of organization and the supervision of construction, has, since our entry into this war, been the subject of considerable comment. Is this the result of the same enthusiasm to display the highest patriotic duty even at the expense of a temporary loss of professional dignity and position, as set forth in the complaint by the *Architect and Contract Reporter* of London, in the following, clipped from a recent issue of that journal? It states:

"The architects themselves are somewhat to blame for the shabby treatment and small appreciation extended to them by the government. They have been too patriotic, and have given their services in the limited number of cases in which they have been employed either gratuitously or at sweated wages. We know of several able and, before the war, prominent architects who have consented to accept lower rates of payment than they formerly paid their draughtsmen and assistants. The natural result for the bureaucrat has been to value professional brains at the relative payment accepted, as compared with that of the skilled artisan."

Historic Building to Be Moved

It is gratifying to note that the building of the Historical Society of Delaware, which has stood for more than a century at Tenth and Market Streets, Wilmington, Del., is to be preserved. Although giving way to the new public library, which is to occupy the old site, the historic edifice will be carefully reerected on West Street, on park land which has been designated for the purpose by the Board of Park Commissioners.

Zone Ideas for American Cities

At a meeting of the American City Planning Institute, held in New York two weeks ago, delegates were present from Phliadelphia, St. Louis, Newark and other cities. Interesting plans were discussed. Methods and results of zoning were particularly dwelt upon by such authorities upon the subject as: Robert H. Whitten, secretary of the Committee on City Plan; Rudolph Miller, chairman of the Board of Appeals; R. H. Murdock, architect, and Francis P. Schiavone of the Committee on City Plan.

At the evening meeting addresses were made by John P. Fox, consultant to the Committee on City Plan; B. A. Haldeman, engineering adviser to the Philadelphia Zoning Commission, and Harland Bartholomew, engineer of the St. Louis Zoning Commission.

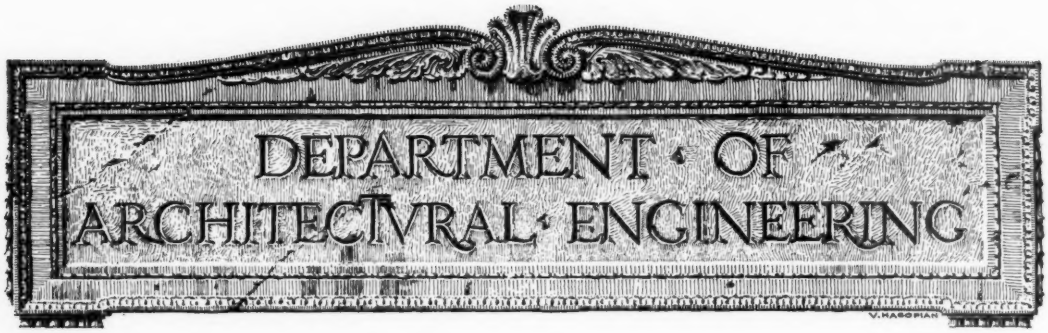
A Request for Catalogs

We are requested by the Commissioner of the Interior, San Juan, Porto Rico, to announce that it is desired to receive by his department catalogs of building materials and supplies, particularly of plumbing, hardware, interior finish and roof coverings. Address all correspondence and catalogs to Commissioner of Interior, San Juan, Porto Rico.

Personal

Durham Brothers, Architects, announce the removal of their offices to 26 South Fifteenth Street, Suite 53, Philadelphia, Pa.

Simon & Bassett, architects, are now occupying their new quarters at 249 South Juniper Street, Philadelphia, Pa.



Pneumatic Water Systems for Country Houses and Estates

By J. Albert Deyo

THERE are a large number of things to be taken into consideration in planning a water system for a country estate or a farmhouse which do not enter into a similar proposition for a city home.

After having decided upon the make of machinery which will be specified or recommended, the next thing for the architect to determine is the amount of water which will be required to take care of the daily needs of the family and the outside demands. For personal use, for cooking and laundry purposes, it is always safe to estimate that there will be needed approximately 50 gallons of water per person. This, of course, covers domestic use only.

If there is irrigating or sprinkling of lawn or garden, then this must be taken into consideration. It requires about 8 gallons of water to sprinkle 100 square feet of lawn and from 16 to 20 gallons to soak it thoroughly. The ordinary ¾ inch garden hose nozzle will require about 6 gallons of water per minute, under pressure of 40 to 50 gallons per square inch, when throwing a solid stream, or about 4 gallons when spraying.

Where there are horses or cattle to be taken care of from the water system, then an allowance of from 10 to 15 gallons per day per head must be made. Sheep and hogs do not require nearly so much water, and an allowance of approximately 2 gallons per day per head will take care of these. For washing automobiles and carriages, for general washing down of buildings and flushing stables it is safe to assume that if more water is required than is contained in the estimate outlined above this can be taken care of by starting the pump and operating it as required.

The make of equipment and the daily water requirements having been decided upon, it is now necessary to decide upon the source of water supply in order that it may be known whether it will be necessary to use a deep well or suction type of pump. If the water will stand within 20 feet vertical lift from the base of the pump, then a suction pump may be used; otherwise it will be necessary to specify the deep-well type, which must be set directly over the well. If the deep-well type of pump must be used it is well to insist that the well must be drilled close enough to the basement wall, if the equipment is to be installed in the house, so that this wall can be extended to take in the machinery. This makes the entire installation frost-proof and obviates the necessity for a separate pumphouse. The sketch shows the usual method of making such an installation.

For a large installation, or where it is not practical to place the well near the basement wall, it is usual to build a pumphouse or to make the installation in the garage.

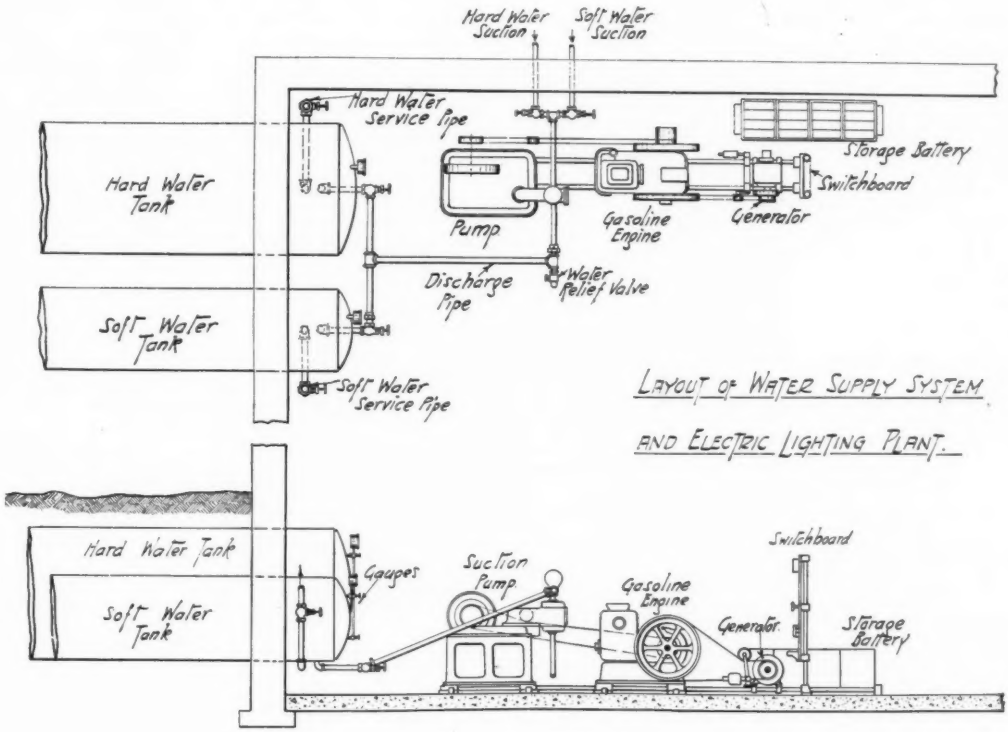
If electric power is available at a reasonable rate it is to be recommended for operating the pump and water system. The photograph shows such an installation consisting of an 8 foot by 36 foot pneumatic tank and a deep-well pump having a capacity of 45 gallons of water per minute against a maximum tank pressure of 100 pounds per square inch. This pressure is, of course, excessive for ordinary purposes, but it is a satisfaction to know that it is available for fire or other emergency. The motor is controlled by an automatic switch, operated by the tank pressure, which stops the pump when the pressure reaches 60 pounds and starts it when the pressure drops below 30 pounds. This pressure can be regulated much more closely than this, but closer regulation means more frequent pumping.

Where electricity is not available, a gasoline engine may be used to advantage, not only for operating the water system, but for making elec-

tricity for lights as well. Such an installation, with two tanks, one for hard and one for soft water, is shown on the accompanying drawing and photograph. The engine is equipped with an automatic device which stops it when the tank pressure reaches a predetermined point, usually from 40 to 50 pounds.

The water for this system is taken from a shallow well and from a cistern. To change the pump from well to cistern it is only necessary to open and close two valves.

The specifications for this installation would be as follows:



LAYOUT OF WATER SUPPLY SYSTEM AND ELECTRIC LIGHTING PLANT.

The contractor to furnish and install complete, where shown on plans and in accordance with these specifications and following the details and instructions furnished by the manufacturer, one complete water system with 48 inch by 24 foot tank for well water and one 30 inch by 10 foot tank for cistern water, combined with one complete electric light plant and engine for operating both systems.

EQUIPMENT

For Water System

One 48 inch by 24 foot plain pneumatic tank for well water.

One 30 inch by 10 foot plain pneumatic tank for cistern water.

One water and one pressure gauge for each tank.

One double-acting horizontal suction pump having capacity of 1000 gallons per hour, fitted with tight and loose pulleys for belt drive; pump to be equipped with device for furnishing air and water at the same time, so that no auxiliary air compressor shall be required; pump to have combined air chamber and check valve, valve to be hard rubber disc on bronze seat; all bearings in pump to be fitted with removable bronze bushings. Pump to be furnished complete with hard oil cups and full set of wrenches.

One automatic stopping device for gasoline engine.

Two sets wood bases for tank support.

One set double 1¼ inch standard discharge connections, with 1¼ inch all-brass angle valve.

One set double 1½ inch suction connections with 1½ inch all brass angle valve.

One set 2 inch service pipe connections with 2 inch all brass angle valve.

One set 1¼ inch service pipe connections with 1¼ inch all brass angle valve.

For Electric Light Plant

One 4-HP gasoline engine of the four-cylinder type with hit-and-miss governor. Fuel feed to engine to be of the sleeve and packing nut type gasoline pump as approved by the National Board of Fire Underwriters. Cooling system of engine to be of circulating type with cooling water to be taken direct from the pump discharge, or of the hopper jacket system. All pins, shafts and cylinder to be ground to a perfect circle and mirror finish. All bearings to be fitted with removable brass bushings.

One switchboard of type to give twenty-four-hour electric service, using lights from battery alone, from generator alone or from generator and battery combined. Switchboard to be of oiled slate, 31 inches by 20 inches by 1½ inches, mounted on bracket castings, supported on 1 inch pipe standards. Switchboard to contain ampere-hour meter, ammeter, automatic circuit closer and breaker, two double-pole single-throw switches, controlling battery and generator circuit, field rheostat, pilot lamp and cartridge fuses for battery and generator circuit.

One 18¾-ampere, 40-volt generator, built according to the specifications of the American Institute of Electrical Engineers and equipped with combined flywheel and pulley, perfectly balanced and holding a uniform speed.

One complete set of pipe bases for mounting gasoline engine, pump, electric generator and switchboard, with necessary belts and idler pulleys.

One set storage batteries of approved type having capacity of 116 ampere hours and 3712 watt-hours. Storage battery capacity to be twenty-three 16 candlepower Tungsten lamps for eight hours on one charge. Capacity of storage battery and dynamo, operating together, battery fully charged, sixty 16 candlepower Tungsten lamps for 8 hours.

Settings

Pressure Tanks and Pumping Unit.—Tanks to be buried underground with heads extending 18 inches inside basement wall. Tanks to be carefully set in place on three wood bases and not to be dropped or allowed to fall. After the tanks have been set and all connections made the outside surfaces shall be cleaned from all dirt and rust spots, using a steel brush. After the surfaces have been cleaned two coats of asphaltum varnish shall be applied, allowing the first coat to dry before the second is applied.

The pumping unit shall be installed upon the pipe bases furnished, which shall be anchored securely to the concrete floor. Sheet lead cushions shall be used to make the pipe bases set perfectly level. These lead cushions shall be placed under all points of contact with anchor bolts extending up through the cushions.

Electric Lighting Plant.—The complete electric lighting plant to be installed in connection with the pumping unit, as shown on blueprints and in accordance with instructions furnished by the manufacturers. Storage battery to be set level on floor of basement or on substantial shelf and to be connected to the switchboard and house service lines, in accordance with instructions furnished by manufacturer.

Connections

Pressure Tanks and Pumping Unit.—Install 1½ inch foot valves of approved type in both well and cistern, running 1½ inch pipes from these to pump, and installing 1½ inch all brass angle valve on each suction line. Install two 1¼ inch discharge lines from pump to tanks. On each discharge line install one 1¼ inch angle valve.

Install and connect automatic stopping device for the gasoline engine in accordance with details furnished by the manufacturer and set automatic stopping device to operate at a pressure of 45 pounds. Connect waste from the discharge of the engine cooling system to discharge into basement drain.

Install a 2 inch service pipe from the well-water tank, and on this pipe install one 2 inch all brass angle valve. Install a 1¼ inch service pipe from the cistern water tank, and on this pipe install one

1¼ inch all-brass angle valve. Install the water and pressure gauges in accordance with the details furnished.

Workmanship and Material

All work in connection with the installation of the water supply system and electric light plant to be done in a neat and careful manner by competent mechanics. All pipe and fittings to be of merchant stock and to be of full internal diameter through entire length. All pipe ends to be reamed after cutting.

Test

A test of 75 pounds pressure per square inch shall be applied to the discharge and service pipes and the pressure tank. The pressure tank to be filled two-thirds full and the service and discharge pipes to be filled full of cold water. This test to be applied for a period of three hours in the presence of the architect, or his representatives, without loss of pressure. Should any leaks appear in the discharge or service pipes, these leaks shall be made perfectly tight in the usual manner. Any leaks appearing in the pressure tank shall be made perfectly tight in accordance with instructions furnished by tank manufacturers.

Many large country estates require quantities of water, both hard and soft, but it is necessary to drill from one to three hundred feet before a sufficient flow of pure well water can be secured. In this event, it is necessary to install two complete systems, one for well and the other for cistern water. As a fair estimate of what will be required under these conditions, for an estate covering thirty acres and having lawns to be taken care of, the following specifications may be used.

The photograph, mentioned before, shows the installation of the hard water pump and the head of the pressure tank extending through the wall of the basement.

Specifications

The contractor to furnish and install complete where shown on plans, and in accordance with these specifications and following the details and instructions furnished by the manufacturer, one complete water system with 48 inch by 24 foot tank for well water, one complete water system with 48 inch by 16 foot tank for soft water and one sewage disposal plant.

EQUIPMENT

For Well Water System

One 48 inch by 24 foot pneumatic plain tank,

One water and one pressure gauge,

One deep well pumping unit consisting of long stroke working-head fitted with differential plunger and having capacity of 20.7 gallons per minute, operated with silent chain drive by 3 HP, 110 volt, 60 cycle, single phase, alternating current motor mounted on cast iron sub-base,

One 3¼ inch by 16 inch all brass artesian well cylinder,

100 feet of 3½ inch galvanized drop pipe and 2¼ inch wood sucker rod,

One automatic starting and stopping device for electric motor.

Connections for 3 inch discharge pipe,

Connections for 2 inch service pipe,

Wood bases for tank supports.

Pump to be equipped with differential plunger and air charging device and with combined air chamber and check valve. Check to be hard rubber disc on bronze seat. All bearings to pump to be fitted with removable bronze bushings. All pins, shafts and plungers to be ground to perfect circle and mirror finish. Unit to be furnished complete with oil cups for all bearings.

For Soft Water System

One 48 inch by 16 foot pneumatic plain tank,

One water and one pressure gauge,

One pumping unit consisting of long stroke triplex pump having capacity of 25 gallons per minute, operated with silent chain drive by 2 HP, 110 volt, 60 cycle, single phase, AC motor,

One automatic starting and stopping device,

Connections for 2 inch service pipe,

Connections for 2 inch discharge pipe.

Wood bases for tank supports.

Pump to be equipped with device for furnishing air and water at the same time, so that no auxiliary air compressor will be necessary. Pump to have combined air chamber and check valve. Valve to be hard rubber disc on bronze seat. All bearings in the pump to be fitted with removable bronze bushings. All pins, shafts and plunger to be ground to perfect circle and mirror finish. Unit to be furnished complete with sight feed oiler and hard oil cups.

Settings

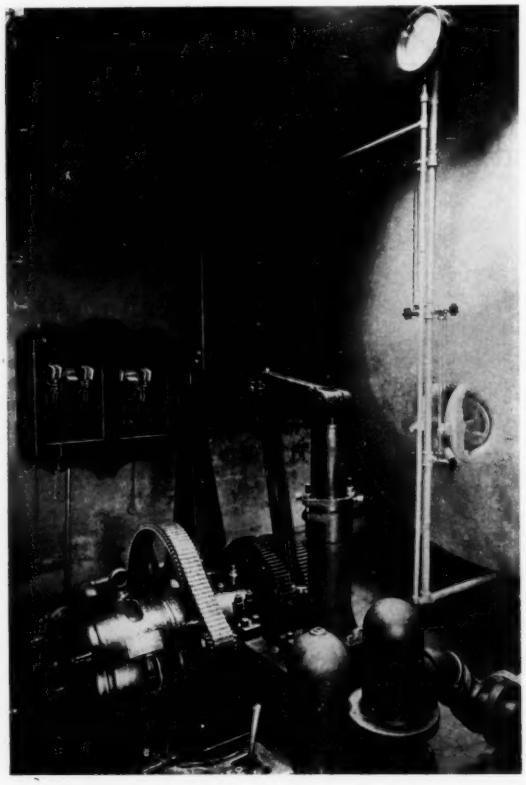
Pressure Tank: Both tanks to be buried underground with heads extending 18 inches inside basement wall. Tanks to be carefully set in place on wood bases and not to be dropped or allowed to fall. After tanks have been set and all connections made, the outside surfaces shall be cleaned free of all dirt and rust spots, using a steel brush. The surface shall be then given two coats of asphaltum varnish, allowing the first coat to dry before the second coat is applied.

Deep Well Pumping Unit: The pumping unit shall be installed directly over the well as shown

and fastened in place by anchor bolts set in concrete floor. Sheet lead cushions shall be used in making the pumping unit set perfectly level; these lead cushions to be placed under the four corners of the pump frame and the two outside corners of the motor frame with anchor bolts extending up through the cushions.

Connections

Install a 3¼ inch by 16 inch cylinder in the well, using sufficient length of 3½ inch galvanized drop pipe and 2¼ inch wood rod so that the cylinder will be submerged at least 25 feet below the per-



manent water level in the well, the drop pipe and rod to be cut to proper length in accordance with instructions furnished by the manufacturers of the pumping unit. Well casing to be cut off above the pump room floor and threaded by this contractor who is to furnish and install stuffing box, packing nut and reducer to make a water tight joint between the drop pipe and top of well casing. Install a 3 inch discharge pipe from pump to pressure tank. On this discharge pipe install one 3 inch gate valve near the tank. Install a 2 inch water relief valve on this discharge pipe between the pump and gate valve and run waste pipe from the relief valve to discharge into the nearest floor drain.

Install and connect automatic starting and stopping device for electric motor in accordance with details furnished by the manufacturers.

Install a 2 inch service pipe from the pressure tank. On this service pipe install one 2 inch all brass angle valve.

Install water and pressure gauges on the pressure tank in accordance with details furnished.

Soft Water Pump: The pumping unit shall be installed as shown on blueprints and secured in place by anchor bolts set in the concrete floor—sheet lead cushions to be used in making the pumping unit set perfectly level, these lead cushions to be placed under the four corners of the frame of the pump and the two outside corners of the motor base with anchor bolts extending up through the cushions.

Connect pumping unit with cistern by 2 inch galvanized pipe, using as few ells as possible, and place foot valve with brass seat and hard rubber valve on the end of the pipe which is submerged in the water. Install a 2 inch discharge pipe from pump to pressure tank. On this discharge pipe install 2 inch all brass gate valve near the tank. Install 1½ inch water relief valve on this discharge pipe between the pump and gate valve and run a waste pipe from the relief valve to discharge into the nearest floor drain.

Install and connect automatic starting and stopping device for electric motor in accordance with details furnished by manufacturer.

Install a 2 inch service pipe from the pressure tank. On this service pipe install one 2 inch all brass angle valve.

Install the water and pressure gauges on the pressure tank in accordance with details furnished.

Workmanship and Material

All work in connection with the installation of the water supply system to be done in a neat and careful manner by competent mechanics. All pipe and fittings to be of merchant stock and of full internal diameter through entire length. All pipe ends to be reamed after cutting.

Test

A test of 75 pounds pressure per square inch shall be applied to the discharge and service pipes and the pressure tank. The pressure tank shall be filled two-thirds full of water and the service and discharge pipes shall be filled full of cold water. This test to be applied for a period of three hours in the presence of the architect, or his representatives, without loss of pressure.

Should any leaks appear in the discharge or service pipes, these leaks shall be made perfectly tight

in the usual manner. Any leaks appearing in the pressure tank shall be made perfectly tight in accordance with instructions furnished by the tank manufacturers.

Sewage Disposal

The contractor to build and install complete where shown on plans sewage disposal system in accordance with the accompanying details. The following special fittings and castings will be required:

One bridgewall casting,
Bolts for attaching to concrete form,
Inlet clamp and bolts,
Syphon clamp and bolts,
One syphon,
Two manhole rings with covers.

Concrete Tank

The liquefying tank and syphon chamber are to be built of concrete, 1-3-5 mixture, and are to be made perfectly water tight. This tank to be tested for tightness before top slab is cast. The top slab is to be reinforced with expanded metal or reinforcing rod. Manhole rings to be set in slab as shown.

The bridgewall casting is to be set in place and secured to concrete forms. The syphon and inlet fittings are to be attached to the bridgewall casting by means of clamps before the forms are filled. The inlet fitting and the discharge from the syphon to be 4 inch cast iron soil pipe and fittings. The 4 inch quarter bend of the inlet fittings to have a 1 inch hole drilled in top. (See details.)

Connections

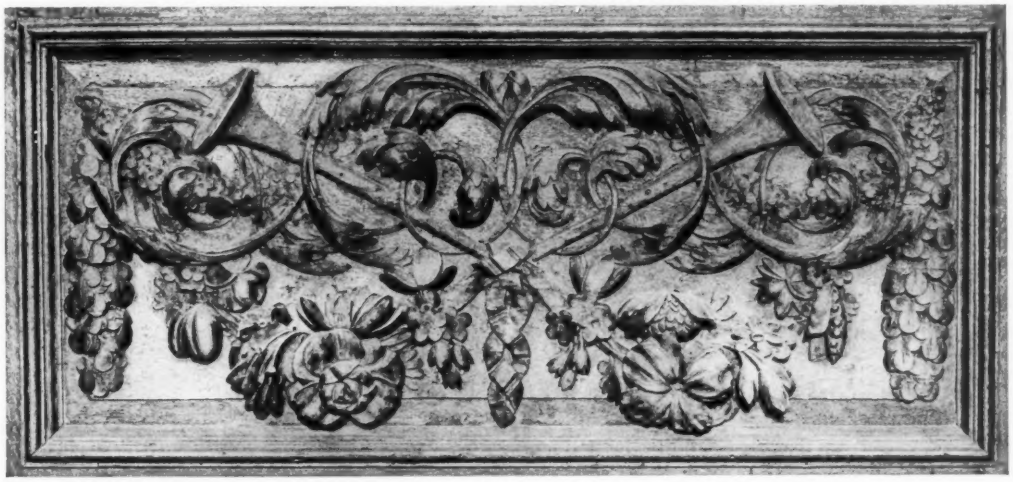
The sewer line from the building to the liquefying tank to be 4 inch vitrified sewer tile laid with cemented joints and with a fall of at least ⅛ inch per foot. This line will require approximately.... feet of tile.

The discharge line from the syphon chamber to the tile disposal field to be 4 inch vitrified sewer tile, laid with cemented joints and with a fall of at least ⅛ inch per foot. This line will require approximately .. feet of tile.

Tile Disposal Field

The tile disposal field to consist of a single system as per general details shown. The trunk line of the field to be 4 inch vitrified sewer tile and Y branches, laid practically level with cemented joints.

The branch lines of the tile field to be 4 inch common drain tile, laid practically level and with the joints ⅜ inch open. The top of all joints in branch lines to be covered with tarred paper. The total length of all branch lines to be 125 feet.



Notes on Industrial Housing

A War Emergency in Industrial Housing

In a letter addressed to President Wilson by Lawrence Veiller, secretary of the National Housing Association, the President's attention is called to the pressing need of prompt measures to secure proper housing accommodations for the large body of industrial workers required to man the plants for the activities incident to our war preparations. It is pointed out that the health and well-being of these employees becomes not only a public duty but also an economic necessity to secure and retain the quality of labor required.

The formation of a board or other agency with power to act is strongly urged. The letter further states:

Such a board should adopt and apply, as opportunity offers, suitable standards for the proper housing of workers on Government contracts or in Government-owned plants. Furthermore, in any case where Government aid may prove to be necessary to expedite proper housing, in order to secure a full and early output of ships and munitions, the board or agency established should have power to make loans and use other means necessary to secure prompt, adequate and satisfactory results.

There is grave danger that without immediate action along the above lines and in the haste by those concerned in war industries to provide accommodations for employees that housing of such unsatisfactory character may be furnished as will fail to attract an adequate and contented force of workers. Moreover, the influence which these housing developments under Government control will exert by way of example either for good or for bad upon the general trend of industrial housing in the United States seems to us a matter of great moment.

War Time Housing

In a special report of the Committee on War Time Housing of the National Housing Association, of which Grosvenor Atterbury is chairman, the subject of present housing conditions is very fully discussed.

The committee urges government intervention in the following manner:

1. The establishment of a housing administration of the Federal Government.
2. The immediate appointment of a housing administrator to have direct charge of the housing of the workers in the war industries of the country.
3. That legislation be obtained from Congress empowering the President to:
   a. Loan Government money upon proper security to employers of labor and to other agencies for the housing of workers in industries producing goods in the opinion of the President necessary for the successful conduct of the war.
   b. To build houses, for sale or rent, buy and condemn land and take all necessary steps for the development of communities in which workers in such industries are to live.
4. That money be appropriated in sufficient amount to enable the President to carry out this work.
5. That in order to avoid dangerous delay pending action by Congress, the President provide from funds that may be available the small amount of money necessary to enable the requisite preliminary work to be done.

As illustrative of what is needed in this respect, it cites the following:

A. Appointment of a small board of technical experts.

B. A quick survey to determine those communities where additional housing is most important to the war.

C. A selection from these of those cases which can be met by the loan of Government funds as distinguished from the building of houses by the Government.

D. An estimate of the amount of money needed for such loans, and a thorough investigation of the basis on which they are to be made and the character of security to be required.

E. The adoption by the housing administration of standards to which dwellings on which governmental money is to be loaned must conform. The determination of such questions as the type of house and the materials and method of construction, etc.

F. A field study of local conditions in those communities where it may be necessary for the Government to do its own building.

Lack of Housing Accommodations

Inquiry made by the Special Advisory War Shipping Committee of the Merchants' Association of New York, among ship contractors for Emergency Fleet Corporation work in the vicinity of New York Harbor has brought responses which show that among the chief problems confronting the shipbuilders is the dearth of adequate housing for industrial workers.

The problems of providing additional housing facilities, of improving transportation facilities and of obtaining a greater supply of labor are practically one problem, inasmuch as the difficulty of obtaining labor is in many cases due almost entirely to lack of housing and transportation facilities. One shipbuilder states that his one great problem is to get two thousand workmen, but he believes this problem might be easily solved if he could provide housing accommodations for them.

"Economy" Boilers

In the types of boilers manufactured by the International Heater Company, Utica, N. Y., great pains appear to have been taken in order to furnish a satisfactory product, one that would combine economy of fuel with the greatest possible efficiency. Special devices and appliances have been perfected in order to aid in the operation of these boilers. This company has branches and warehouses in Chicago and New York, and claims to have made the most rigid tests before submitting its special products to the public.

Electrical Specialties

The Chelten Electric Company, with general offices and factory in Philadelphia, have issued a catalog of electrical specialties for 1918. List prices are given, mention is made of important installations of their work, and the whole catalog conveniently indexed. The subject of electric switches in general seems to be thoroughly gone into in this catalog, while various needs of the many automobile companies of this country are not forgotten.

Ornamental Facing Brick

The Beaver Clay Manufacturing Company, with main offices in New Galilee, Pa., have issued an interesting catalog to set forth their products. In the manufacture of their ornamental brick the makers claim that only the best of material has been used, and that great care has been exercised in the entire process.

Four types of brick are supplied by this company, with varying grades of smoothness of texture. Particular attention has been given to shades of color, this being well represented in the many color illustrations shown in their catalog. They refer especially to the excellent results obtained by the use of their ornamental brick for fireplaces in residences, as well as in positions where brick of special manufacture is needed, as for molded shapes and arches. The Beaver Clay Company claim that by reason of their long experience they are able to be of great assistance to the architect.

Ventilators

The Ideal Ventilator Company, 370 Waterman Street, Providence, R. I., in a recent booklet claim to have solved, by the application of a simple device, many problems in ventilation which heretofore have perplexed architects. A list is given of the many firms in the United States who have had the particular type of ventilator manufactured by this company installed in their buildings. Architects might find it worth their while to investigate the claims put forward in regard to this product.

Overhead Trucking

The Richards-Wilcox Manufacturing Company of Aurora, Ill., with branches in other cities and Canada, specialize in the construction of overhead trucking and carrying systems in their various forms. In their bulletin, "Doorways," they illustrate the various adaptations of their sliding-door constructions, where their overhead "R-W Trolley Track" seems to have been effectually used in buildings ranging from factories to residences. A particular style of door closer and check for swing doors is also manufactured by this company.

Their overhead trucking and carrying system, with its claimed economy of manual labor, surface space, time, and avoidance of accident, would recommend it especially to architects engaged in factory construction. The general catalog published by this company will be sent on request.

"Industrial Russia"

The Champion Coated Paper Company, 108 Duane Street, New York City, issue monographs from time to time in order to call attention not only to their line of paper, but also to furnish some interesting information.

Their November bulletin takes up the subject of "Industrial Russia," a timely question. Statistics are given in regard to the forests and crops of Russia, the cotton and mining industries, as well as a number of other valuable items. It is stated, for instance, that Russia leads the world in the production of wheat, oats and rye. Russia is also said to be second to the United States in the production of petroleum.

Protective Devices in Electric Installation

The Metropolitan Engineering Company, 35 Vestry Street, New York City, in a recent bulletin set forth the advantages of their system of installation, by means of which electric service switches, meters, etc., can be so placed that proper means of precaution can be taken.

This company states that by their methods of prevention, dangers from accident and interference are practically eliminated. The whole subject will be found of interest to the architect.

Safety First Booklet

The Youngstown Sheet & Tube Co. (Member N. F. P. A.) has issued an admirably printed little 24 pp. booklet which shows the successful safeguarding of the large mechanical units used in producing metal sheets and tubes. Safety Director James M. Woltz will send a copy to members desiring it. Address him in care of the company, Youngstown, Ohio.

Pedestal Pile Construction

A distinct advance in concrete construction is claimed by the MacArthur Concrete Pile and Foundation Company, 120 Broadway, New York City. This firm, allied with the MacArthur Brothers Company, has been in existence since 1826, and in their recent booklet set forth some of the results of their engineering experience.

By the use of the Pedestal Pile many difficulties are, it is claimed, removed, even where soil conditions are most adverse. The enlarged base of the pile helps to make a stable foundation without corresponding increase in cost. Detailed information is given in this booklet as to the construction of the Pedestal Pile, while a list is given of users in the United States, Canada, and Japan. Engineers, architects and contractors will find much of interest in the pamphlet issued by this company.

Draughtsmen's Supplies

F. Weber and Company, 1125 Chestnut Street, Philadelphia, with branch offices in Baltimore and St. Louis, specialize in artists' materials and draughtsmen's supplies. This company lay particular stress on their various styles of "Fabriano" handmade drawing papers, and state that they are the sole agents in the United States for these papers. The Fabriano process is claimed to have been used in Italy for more than four hundred years, resulting in paper of strong fiber and even texture. F. Weber and Company also manufacture a waterproof drawing ink, as well as other inks of various colors.

National Board of Fire Underwriters

The National Board of Fire Underwriters, with offices in principal cities, have issued, in a recent booklet, a list of inspected and approved mechanical appliances. This list has three main divisions: (1) Fire appliances, (2) Gas, Oil and Chemical Appliances, and (3) Safety Appliances. The careful methods of inspection and labeling used in regard to the products of various manufacturers is of valuable assistance in insuring public safety.

Ventilating Equipments

The American Blower Company, Detroit, Mich., with sales offices in principal cities of this country and Canada, claim that their "Sirocco" method of ventilation is the "last word" in air conditioning. By the installation of the Sirocco Air Purifier in the basements of buildings the air is not only cleansed, but, it is claimed, an even temperature is maintained both winter and summer.

Data are also given in regard to the various types of Forge Blowers manufactured by this company, and particularly their Fans, which are to be used in many kinds of service, from the purification of the air in mines to kilns and brickdrying equipments. A number of booklets, which will be sent on request, are issued by this company.

XUM