THE ARCHITECTURAL RECORD

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THE ARCHITECTURAL RECORD

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FIG. 1. CANTERBURY CATHEDRAL, CHOIR; TRINITY CHAPEL BEYOND.

THE ARCHITECTVRAL RECORD

VOLVME XLI NVMBER I

January, 1917

Gothic Architecture and Its Critics

Part 4 - The English Gothic Style

By A. D. F. Hamlin

IN the development of that medieval architecture which, by reason of certain underlying unities and resemblances, has been for some centuries collectively called Gothic, each country impressed upon it a form and direction which differed from those it received in other countries. We speak of the French Gothic, the English Gothic, the Spanish Gothic, in recognition both of the diversities and of the unities of that marvelous architectural movement which covered Western Europe with churches and cathedrals between the middle of the twelfth century and the end of the fifteenth. These unities were not merely on the one hand that of the ritual and discipline of the uniform church which they served, nor on the other that of mere form and detail. It is no mere superficial resemblance of pointed arches and pinnacles and tracery that warrants our applying the common name "Gothic" to all the varied phases of the medieval ecclesiastical and even domestic architecture of Western Europe. Doubtless these superficial resemblances and that ecclesiastical unity are what appear most obvious in this architecture; and it is perfectly true that the term "Gothic" was wholly unscientific in its origin, as used to designate all medieval work because of its non-conformity to the "correct" or classic manner of antiquity and of the Renaissance. But it is also true that the later narrowing of its popular application, to designate the pointed architecture of the Middle Ages, was justified by those underlying unities which are traceable in all the Gothic styles, though so often obscured by their differences. The fundamental structural problem which dominates all these styles is the ribbed intersecting vault and the means for supporting and abutting it; and the features which I enumerated in a former paper* as characteristic of these styles were chiefly derived from or consequent upon the development of the various solutions of this structural problem. Through all these solutions runs a more or less systematic division of the loads from the thrusts, with separate provision

*In the Architectural Record for May, 1916.

for each, and a shaping of members with reference to the structural function of each. These fundamental principles are recognizable in all the styles, though it is only in the Ile-de-France Gothic that they are expressed with complete and thoroughgoing consistency.

Professor Moore declares, however, with great positiveness, in his article in the September RECORD, that "there never was any general movement covering all Western Europe governed by a common structural principle"; and that, therefore, as I had accepted the principle that structural systems furnish the true basis for architectural discriminations, I am inconsistent in my definition of Gothic architecture given in the May RECORD. He implies that my definition ignores construction or "structural" principle. On rereading it I can find no warrant for the charge. If the "problem of the construction and adornment of the cruciform church with aisles, wholly vaulted with stone," which is there specified as the criterion of the Gothic styles, does not involve a structural principle as well as structural methods, I do not know what the word "structural" means.

In his assertion that there was "no general movement covering Western Europe governed by a common structural principle," therefore, Professor Moore begs the very question at issue; or, rather, simply reasserts the very proposition which I was protesting against—the implied assumption that the only structural principle to be recognized as a criterion of Gothic architecture is the stone skeleton of the Ile-de-France churches with practically no walls except of tracery and glass. This contention ignores, without controverting, the broader view accepted by nearly all the writers of recent times, that the European Gothic styles are all fundamentally based on the effort to solve the problems (a) of the construction of ribbed vaulting over the high central aisles as well as over the side aisles of the churches, and (b) of the support and abutment of these vaults. Sir Thomas Jackson, the latest and most scholarly of all the English writers on the subject, makes a dignified protest against the restriction of the term Gothic to the Ile-de-France style in his *Gothic Architecture* (ii, 254-258); a passage to which I must refer my readers, as it is too long to quote entire and too fine to mutilate by quoting mere fragments. May I be permitted further to observe that nowhere in the article which Professor Moore criticizes have I asserted that structural principles are the *sole* criterion of an architectural style; it is he, not I, who so considers it. In that same article I enumerate all three basic elements of architectural design—plan, construction and decoration; not structural principle alone. Inasmuch as Professor Moore later on in his article admits that "a style must be defined by its features, for it is only by its features that it can be known," and furthermore admits that he cares little about the term Gothic, the inconsistency would appear to be on his side, in restricting the term to the Ile-de-France structural system, as he practically does by calling all other styles by other names.* He disclaims wishing to impose his views on others. I must, therefore, have been mistaken in supposing that it was for that purpose that he wrote and published the books to which I have referred.

I regret that my space limits prevent my taking up in detail his other criticisms of my article, as they supply material for a very interesting discussion.

This fundamental structural problem of the ribbed groined vault and its support and abutment, common to all the Gothic styles, was differently handled in different countries. Differences of climate, environment, materials, racial predilection and tradition, the varying relations of the Benedictine orders with each other and with the bishops, the varying attitudes of the civil and religious powers and of the people to both, all produced wide local variations of the general style. The differences between the various phases of the Gothic architecture are so great oftentimes as to obscure the underlying unities to which I have referred. Of all these various styles that which was developed by the English is

*I make my apologies for having charged him with calling them "false" and "bastard." These adjectives do not occur in his writings, which are uniformly courteous and restrained in expression.

the most consistent and at the same time the most strongly national. It would appear that the English Gothic system was derived primarily from the French, and did not develop spontaneously and independently from the English Norman which preceded it. But the ideas and features of French origin were blended by the English with ideas and methods characteristic of the Anglo-Norman, and out of this blend they developed a national style of remarkable beauty.

In discussing the relations of the English and French styles the critics are divided into three schools: the ultra-English, who deny or minimize the French influence; the ultra-French, who magnify the French at the expense of the English share in the development of the style; and a third group who recognize certain French origins and influences, but give full credit to the English for what they developed out of these foreign elements. To the first class belong J. H. Parker (*Introduction to Gothic Architecture*) and E. S. Prior, author of an excellent account of *Gothic Architecture in England*. To the second class belong Professor Moore and the Frenchman Corroyer. To the third we must assign Viollet-le-Duc, the Frenchman; Sir J. Fergusson, Professor Simpson and Sir T. G. Jackson among English writers, and Mr. R. Sturgis and Professor Frothingham, the Americans. These lists are, of course, not exhaustive; they are intended merely to give an idea of the attitude of a few of the more prominent writers on the subject.

Thus Mr. Prior asserts in his Preface that "his survey of the cathedrals and most of the monastic remains and larger parish churches of England has given him opinions which * * * are at variance with the assertion of the great French architecture being the mother of all Gothics" (*sic*). Further, as in the first chapter, he declares that "our English art has lately particularly suffered from this misapprehension. The idea is now continually advanced that our English styles were at their starting always mere borrowings, and that constant reinforcements from France were added to enable us to produce Gothic at all. Canterbury and Westminster have been considered as conclusive for this view even by some English writers, whose acquaintance with our English art might have been supposed to have given them a wider outlook."

All the earlier English writers were wont to insist, often with little critical discrimination, on the purely English origin as well as the purely English development of the English Gothic style.

As an example of the claims of the second group, represented with great erudition of scholarship and in a literary style which makes his *Development of Gothic Architecture* a masterpiece, one should read Professor Moore's Chapter VI in that work and the whole of his *Mediæval Church Architecture in England*. A brief quotation must suffice to outline his general position. In the first named work he says (p. 196, ed. of 1899): "But the choir of Canterbury was the real beginning of what Gothic there is in the pointed architecture of England. From it, as the main source, is derived, in so far as structural elements are concerned, what is known as the Early English style." In the last chapter of that work, after reviewing his contention that the Early English style is not Gothic, but Pointed Anglo-Norman, he says: "This architecture cannot, therefore, be properly called English in the sense of being a purely native product; it is Anglo-Norman. And this is, of course, largely French, since the dominant artistic influence under which both Normans and English worked at this time was that of France" (*op. cit.*, p. 426).

Professor Frothingham, in his admirable continuation of Sturgis' *History of Architecture*, has clearly and concisely presented the view of the third group. He says in the fourth volume of that work (p. 3): "An exceptional position is taken by England. She is a splendid second to France in the race for honor, leaving other countries hopelessly distanced. More than this, while what is considered the orthodox system of Gothic construction and decoration was born in France, England may claim that she experimented independently in its basis,

FIG. 2. LINCOLN CATHEDRAL, PRESBYTERY, EAST WINDOW; CLUSTERED MARBLE SHAFTS; TIERCERON VAULT; CORBELED VAULTING SHAFTS; MULTIPLIED LINES AND RICH DECORATIVE EFFECTS.

the ribbed cross-vault, about as early as this was done in France. England also from the beginning made an independent application of Gothic principles and developed its artistic forms under different names. She soon contributed original elements to the common stock, in ground plans, systems of subsidiary vault ribs and forms of tracery. * * * No European country showed such a dominance of national traits."

II.

When the same facts give rise to diametrically opposite conclusions in different minds, what is the perplexed reader to conclude? Plainly this, at least: that in the study of a complex subject the opponents have emphasized different facts, or different aspects of the same facts. He is, therefore, pretty safe in assuming that the truth lies somewhere between the opposite extremes of opinion, unless, indeed, the arguments are overwhelmingly on one side. In the present instance a fair balancing of the arguments on both sides seems to me to warrant a conclusion somewhat as follows: Though there were sporadic instances of the pointed arch and ribbed groined vault before 1175, these nowhere showed a clear apprehension of the principles and methods followed at that time in France. The first building erected in a post-Romanesque style, with ribbed vaulting and an approach to the Gothic as it then existed in France, was the choir of Canterbury, by William of Sens, and his successor, William the Englishman (1175-1184). How far Trinity Chapel and Becket's Crown built by the English William are an "English" or "French" work is much discussed, but it shows no notable departure from the style of the choir, except in details which must be considered as English. Lincoln Cathedral, begun in 1192, is a purely English Gothic church, in plan, construction and detail. It was undoubtedly influenced by the new choir and East end of Canterbury, but hardly enough to merit the adverb "profoundly" used by Moore. The contemporary nave of Wells shows much less of the Gothic spirit and method. But from Lincoln on the English style was developed independently, on lines which diverged widely from the French, from which it received no accession of influence except in the single case of Westminster Abbey, in which the plan of the choir and sanctuary is French, and so is the loftiness of the church compared with the width of its central aisle. But this is an isolated example; the French influence stopped there; nowhere did there appear another design perceptibly influenced by Westminster. The English Gothic continued to develop through the Decorated into the Perpendicular style, with no slightest touch of French influence, except at first in its Geometric tracery. This influence is returned later in its Curvilinear tracery, which apparently gave the first start to the French Flamboyant tracery; and in the vaulting of a few late French churches in Normandy with multiple ribs somewhat after the English manner.

But in all this discussion of what is French and what is English, one is apt to forget that in the twelfth and thirteenth centuries national lines were not drawn as they are now. The kingdom of France was the Ile-de-France, a small territory. Burgundy and Brittany were practically independent dukedoms. Throughout the second half of the twelfth century and the early years of the thirteenth, Normandy, Brittany, Anjou and Aquitania—practically the western half of France—were under the English Plantagenet kings. French was the official language of the English court, and not till well on in the fourteenth century was it finally banished from the English schools. The Norman element was strong in the upper ranks of the English people. All this Mr. Prior has set forth very clearly in his *Gothic Architecture in England*. The Cistercian order, whose influence in the plan and construction of English churches was undoubtedly important, originated in what we now call France, as a protest against the luxury and splendor of the Clunisian Benedictines, but it can hardly be called French, except in that sense. Its members were of all races and countries, and the constant interchange of members between the different chapters tended to obliterate na-

FIG. 3. LICHFIELD CATHEDRAL, CHOIR; TIERCERON VAULT, STRONG RIDGE RIB, RICH INTERIOR DECORATIVE MEMBERING.

tional lines and purely national influences. Among all the peoples of Europe the English were the nearest to the modern conception of a nation—a people under one government, with common tastes, ideas and aspirations.

English Gothic architecture reflects this fact: it is more nearly alike in character in the different parts of the kingdom than is the French or German or Italian. It cannot be sharply divided into provincial schools like the French schools of Normandy, Burgundy, Anjou and the Ile-de-France. The variations in its products are many and wide, but they are individual or local, not provincial.

III.

In my paper on the *Logic of Gothic Architecture** I referred briefly to the English treatment of vaults, buttresses and vaulting shafts. They deserve a somewhat fuller notice in considering the English "logic" and lack of logic. Professor Moore, as has been observed before in these papers, dwells frequently on the failure of the English to design logically, not only in their disregard of the Ile-de-France conception of the skeleton frame of stone, but also in their treatment of details, particularly in the design of their piers and vaulting shafts. Most of his conclusions flow logically from his implied major premise that the only true Gothic architecture is that of the Ile-de-France of the thirteenth century. This major premise, as I have shown, is not conceded by the majority of modern writers. But apart from the acceptance or rejection of that assumption it is fair to ask whether there is not in English Gothic architecture evidence of a logic proceeding on other lines than those followed by the Ile-de-France builders, as rational from its own point of view as the French from its own.

The Anglo-Norman had been developed into a splendid phase of ecclesiastical architecture which, in spite of its French origins, was unmistakably and completely English. The great abbey churches of Durham, Norwich, Canterbury, Ely and Peterboro were certainly not surpassed in dignity and architectural splendor, if they were equalled by contemporary churches, in France or the Rhine Valley. These great churches were, however, vaulted only over the side aisles; the lofty central aisle was roofed invariably with wood. England was abundantly supplied with timber, especially with oak, and the English preferred using this abundant material to constructing huge vaults over the nave and choir. Yet all these churches were built with an almost Egyptian massiveness, abundantly strong to carry the high vaults; and in many cases the piers are membered with vaulting shafts as if vaults were contemplated from the first. This I believe to have been the intention in each case; and I attribute the abandonment of this intention partly to timidity due to inexperience in large vaults, partly—perhaps mostly—to fear of inadequate foundations. Sir T. G. Jackson has called attention to the inferior and often careless work in the foundations. Undoubtedly the massive masonry settled during construction, without serious cracks and fissures, perhaps, but sufficiently to deter the monks from adding the heavy load of a high vault. Vaults were added later, it is true, to Durham,* Gloucester, Tewkesbury, and Norwich, and usually with little regard to the membering of the substructure. It is a notorious fact that the medieval builders in altering existing buildings were generally quite indifferent to the demands of unity of treatment and more or less contemptuous of the original designers. The spire of Salisbury is a conspicuous exception.

When, after sporadic experiments with pointed arches and ribbed vaults (at Malmesbury, Fountains, Bristol chapter house, etc.), the splendid choir and Trinity Chapel rose from their foundations at Canterbury, the English became acquainted for the first time with the new conceptions of architecture that were then (1174-84) maturing in France. Certain features of this new architecture made a great impression on the English

*In the Architectural Record for August, 1916.

*There is much controversy as to the date of the Durham vault. I incline personally to the view that it was added some time after the original construction, to replace a temporary wooden roof not contemplated in the original design.

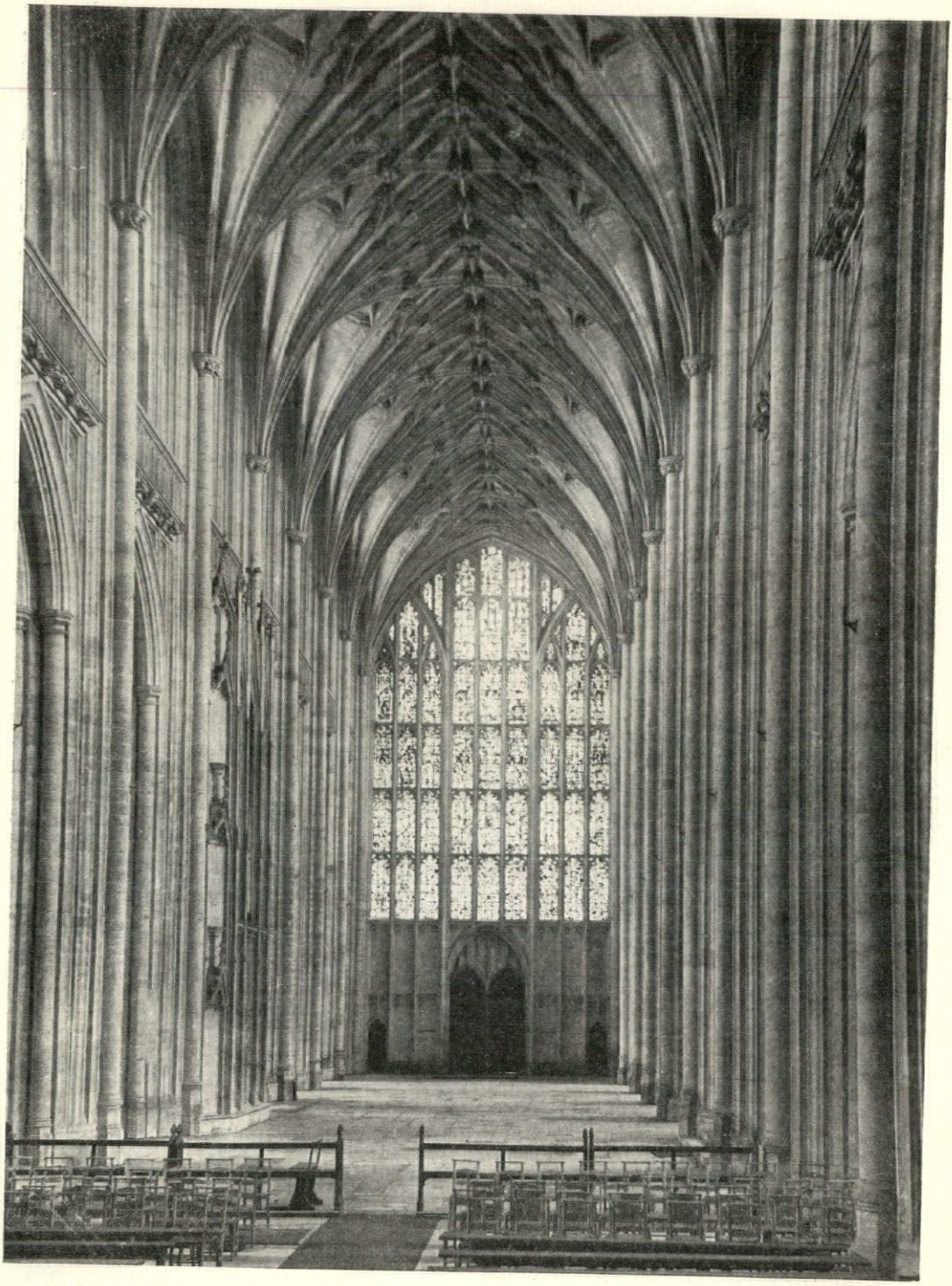


FIG. 4. WINCHESTER CATHEDRAL, NAVE; LIERNE VAULTING, PERPENDICULAR WEST WINDOW; SINGLE CONTINUOUS VAULTING SHAFT.

monastic builders, particularly the clustered pier with attached or detached shafts of hard stone or marble, and the six-part vault which appears soon after in the transepts of Lincoln and two or three other instances. The English builders, however, while they used ribbed vaulting and the pointed arch and clustered shaft, long refused to abandon wholly the conception of the massive continuous wall in favor of the organized skeleton of stone after the French fashion. As has always been the English custom, they effected a compromise. As Prior says, the Englishman's "genius was for compromise. The articulated and balanced construction which took the Frenchman's fancy and became to him a domineering mistress was still to the English artist only a helpmate." He reduced very greatly the massiveness of his Norman construction, but preferred to retain something of its expression of stability by the use of a superstructure much heavier than the French. He declined —very likely he feared—to depend upon external abutments and flying arches alone for the stability of his vaults.* With heavy clearstory walls he could afford to lower his flying arches and protect them under his side-aisle roofs. He distrusted the permanence of exterior props, exposed to the peculiarly trying extremes of the English climate. It is plain that he disliked the appearance of the huge array of doubled flying arches and the forest of pinnacles which he saw in the churches of Normandy and the Ile-de-France. Moreover he preferred the effect of long and relatively low vistas to the effects of airy loftiness which the French builders were producing. We may not agree with his tastes and preferences, but they were perfectly legitimate, and his whole system was logically consistent and harmonious within itself. He developed it into a wholly new architecture, as widely different from the precedent Anglo-Norman as from the Ile-de-France Gothic. It was still a monastic architecture chiefly, and retained certain characteristics of the Anglo-Norman buildings—their length and a small share of their massive wall masonry; but it seems to me very misleading to call it "Pointed Norman." For it was a vaulted style, which the Anglo-Norman was not, and it differs from the Anglo-Norman fundamentally in structural conception and in architectural membering. The Norman apsidal termination was universally given up in favor of the Cistercian square east end, while the reduction in the area of supports was revolutionary, notwithstanding the massiveness of the piers of Exeter and one or two other churches. Lincoln cathedral, for example, is said by the late C. F. Penrose, an extremely careful writer, to have the smallest proportion of solid to void in its supports of any large vaulted building in Europe.

Professor Moore points out the general lack of exact correspondence between the English vaulting shafts and the vault ribs they carry. The fact is undeniable; the question arises how far such exact correspondence is really necessary from the point of view of design. Bearing in mind the fact that the vaulting shaft performs no real structural function, but serves the purely esthetic purpose of providing an apparent support for the vaulting and of visibly dividing the bays by a vertical line, the deficiency of logic in this lack of correspondence becomes more apparent than real. Whether the single vigorous shaft of Winchester nave, for example, is or is not more satisfactory than the group of five shafts of Rouen (shown in my Figure 3 in the August RECORD), given the whole style and proportions of each edifice, is really a question of taste. Nevertheless, the general proposition is quite justified that the English cared far less than the French for that rigid structural logic which was the glory of the Ile-de-France. This is admitted by many of the writers of the third group, both English and American, like Sir T. G. Jackson, Mr. Prior, Mr. Cram and Professor Frothingham. Several of these decry the extremes to which the French carried their logic of the stone frame, noting the constant repairs which these extremes have made necessary; all of them assert

*See Mr. Francis Bond's excellent discussion of the English systems of vaulting and abutment in his Introduction to English Church Architecture, Vol. I.

the countervailing decorative beauty of the English structures.

With the rejection of the skeleton system of supports goes the whole group of its logical accompaniments. With relatively low vaults and massive clearstories, flying arches above the aisle roofs became unnecessary or were added *pour surcroît de sureté*. When employed they were generally kept low and given a steep slope. I believe a graphical analysis of the strains will prove that in this the English were better and more logical engineers than the French, who used two arches, one much too high and the other perhaps too low, to do what should logically be done by one arch.* The omission of the wall buttress against the clearstory was an obvious corollary of the English system. More logical also than the French, as I have shown in my last previous article, was the English builder in springing his vaults, as he often did, from vaulting shafts carried on corbels and not starting from the ground. I am glad to find my contention on this point supported by so high an authority as Sir Thomas Jackson's, whose acquaintance with problems of vault-abutment is practical as well as theoretical.

Coming to the subject of the vaulting itself, it is interesting to note how the practical Englishman, although he rejected the system of the stone skeleton for his supporting masses, where it did not seem to him to be necessary, adopted it for his vaulting, where he felt its aid to be imperative; not only adopted it, but carried it out in a far more thoroughgoing manner than the Frenchman, and pushed it to its utmost limits of structural and then of decorative application until he had exhausted its possibilities. The introduction of tiercerons or intermediate ribs, to reduce the width of the fillings and get rid of the twisted surfaces of the French vaults which he disliked, brought with it the necessity of ridge-ribs to abut the opposed tiercerons which are, of course, not in the same plane. I am unable to conceive why this ingenious and admirable extension of the principle of the vault carried on a frame of six ribs to a vault on a frame of eight, ten or twelve ribs, should be considered a "violation of the principles of Gothic art, in which no superfluous features occur." The tiercerons and ridge-ribs are anything but superfluous; and while opinions may differ as to the relative beauty of the French and English vaults, one must, I think, admit that the latter represent an admirable and logical structural device. Its decorative richness was in harmony with the whole English system of interior design, which, lacking the element of great loftiness, gave added effect of scale to its long vistas by multiplying all the architectural lines—shafts, arch moldings and vault ribs. After speaking of the English molded caps, Frothingham observes (Vol. IV, page 6): "She" [England] "also used her uniquely heavy walling to create effective, strongly undercut and massive groups of moldings. In both these fields she had no rivals."

Professor Moore regards it as a great defect of the English vaults that the wall arches are not stilted, so that the severy widens against the clearstory wall all the way from spring to crown. The pressure of the vault is thus not concentrated effectively against the vertical strip of the clearstory wall which is abutted by the wall buttress. But with the massive clearstory wall of the English system such concentration was not at all necessary, while the English avoidance of the stilted wall-arch carried with it the avoidance of the French plowshare twist of the transverse vault-panel.

Moreover, I am sure Professor Moore greatly exaggerates the importance of the concentration to which he refers. The cross-vaults themselves exert, of course, no thrust except in the direction of the length of the church. Their only service of "concentration" therefore is to transmit the thrust of the diagonal ribs (in a French vault) to the clearstory. If this thrust were considerable, it might be structurally important to warp the transverse fillings by stilting the wall arch as the French did, thus transmitting the thrust of the groin rib to the wall directly behind the clearstory wall buttress. But only one component of the thrust of that rib is thus transmitted, and that is

*See Guadet's analysis of St. Ouen at Rouen and the ideal flying arch strut-form in my article in the August Record.

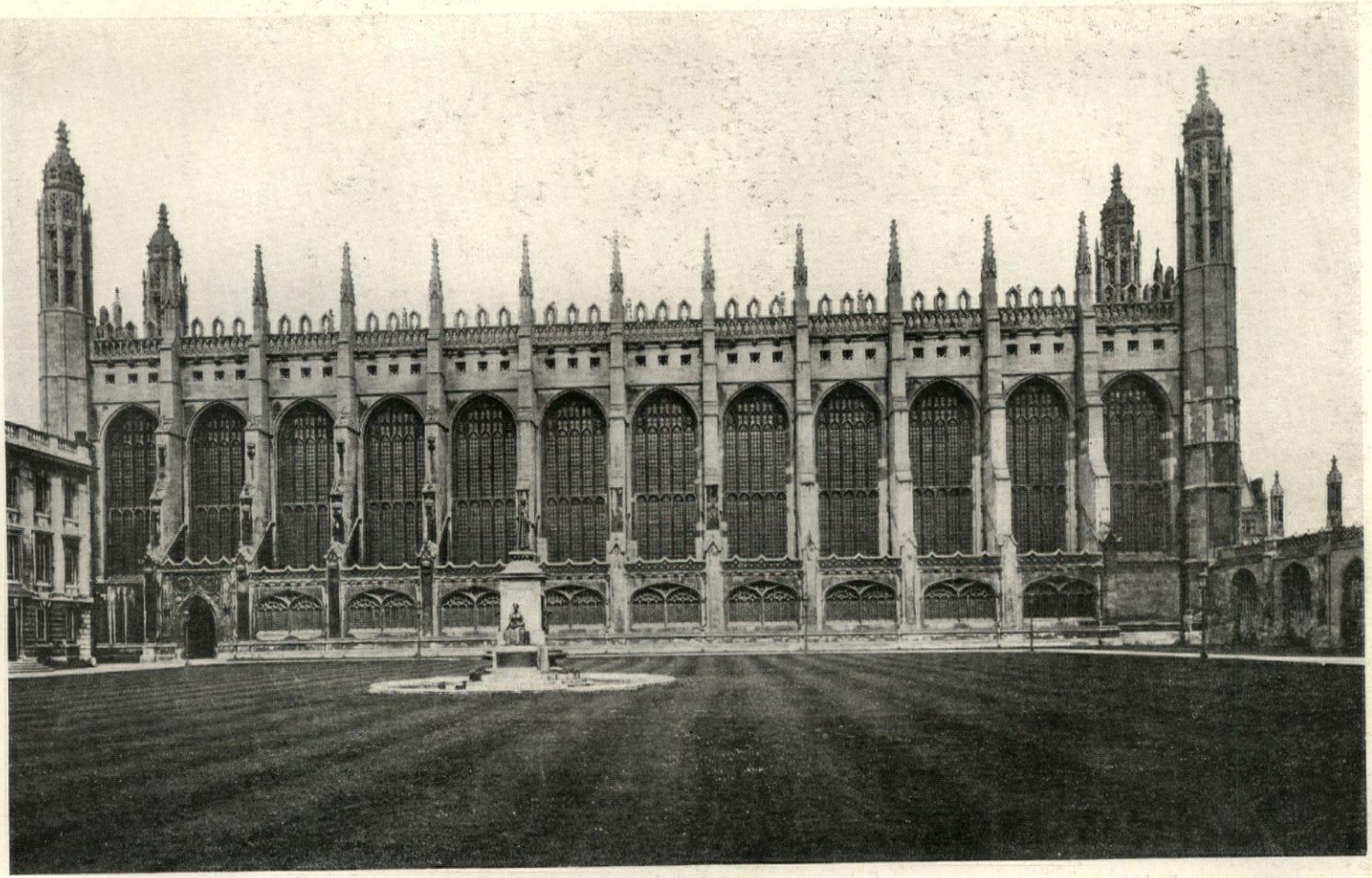


FIG. 5. KING'S COLLEGE CHAPEL, FLANK.

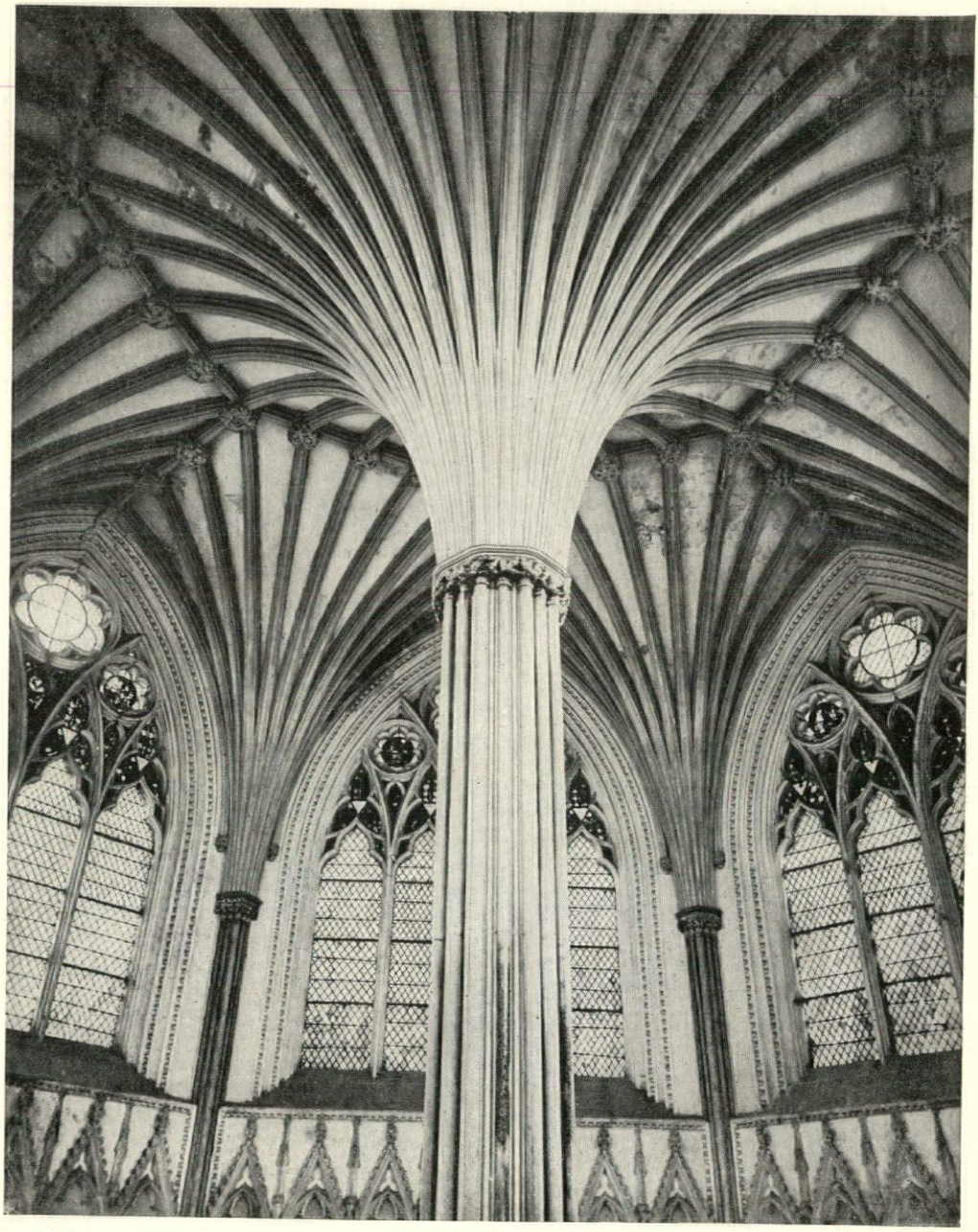


FIG. 6. WELLS CATHEDRAL
CHAPTER HOUSE, VAULTING.

but a small strain in comparison with the thrust of the great doubleau and the sections of the great longitudinal vault on either side. In the English vault with tiercerons, the load on the tiercerons is half or one-third of that on the French *ogive,* and its element of transverse thrust utterly negligible. Sir Thomas Jackson declares that in Winchester the clearstory wall was wholly detached from the ends of the transverse vaults, which nevertheless remained perfectly stable. Evidently the concentration which the French effected by stilting was quite unnecessary with the English vaults with tiercerons. The stability of the Winchester vault deprived of its clearstory abutment is pretty good evidence of the structural propriety and excellence of the English use of multiple ribs.

IV.

It is a curious fact that in the fifteenth century, after the close of the Hundred Years' War, after the completion of cathedrals for every diocese then existing in England, the ecclesiastical architects of that country developed a new Gothic style which, more than any that had preceded it, recognized and carried out the principle of the skeleton frame of stone with all the openings glazed. The two conspicuous and complete examples of this are St. George's Chapel at Windsor, and King's College Chapel at Cambridge. Indeed, it was carried out in a more thoroughgoing way than even in France, in respect at least of the west fronts, which in these two buildings are huge walls of glass framed by the stone skeleton above the low doors; and of their perpendicular tracery, which is mechanically the most scientific of all forms of tracery, though rarely quite satisfactory in the element of beauty. The vaulting, on the other hand, having exhausted the principle of the frame of ribs, had now taken on the singular form of the fan-vault, with a mere surface decoration of carved riblets or panels. Unlike the earlier vaults, these were masterworks of careful stone-cutting, marvelous in execution, mechanically correct, but no longer decoratively expressive of the construction. Certainly the long pendants sometimes used were *tours de force,* such as one would expect to find in Germany rather than in England. In Henry VII's Chapel at Westminster the attenuation of the tracery and of the wall-paneling was carried to a painful extreme. Francis Bond, nevertheless, in his *Westminster Abbey,* bestows unmeasured praise upon this chapel. Fergusson says: "It makes up in richness for any defects of detail." Most critics admire the technical excellence of its execution and the richness of its vaulting, but criticise its excessive and wiredrawn detail, its concealed cross-ribs and its showy pendants. The other two chapels usually receive fuller praise, and King's College Chapel, especially, is coming to be regarded as one of the noblest of English works, and one worthy of comparison with the finest French masterpieces.

The transition to this style was effected mostly in minor works and alterations of older buildings. One of the finest transitional vaults was that of Oxford Cathedral (Christchurch). The rich lierne vaults of the naves of Winchester and Canterbury, of Norwich and of Sherburne church all contributed to the final result. A word must be written here regarding the chapter houses. These polygonal halls, about 57 feet in diameter in the later and finer examples, were—with the exception of that of York—built with a central clustered shaft, from which ribs of equal curvature radiated to meet, at the ridge, the groins and tiercerons from the surrounding walls, or rather from the angle-piers; for in these exquisite buildings the wall is suppressed as completely as in any French cathedral. The principle of the stone frame is here carried to complete expression. Although built in the second half of the thirteenth century—at least 100 years before the earliest Perpendicular buildings with fan-vaults—it seems probable that they played a not unimportant part in suggesting the dominant features of the Perpendicular architecture. It is rather singular that they have received so little separate notice from the historians of the English Gothic style; for they are in some respects its most consummate products.

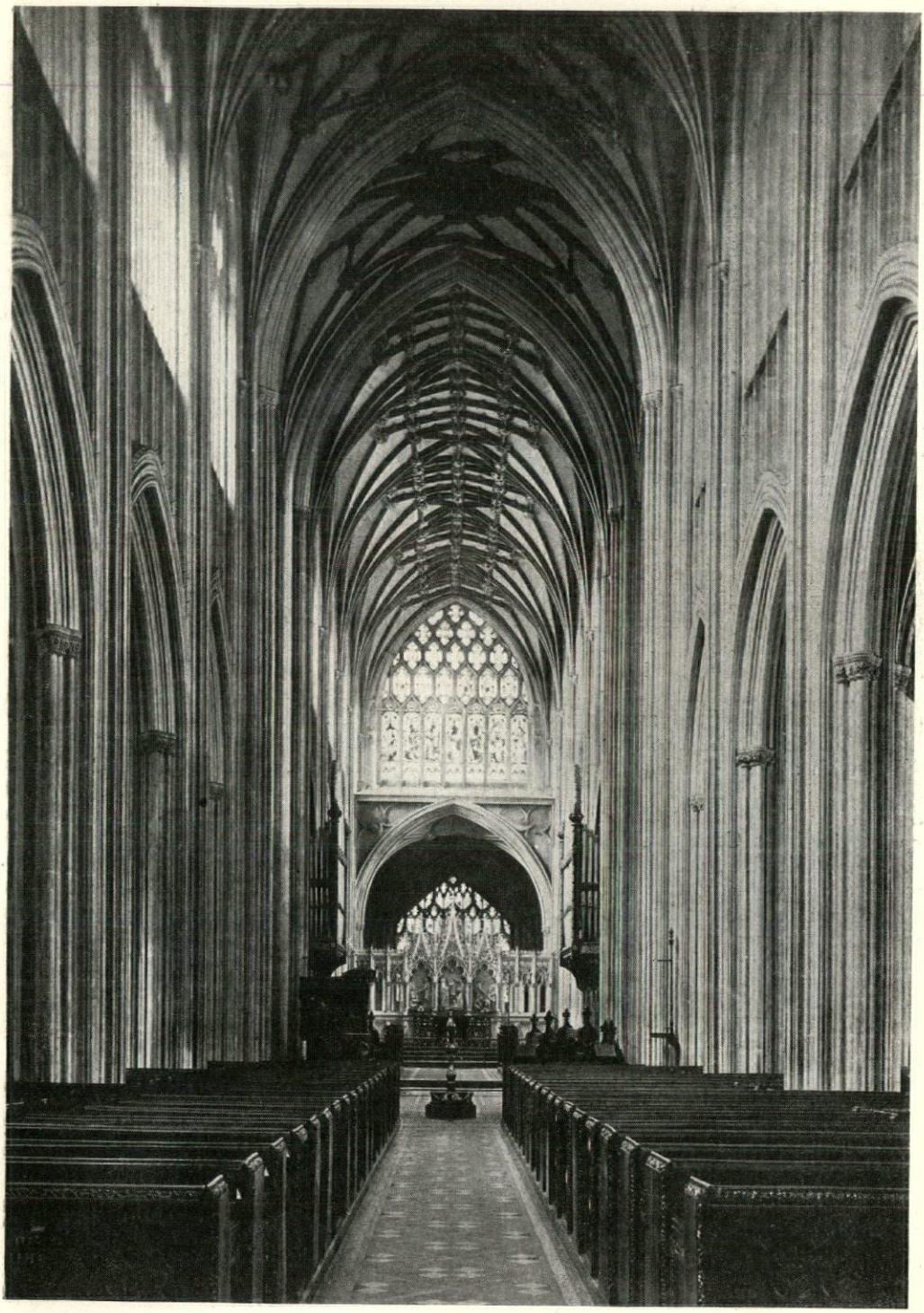


FIG. 7. BRISTOL, ST. MARY'S REDCLIFFE, INTERIOR. EXAMPLE OF A LARGE PARISH CHURCH, EARLY PERPENDICULAR.

V.

The English timber ceiling and the English parish church each deserves a chapter or at least a section of these pages, but the limits of my space forbid an adequate treatment of either. I must be very brief.

The English hammer-beam roof-ceiling is by many writers, I think quite justly, regarded as one of the glories of English architecture. It has in the first place the signal merit of being complete in itself and absolutely expressive of the facts of construction; and this is generally regarded as one of the peculiar merits of Gothic architecture in general. All vaulting in northern climes has to be protected by a covering of timber and metal or slate or tile. The outer roof does not express the vault, but hides it; the vault is a stone ceiling under the real roof. Fergusson calls them "false ceilings" and asserts his preference of an honest modern roof to the "deceptive" Gothic practice. One need not accept this judgment, while yet one may give unstinted praise to the English practice of making decorative ceiling and external roof one and the same structure, all of "honest wood." The danger from fire was little, if at all, greater than with a wooden roof over a vault.

To these ceiling-roofs the English applied, as far as the science of roof-carpentry permitted, the Gothic principle of making the actual scientific construction decoratively expressive. The hammer-beam type, as finally perfected in Westminster Hall, dispensed with the tie-beam connecting the opposite rafter-feet, and brought the ultimate resultant of the thrust (greatly reduced by a collar-beam half way up the truss) down to a low point of the wall. That the thrust was not wholly destroyed by a tie-beam, as it is in an engineer's roof truss, was due to two considerations: one practical, in the difficulty of providing tie-beams 65 feet long, and their enormous section if found; and the other esthetic, in the woful disfigurement of the perspective that would result. They would have been even more objectionable than the iron tie-rods that hold together the Italian vaults. The Westminster roof receives high praise from the Frenchman Viollet-le-Duc; the English writers are unanimous in their approval; and not only that example, but a score at least of other English wooden roofs are admired by nearly all who have studied and written about them.

The English parish churches have been made the subject of two recent works: one the remarkable and sumptuous work in two volumes by Francis Bond *(Introduction to English Church Architecture)*, and the other a single small volume by Rev. J. Charles Cox (*The English Parish Church*), a book whose value is not measured by its small size. Because so many of these churches have wooden ceilings, Professor Moore declines to consider them as truly Gothic; but if the broader definition I laid down in the May RECORD be accepted, they may rightly claim the Gothic name. Such edifices as those of Boston in Lincolnshire, of Lavenham, Sherborne, St. Mary's Redcliffe at Bristol, are highly important works, and in their class hardly equaled elsewhere except by such cathedral-like churches as St. Ouen at Rouen.

VI.

The limits allowed me for this paper have now been reached, with a result which makes me keenly sensible of its many omissions. I should have liked to speak of the English lanterns and crossing-towers; of English tracery; of English spires; of English West fronts and East ends; of English influence on the later French Gothic. I must omit all these, and also the promised discussion of Italian Gothic architecture, lest I weary the reader beyond endurance. May he bear with me long enough for a brief summing up of the conclusion which I think may fairly be drawn from an unprejudiced review of the writings I have referred to and others from which I have not allowed myself the space to quote.

The English medieval architecture was a strongly national phase of the architecture we call Gothic, if we give that term the meaning accepted by the majority of writers. It was developed from the earlier Anglo-Norman by blending with it certain conceptions and many

FIG. 8. GLOUCESTER CATHEDRAL, FROM THE WEST. LATE ENGLISH GOTHIC WEST FRONT AND CROSSING TOWER; BUTTRESSED TRACERY.

features derived from the early French Gothic, mainly by way of Canterbury choir. Unlike the French, which was primarily an episcopal and "secular" or lay architecture, the English Gothic was developed chiefly by monks, under a strong Cistercian influence, and long retained certain qualities of the Anglo-Norman style. It rejected at first the Ile-de-France conception of the frame or skeleton of stone; but it greatly reduced the Anglo-Norman massiveness and introduced many features of the French articulated Gothic. It began early to develop a new system of framed vaulting on multiple ribs with horizontal ridges and straight filling-courses. While it employed balanced and transmitted thrusts to a great extent in place of inert massiveness, it made the flying buttress system as inconspicuous as possible. The resulting buildings were longer and lower than the French, far less daring structurally, externally picturesque rather than majestic, internally showing a much richer decorative system of shafts, mouldings and ribs than the French, with all details on a smaller scale and executed with great delicacy and refinement. In place of the rigid logic of structural expression of the French Gothic it displays a logic of esthetic effect and expression which gives its works a remarkable harmony and an undeniable charm. As the style progressed the decorative element still further increased in importance, especially in the vaulting, while the conception of the stone frame, for the first time realized in England in the chapter-houses of the late thirteenth century, became dominant in the Perpendicular buildings of the fifteenth century.* English tracery, at first based on French models starting with Reims, attained far greater variety than the French, later sending back a reflex influence to France, and ending in the dry, mechanically logical Perpendicular type. English timber ceilings, based upon Gothic principles applied to carpentry, were a notable and peculiarly English product. English West fronts are in many cases wholly illogical designs, though often picturesque; more logical fronts like those of Winchester or of King's College Chapel are apt to be flat, thin and uninteresting. East ends are far more satisfactory, and the English East and West windows are unrivaled in size and splendor of combined tracery and glass.† English towers and spires, tombs, chantries and reredoses, all exemplify a very high skill in design, controlled by a sure judgment of picturesque and decorative effects.

The ideal of Gothic architecture was realized in France. The English Gothic was not ideal, but thoroughly practical and imaginative rather than logical; it always avoids logical extremes. In its final form, the Perpendicular, "it is less religious and more secular . . . It has no mystery, no depth of symbolism . . . . but no style shows . . . a more complete mastery of technique . . . . or a truer sense of the beauty of outline and composition in the mass."‡ "In England, it (her special gift) lies in the hewing out of dramatic contrasts and . . . . picturesque and strong effects. In doing this, one defect is evident. It is the lack of logic."§ "Throughout, the English sought only to erect the building then most suitable for its destination with the best materials available for the purpose."‖ "Economy of material was not, as a scientific abstraction, the end of its effort, but only so far as it was the means whereby were gained directness of expression and the rejection of superfluities" (Prior, *Gothic Architecture in England*).

*E. A. Freeman and Moore agree that the Perpendicular is the finally distinctive English style, but Moore denies it any claim to be called Gothic ("Development of Gothic Architecture," p. 427).

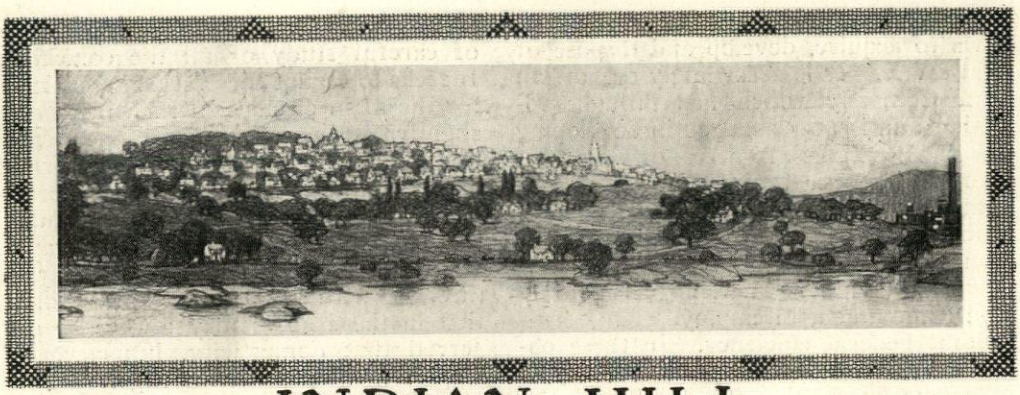
†Professor Moore's criticism of Gloucester West window with its buttresses against two of the mullions is wholly sound from the artistic point of view. But the objection to these buttresses on the ground that wind-pressure forces a window in and not out, although perhaps valid for the majority of cases, overlooks the fact that windows are frequently blown out and not in, owing to the low pressure outside that often accompanies violent gales. Perhaps the Gloucester builders had experienced or witnessed that phenomenon, frequently observed in New York.

‡Jackson, *op. cit.*, II., 95.

§Frothingham, *op. cit.*, IV., 6.

‖Fergusson, "History of Architecture," II., 120.

INDIAN HILL, WORCESTER, MASS., FROM ACROSS THE LAKE, WITH A GLIMPSE OF THE FIRST FEW HOUSES.



INDIAN HILL

AN INDUSTRIAL VILLAGE AT WORCESTER, MASS.

Grosvenor Atterbury
Town Planner and Architect

By Charles C. May

A DESCRIPTION of the settlement which the Norton Company of Worcester, Mass., is building for its employees might well take for its text, "A city that is set on a hill cannot be hid." Certain it is that if the development is successful, its attractions will become a beacon to the countryside for miles around; if it should fail in any considerable degree, its shortcomings will become a lesson that he may read who runs anywhere in the vicinity.

This means that Indian Hill is the possessor of a most commanding site. Removed by several miles from the heart of the city of Worcester, lies Indian Lake, a sheet of water of perhaps a mile and a half in length by half as much in width. Its banks have not, as yet, been reached by industrial development and lie happily unspoiled—a challenge to the city of Worcester for appreciation and preservation.

Indian Hill itself—the "thirty-acre tract," as it has been named during the development—occupies the lofty ridge that thrusts its point out toward the head of the lake. Before it lies the open country in opulent variety in all directions, to the limits of perhaps 300 degrees of the circle. Holding the northern end of the lake, the major part of the hillside slopes toward the south, with the higher wooded areas at its back for buffers against the north winds. This is a detail of not merely sentimental value, for in these latitudes the land of extended outlook is also the land of bitter-cold blasts.

Almost the only blemish in the whole prospect is the branch of the Boston & Maine R. R., which skirts around the hill from the north and then diverges straight off to the east to join the main line. Where it skirts Indian Hill proper the tracks run in a deep cut, coming to the surface as they leave the high ground and approach the junction. In itself this cut is frankly a scar on the natural hillside. One might wish it otherwise, but it is exactly such fixed conditions that the town planner must accept, study and, if it is possible, transform into his opportunities.

Back from the northeastern corner of the lake and within the angle between the main railroad and its branch, lies the plant of the Norton Company, whose area hardly remains constant from month to month, so rapidly have its physical requirements expanded within two years. A statement as of August, 1916, would place its extent at twenty-six and two thirds acres—a modern plant manned by some 3,700 employees. Primarily for the adequate housing of these men and their families was formed the Indian Hill Company, a subsidiary of the Norton

Company, entitled under Massachusetts laws to acquire, develop and dispose of real estate. It is accordingly the Indian Hill Company which has brought together and is now engaged in developing holdings of some 116 acres, of which Indian Hill proper forms the first demonstration. The development, we have said, is primarily to provide adequate housing for its employees, with a view toward individual ownership, permanency and contentment in employment, and resultant general efficiency. In these objects the company is self-seeking only in the same degree that the word might be applied to those others of its institutions for the office workers—the auditorium, the gymnasium, the rest-periods, the hospital, the tennis courts, to name some of them at random.

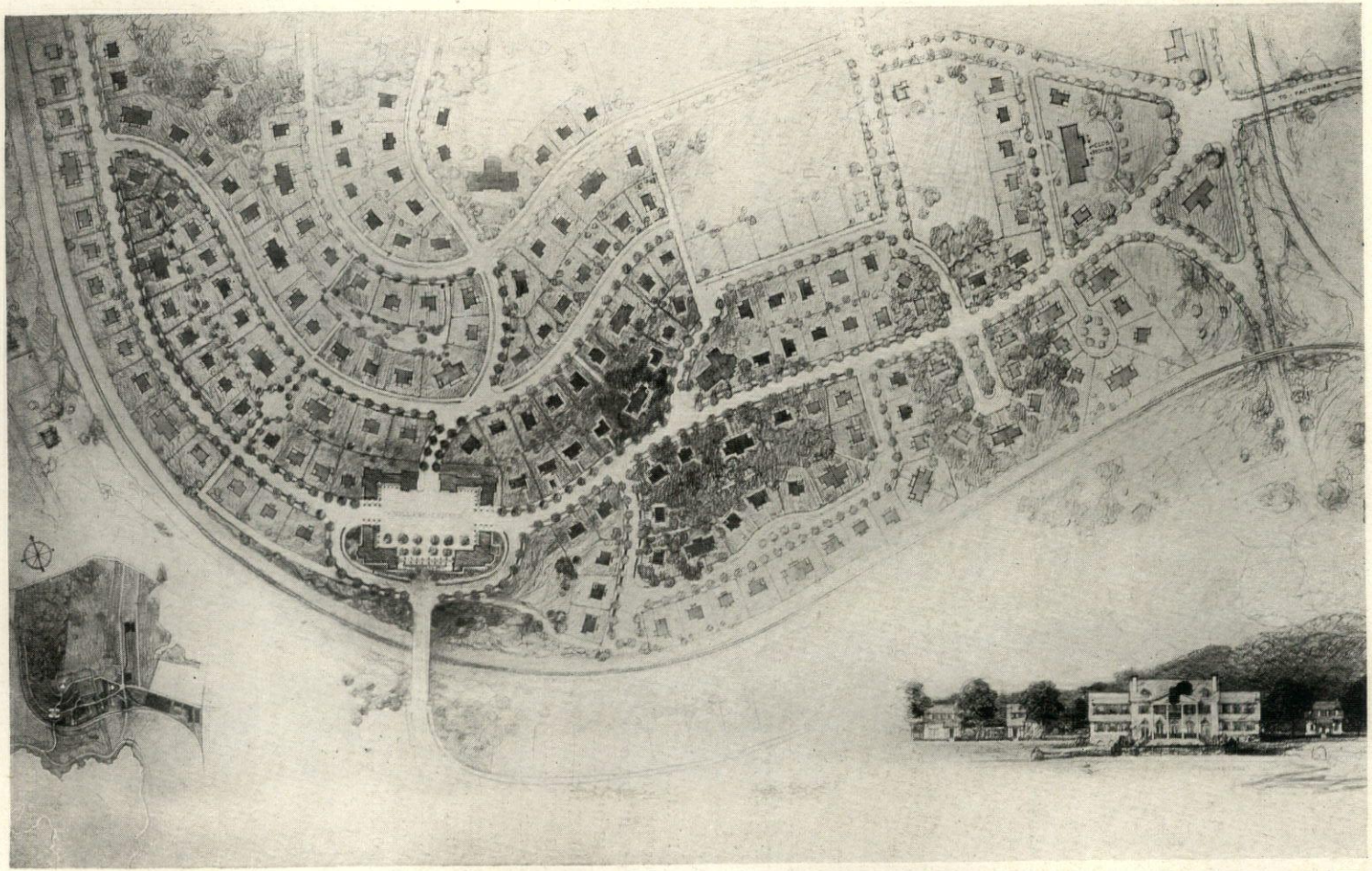
Secondarily, and in no sense selfish, was the company's hope that in wrestling with their own housing problem they might at the same time make some contribution toward the solution of the wider problem of workingmen's houses in general and toward the suppression of that pest of Massachusetts—the wooden three-decker. It is an outcome devoutly to be wished.

One cannot be too thankful that Indian Hill did not belong to one of those communities where the rule of a standardized street system reigned supreme. Had it been so their engineers would have done exactly what New York's did to Manhattan Island—they would have laid down on the map of Indian Hill a gridiron of rectangular streets that had no respect for height nor depth, that recognized no main artery where traffic would naturally congregate, that had no eye for a magnificent view, that could afford no resting point with an outlook toward the sunset. Is it inconceivable that anything so inflexible and utterly devoid of imagination could happen to a spot like Indian Hill? Yet, remember that in 1807, when New York's plan was concocted, the Island of Manhattan above Chatham Square lay as virginal and as unstandardized as is Indian Hill today.

The plan that has actually been worked out by Grosvenor Atterbury of New York, town planner for the development and architect for the houses, is the result of careful study of all the conditions. It seeks to secure the best possible grades for the main circulation roads, and only slightly steeper for the minor, non-traffic ones; it shows deference for the natural features of the site in conformation, woodlands, views and exposures; it seeks to provide quiet by-paths away from the lines which will one day be thronged with streams of traffic, in order that in these spots may always be preserved that domesticity, intimacy, and hint of aloofness that belongs rightly to cottage surroundings.

The main lines for traffic, as projected, are Indian Hill Road and the street that climbs up the shoulder of the hill after crossing the railway cut and circling in a double sweep to enter the Community Center from either side. This latter approach anticipates the creation of a shore drive which, it is to be hoped, will some day skirt the edge of the lake, where it would form a connecting link between the areas on the east and west. A cross connection of some sort must in the future become immensely valuable, since the steepness of the slopes prohibits any other east and west link within a reasonable distance. This shore drive would furthermore preserve the banks of the lake to the city for all time and prevent private exploitation in a manner that might injure the entire section. And, to put the aesthetic element last, as the town planners have fallen into the habit of doing, this shore drive has the possibility of becoming a feature of very great charm, one that will attract to the region a considerable and desirable volume of motor and other traffic.

The Community Center is placed at a point which combines the geographic location needed for such a gathering place, with other desirable elements. It holds the salient point on the shoulder of the hill, where grades are least difficult to manage; it will witness the passage of nearly all the through travel of the section; it commands a magnificent view, which should in itself prove a magnet to attract the strolls of the villagers. To enhance the charm of this outlook the side of the square toward the lake will be left



GENERAL PLAN OF INDIAN HILL, AN INDUSTRIAL VILLAGE FOR THE NORTON COMPANY, WORCESTER, MASS. GROSVENOR ATTERBURY, TOWN PLANNER AND ARCHITECT.

A TYPICAL STREET SCENE—INDIAN HILL, WORCESTER, MASS.
Grosvenor Atterbury, Town Planner and Architect.

open and treated as a public terrace. Footpaths will also be brought down the steeper slopes of the hill toward the Centre in order to provide easy crosscuts and thus make it readily accessible for pedestrians, shoppers and strollers.

The secondary streets are, in the majority of cases, contour roads. Looked at merely as a paper plan, the layout is definitely lacking in cross connections. But, studying the topography, one realizes that gradients so steep as these would be impossible for any but travel on foot, and that to create roadways suitable for vehicles would entail expenses quite prohibitive in a development of this character. The footpaths just mentioned are therefore by way of a compromise to break up the long blocks.

When it was first proposed to develop the lovely little grove which is now Nashoba Place in the manner of a close, it was an open question whether or not such an arrangement would appeal to the American buyer (or to the foreign-born employee grown American in tastes). Experienced real estate men have told us repeatedly: "First of all, give each one his full share of frontage on the building line. The American loves his look at the asphalt." Mr. Atterbury had faced this situation before in the planning of Forest Hills Gardens. There, despite pessimistic views as to American discrimination, groups involving so-called "rear" housing units were liberally used, but with some fear and trembling for the outcome. Actually, the very first sale was a house that had greater setback, less view of the asphalt; from that day on there has never been a doubt of the saleability of grouped units, in Forest Hills.

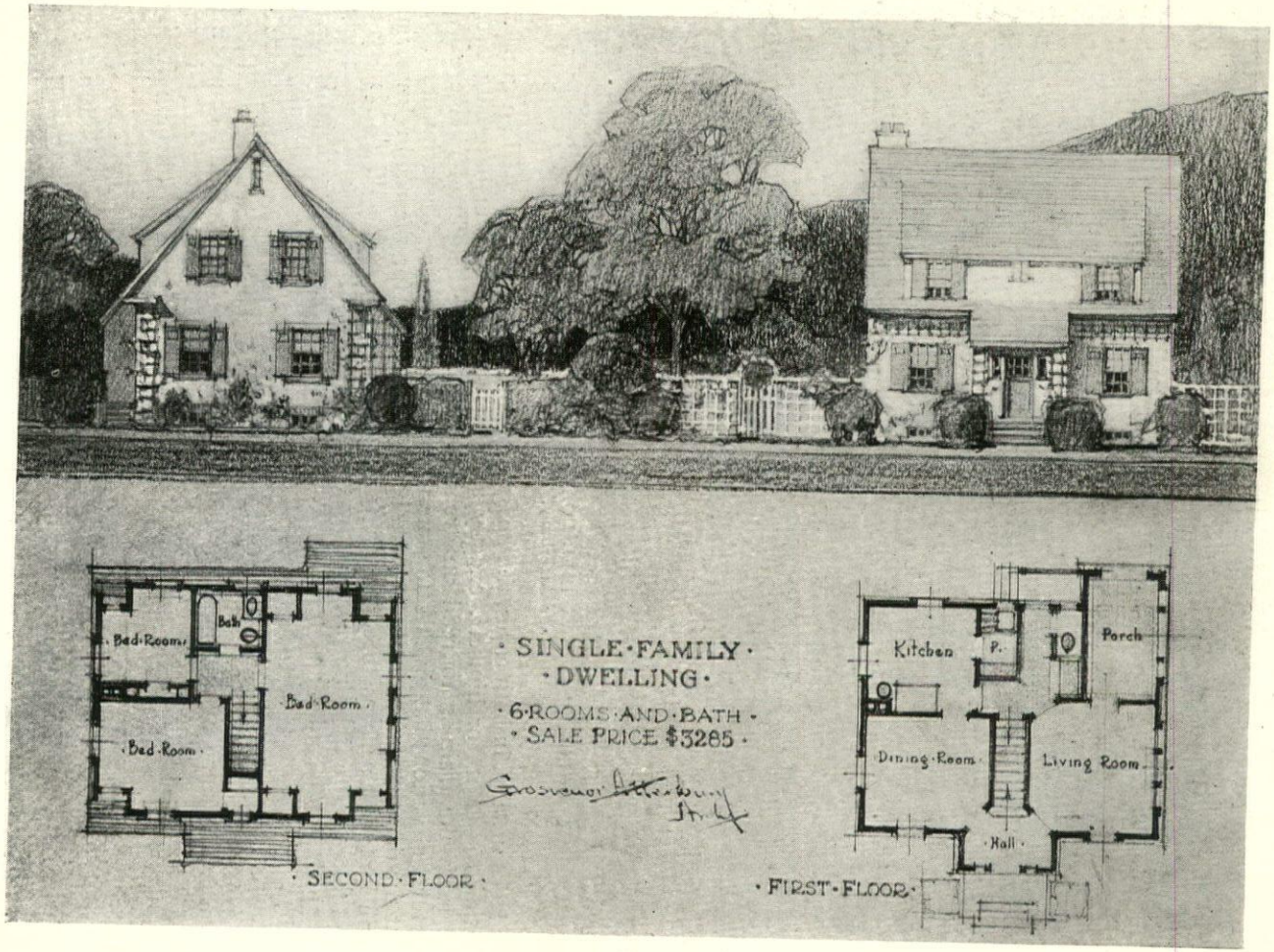
At Indian Hill the question was reopened in a development of a different character. Here the provision of public amenities was to be more limited, the cost of private houses far less, the whole project more circumscribed by financial limitations. Yet here, too, where the very modest little house could rely upon little landscaping or "trimmings" to dress it up, the result has been identical with that in Forest Hills. Faith has been justified in believing that in most cases the buyer (be it of a house to cost $3,000 or $10,000) needs only to be shown. True,

LOOKING UP INDIAN HILL ROAD—INDIAN HILL, WORCESTER, MASS.
Grosvenor Atterbury, Town Planner and Architect.

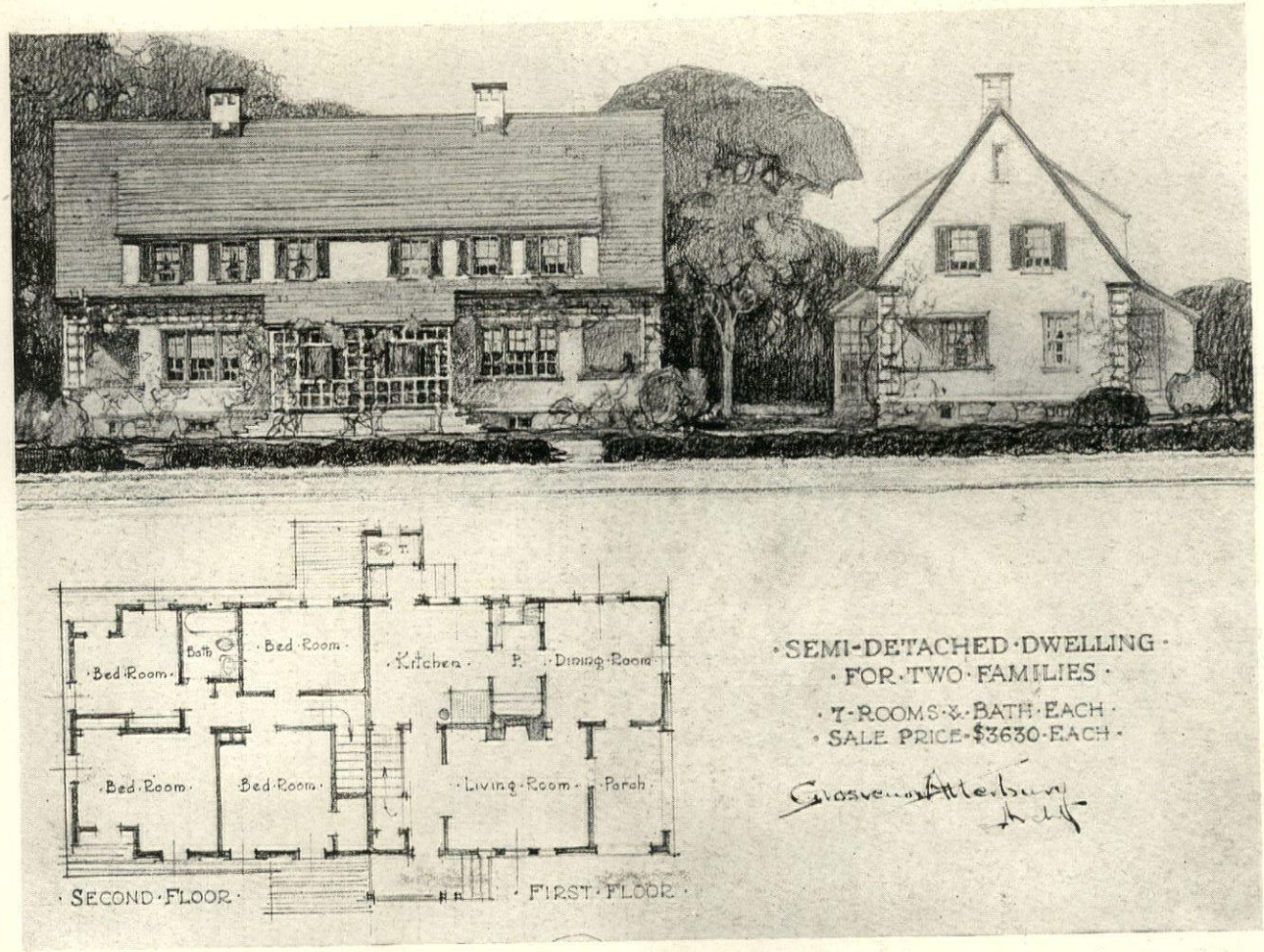
he lacks usually, in both cases, the imagination to see it for himself, exactly as he lacks the training to read an architectural elevation; but given some one to put the demonstration on the ground before him, and perhaps to explain a few of the *whys,* he is by no means slow to grasp the truth and to act upon it. Nashoba Place has accordingly been successful from the first; fully occupied, tastefully planted, delightfully sheltered, it already has some of that quality which, a few years ago, one sought vainly in this country and found only by traveling to England or Germany.

Construction work at Indian Hill has heretofore been confined to dwellings—some fifty-eight of them, built in two operations during the summers of 1915 and 1916. Enough has been done to give a suggestion of the ultimate look of the town—white walls seen among the trees, roofs gray green to unify the composition. The white was selected because of its consistency with New England traditions, because of its effectiveness, viewed from close at hand or from a distance, and because, unlike any other color, it can be repeated in a great number of cases without becoming tiresome (witness the delightful village of Whitinsville, also in Massachusetts). Slate was chosen for the roofing material because of its economy, its fire-resisting qualities, and because the color is good in itself. The roof material is the same throughout, as we have said, to bring unity into the composition. Where a collection of houses can be seen all together and from a distance, this common bond between the individual units is of the greatest value; it is like the family resemblance that marks them all one kindred; it is like the soldier cap that transforms the gang of boys into a regiment. Only by this and similar evidences of collective planning can there be produced dignity and carrying power in an aggregation of which the units, taken singly, must be too small or too insignificant to be effective.

This problem is peculiarly pressing at Indian Hill, since the number of buildings other than tiny cottage units, is at a minimum. For, by a curious psychological kink, the grouped party-wall dwellings



SINGLE FAMILY DWELLING—INDIAN HILL, WORCESTER, MASS. GROSVENOR ATTERBURY, ARCHITECT.



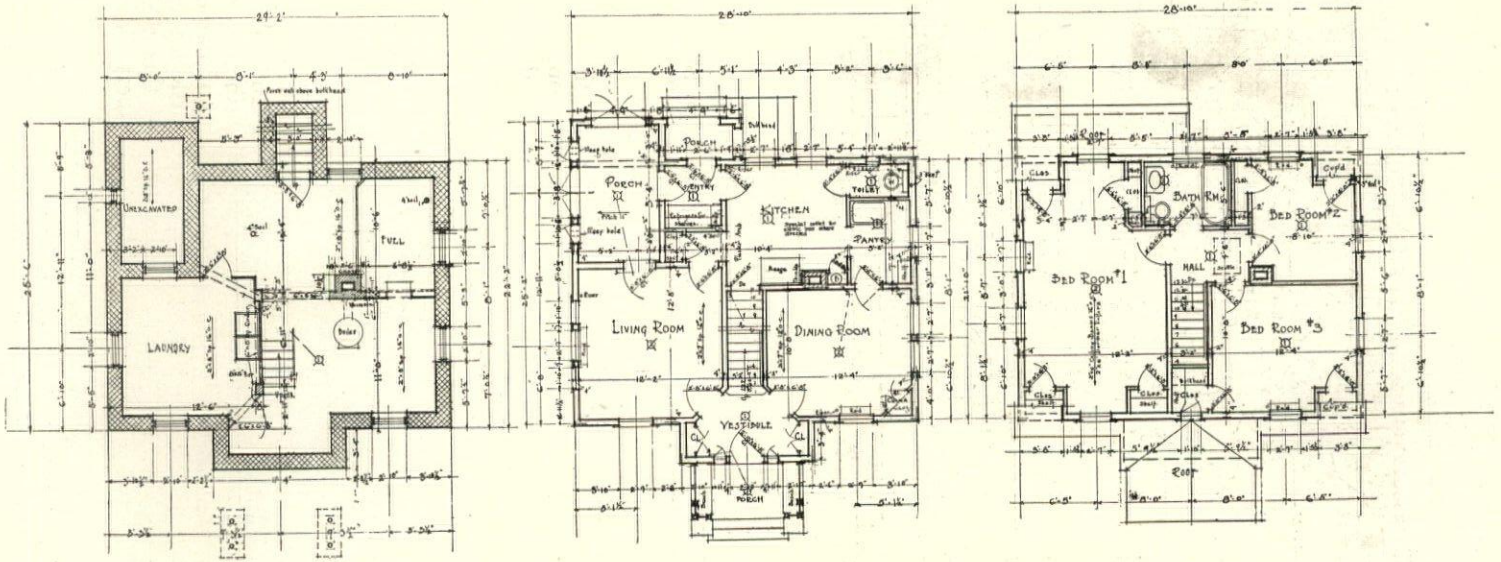
SEMI-DETACHED DWELLING FOR TWO FAMILIES—INDIAN HILL, WORCESTER, MASS. GROSVENOR ATTERBURY, ARCHITECT.

A HOUSE OF TYPE D^3 ON INDIAN HILL ROAD—INDIAN HILL, WORCESTER, MASS.
Grosvenor Atterbury, Architect.

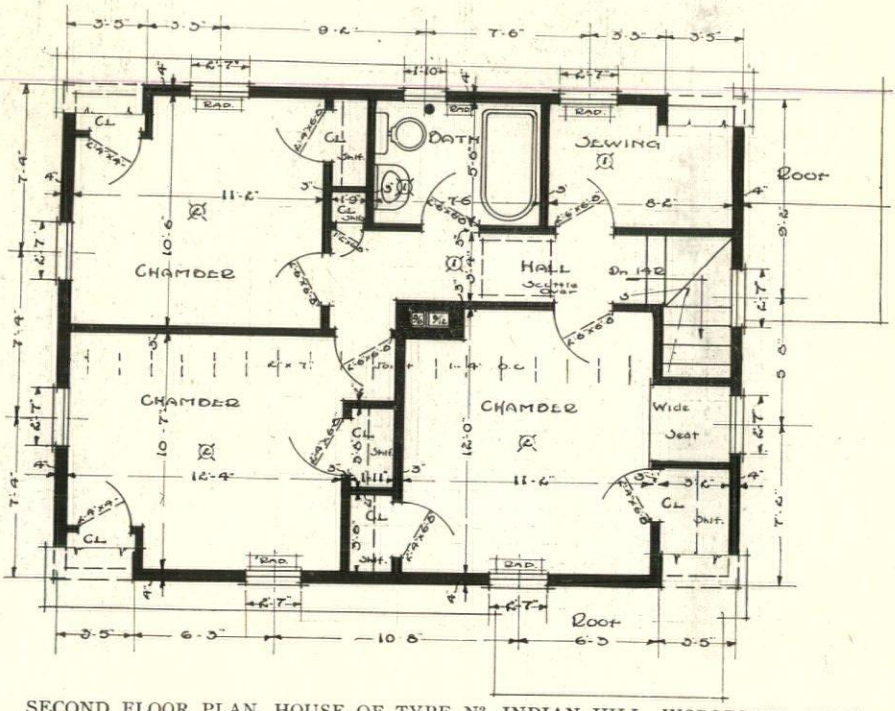
that are the rule in English Garden cities, that are eminently successful at Forest Hills Gardens, are usually rejected with scorn by the industrial worker. He pridefully insists that his dwelling (to cost one-third as much as those, for example, at Forest Hills) shall be placed on its own lot, with free spaces all around, and shall be guarded to the last foot from any loss of power in its proclamation of individual ownership. Even the two-family semi-detached house, although planned to give perfect privacy, exposure and open spaces, does not as yet appeal strongly to the buyer, except in special circumstances of relationship or a David-and-Jonathan intimacy between two families.

Further development will, of course, work vast improvement in that there are already provided site reservations for several buildings of adequate mass in different sections of the property. There is the Dining Hall, at the fork of the streets as one enters Indian Hill from the plant; the Satucket Inn, really an exalted boarding house for bachelors, embodying the features of a club; a similar institution for the bachelor girls of the office force, a chapel, a recreation hall. Considering that these are quite apart from the buildings that will form the three-sided enclosure of the Community Center, we may feel that the amount of reservation for larger buildings is generous enough to go far toward overcoming the handicap of the minuteness of the individual units.

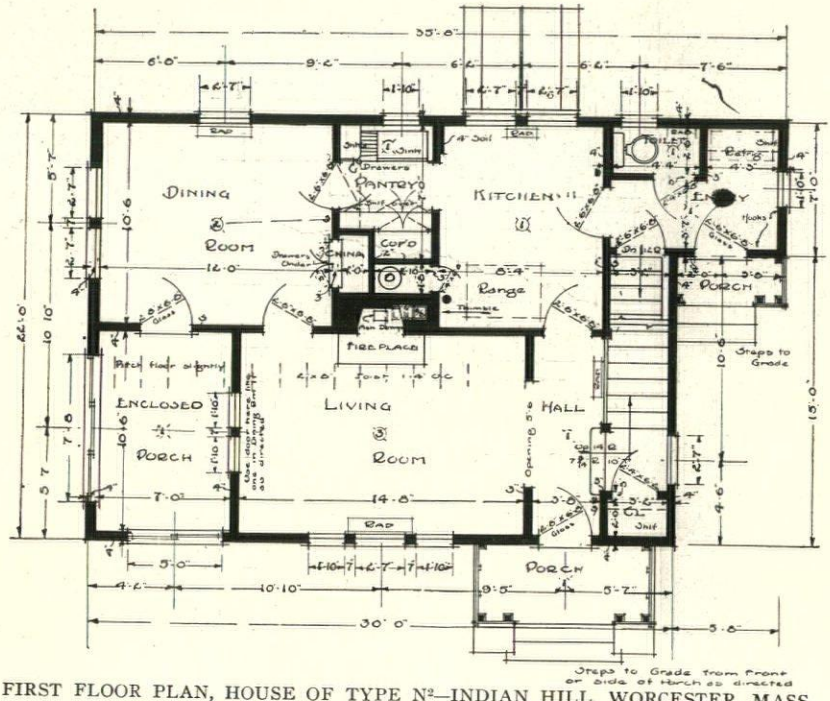
When the time came for naming the streets, the cue from local tradition was obvious. Upon Indian Hill, at the head of Indian Lake, one would hardly impose an assortment of Broadways, Main Streets or Grandviews. On the other hand, it was comparatively simple to find Indian names which would respect tradition, sound well and at the same time possess some distinction of their own. The first selection of names proved that the danger of a little knowledge was no more absent from this than from other pursuits. An expert in Indian lore, called in to visé the list before final christening, found that about half the names were distinctly applicable to the ocean and its shores. This naturally de-



FLOOR PLANS FOR TYPE D[3] HOUSE—INDIAN HILL, WORCESTER, MASS. GROSVENOR ATTERBURY, ARCHITECT.

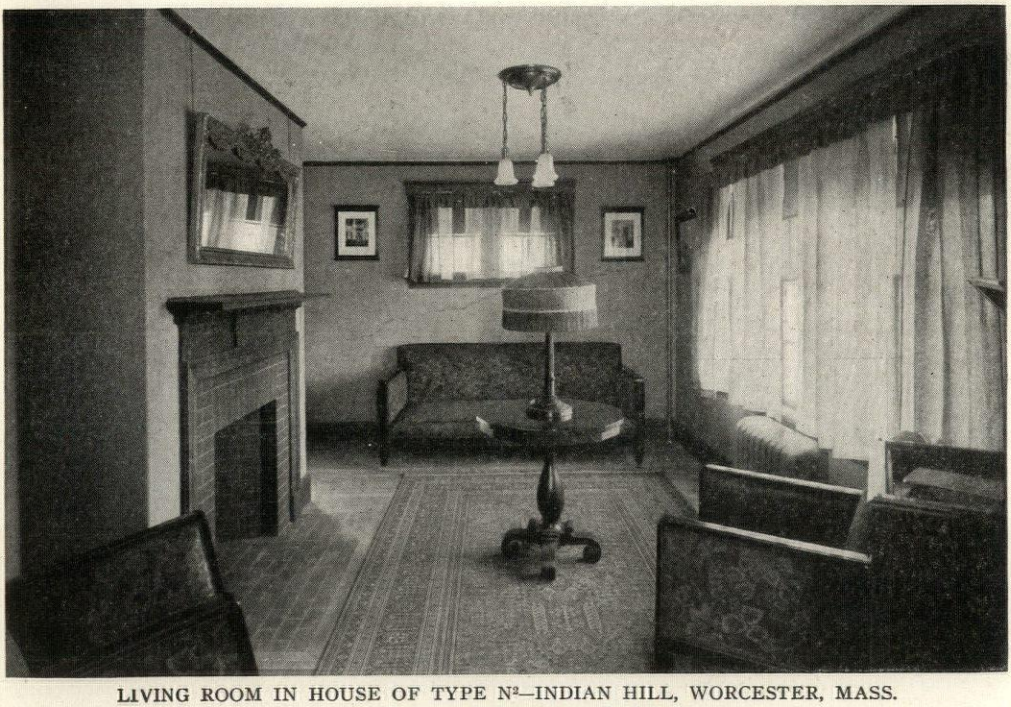


SECOND FLOOR PLAN, HOUSE OF TYPE N²—INDIAN HILL, WORCESTER, MASS.
Grosvenor Atterbury, Architect.



FIRST FLOOR PLAN, HOUSE OF TYPE N²—INDIAN HILL, WORCESTER, MASS.
Grosvenor Atterbury, Architect.

HOUSE OF TYPE N² ON INDIAN HILL ROAD—INDIAN HILL, WORCESTER, MASS.
Grosvenor Atterbury, Architect.



LIVING ROOM IN HOUSE OF TYPE N²—INDIAN HILL, WORCESTER, MASS.
Grosvenor Atterbury, Architect.

A HOUSE ON NASHOBA PLACE—INDIAN HILL, WORCESTER, MASS.
Grosvenor Atterbury, Architect.

A SEMI-DETACHED HOUSE FOR TWO FAMILIES—INDIAN HILL, WORCESTER, MASS.
Grosvenor Atterbury, Architect.

AN INDIVIDUAL HOUSE OF THE SMALLER TYPE—INDIAN HILL, WORCESTER, MASS.
Grosvenor Atterbury, Architect.

manded revisions, in which "Big Wave," "Long Beach," and the like were exchanged for names which signified "Great Oak," "Open View," and so on.

In a countryside as open and unrestricted as in Indian Hill today, it would not be surprising if it were difficult or impossible to prove to the promoters the wisdom of large reservations for park areas. Fortunately this has not been true. It is the policy of the Indian Hill Company to preserve generous tracts of high, wooded land as a playground for the villagers; certain parts of the lake shore will doubtless be developed for bathing, boating and water sports; and over along the east base of the hill will be the general recreation center. A comparatively slight amount of modeling will make the side hill into a natural amphitheatre, before which will be spread out the baseball field, the running track and their adjuncts.

Beside park areas for the general public, serious consideration is being given to the question of providing small parks in the interiors of various blocks as a play space for the children from the homes surrounding.

The numerous advantages of this system—safety, accessibility, economy of land value, ease of supervision—are all so familiar and so generally recognized that comment is uncalled for. One special feature might be noted, however, as an exceptional opportunity. The higher portions of Indian Hill contain several excellent springs which, unused, might become troublesome. They must be controlled by piping into the storm sewer. To do this and nothing more would appear to be neglecting a splendid opportunity. Piped into the private parks, these springs would, for a ridiculously small outlay, afford the bit of quiet water that would be the completion of the picture, the final element of charm usually left out in such cases because too expensive. The older boys and girls could swim in the lake and the younger children could wade and splash and have a generally wonderful time. For their sakes, if for no other reason, the springs should not be consigned to waste their

A TYPICAL BEDROOM—INDIAN HILL, WORCESTER, MASS.
Grosvenor Atterbury, Architect.

streams of pure water forever unhelpfully into a sewer.

Certain parts of Indian Hill are beautifully wooded; there are several fine specimen trees worthy to form landmarks; elsewhere the planners have started to make good any tree deficiencies. Not only have they adopted a program for tree planting along the highways, but included in the purchase price of every house is a small amount representing the beginnings of a landscape treatment for that particular lot. The amount is small because the operation is a wholesale one; the results have a unity and breadth of scale which would be impossible were the planting left to individuals. This is by no means a criticism of the individual enterprise and taste of the owners; it means simply that in this department, as in others, the advantages of collective planning are apparent.

Buyers at Indian Hill have every reasonable assurance of the stability of their purchase. They know of the substantial materials that have been built into their houses (brass supply piping and copper flashings are not used by the jerrybuilder), and they know that no man can plant next door a factory or a store or a saloon. In other words, the property is all sold under carefully considered protective restrictions, which are accepted and recognized by the purchaser as equally valuable to themselves as to the company.

The terms of sale have been made most liberal. Two notes, one a time note to run for twelve years, the other a demand note guaranteed against calling so long as the interest payments are kept up, both secured by the company's mortgage, are the bases of the transaction, and enable them to omit any second mortgage. A further agreement binds the buyer to subscribe to a certain number of shares in a co-operative bank, which shares are assigned to the company. There is, too, an insurance provision to cover cases of purchasers' death or total disability before the expiration of the twelve years. These articles have made possible the sale of houses upon a very small initial payment, often less than ten per cent. of the price of the house and lot.

Regarding the houses themselves, the plans and photographs reproduced herewith speak as clearly as any description. They are, as Col. Roosevelt said during a recent inspection, good enough for any good American to live in. They could have been built more cheaply, but materials would have been inferior; the costs could have been less in 1915, but greater in 1925. In other words, the company has regarded the project as an investment for its own members, and in this aspect the long view of the transaction is the only justifiable one.

The costs of these houses individually shed an interesting illumination upon comparative prices of building as between 1915 and 1916. For instance, the constructional cost of the six-room house, known as N^2, has jumped from $3,188 in 1915 to $3,791 in 1916—an increase of nearly 19 per cent. The other types show similar results, though not quite so exact a comparison is possible, since certain changes were made by way of added features; the demand for the houses of ampler accommodations more than offsetting the burden of increased cost.

These prices are further interesting in their relation to the study of variations due to local conditions. Mr. Atterbury is just now engaged in studying the general plan for Erwin, an industrial town in the Blue Ridge section of Tennessee. In this case a six-room house, closely comparable to the N^2 type quoted at $3,791 in Massachusetts in 1916, has just been contracted for at $2,525. Or, to put it upon a cubic foot basis, the Massachusetts house has mounted during the summer to about $0.19 per cubic foot from the $0.16 of the year before. The Tennessee house, greater in actual size, and only slightly inferior in general finish, is being built at almost exactly $0.10 per cubic foot. In a time of violent fluctuations from month to month, here is a variation between localities that is even wider.

As to the general costs of a development such as Indian Hill, we find that the improvement of this acreage, that is, sewer, sidewalk and road building, tree planting and seeding, have amounted to just about 7 cents per square foot. This rate does not take account of overhead and administrative costs, which were not available. The amount chargeable to each of the fifty-eight houses built thus far, for town planning and architectural services, has come to about 2 per cent. This burden, moreover, light as it is even now, rests most heavily upon these first groups and will decrease still further with the progress of the development.

Any visitor to Indian Hill who would visit the interior of these cottages with a spirit of curiosity, or perhaps a touch of condescension as to their furnishings, is likely to receive a sharp mental jolt. The company, it is true, decorated and furnished a couple of houses to act as friendly counsellors to the others, but discounting this aid, it is only just to say that the average of taste displayed in these homes is remarkably high. There is very little overcrowding; the mass of gimcrackery is conspicuously lacking; there is discrimination, selective choice, and restraint everywhere. If one has sometimes been downcast by the bedevilment often worked by owners of mansions in their furnishings, let him turn to industrial cottages such as these and be encouraged.

WINONA SAVINGS BANK AND WINONA NATIONAL BANK, WINONA, MINN. GEORGE W. MAHER, ARCHITECT.

THE WINONA SAVINGS BANK AND WINONA NATIONAL BANK BVILDING WINONA, MINN

GEORGE W MAHER. ARCHITECT

By Peter B. Wight

GEORGE W. MAHER, architect for the Winona Savings Bank and Winona National Bank Building, is well known as one of the "progressive" architects of Chicago. He has designed many rational and beautiful city and suburban dwellings; and the Patten Gymnasium of the Northwestern University, at Evanston, Illinois, is the principal of a number of large buildings of a public character, including several schools, which have been erected from his plans. Among the latest buildings of this kind are the new laboratory and the administration building of the J. R. Watkins Medical Company, at Winona, the latter of which was so beautiful and appropriate to its purpose that the new bank building, just completed, naturally fell under his professional charge.

This building, it will be seen, is unique and original in its conception and execution, for it is doubtful if there is another financial institution like it in this or any other country. It is called by its managers an "Institutional Banking Home," and it is owned by two banking corporations, both having the same president, the Winona Savings Bank and the Winona National Bank.

The Winona Savings Bank was opened for business in 1874. At that time Winona was the seat of the lumber business for that part of the Mississippi Valley, having extensive sawmills which manufactured the lumber from the logs that were floated down the river. It was noted for its prosperity and wealth. But as the tributary country became denuded of trees, the lumber industry declined for want of supplies. This continued until 1909, when the last sawmill disappeared. The Savings Bank, which had been built up by this business, was, however, recouped by the growth of other manufactures, and its business has increased until the present time. Meanwhile the Winona National Bank was incorporated by the same management practically, and it became necessary to have a new building to accommodate both of them. Hence the twin building, which has two names, but a central working section.

It was decided also that these institutions, so intimately allied with the business and progress of Winona, should develop a new idea in banking—that they should encourage all sociological movements which might conduce to the prosperity of the city, and consequently to the increase of the business of the banks, and at the same time practice economy by sharing in some of the expenses incidental to the management of the building. For the first of these purposes they devoted the second story to institutional work, providing meeting and social rooms on the second floor for such associations as might be of a public spirited nature, as well as a library and exhibit room for products of the soil or of manufactories. These, therefore, had to be provided for and brought up new problems for solution by the architect. All of this was the result of suggestions made by Mr. Maher after he had been retained. The whole scheme was one calling for special study, and the ground plans herewith illustrated will show its result. Mr. Maher entered into it with intense interest, and the outcome seems to have met with the enthusiastic admiration of the bank managers and of the people of Winona.

To understand how the problem appealed to Mr. Maher, we may hark back a few years to an occasion when he had centered his ideas on the proper mission of architecture, for this building appears to be one of the practical expressions of the creed which he then gave utterance to in an address before a club composed of young architects and draftsmen. Here is a building of which the thoughtless observer may jump to the conclusion that it is in the Egyptian style of architecture

(whatever that means), while it is in reality the result of deliberately avoiding all stylistic tendencies. These few extracts, therefore, will enable those who read a little farther to understand Mr. Maher's views as to the state of mind a man should be in to practice architecture in a modern and democratic way:

"Let it be well understood that progress, or a freedom from precedent, does not mean a lack of knowledge of the past, for no architectural training is worth while unless rooted in a profound knowledge of that which has gone before. No one should expect to design on progressive lines who is deficient in architectural training and history. Thebes, Athens and Rome offer fruitful examples of enduring work and represent to us a heroic past. On the other hand, merely familiarizing one's self with the form and style of architecture found in these grand ruins of antiquity is not sufficient as a training for our art.

"Wherever in the history of the past we have found great achievement in whatsoever line of endeavor, there it is that men lived who heeded well the spirit of their times, who drank deeply from the inspiration of the life which surrounded them and who did not in any manner strive to conceal that life, humble and ordinary though it may have been, but whose strong conviction was to live honestly and truthfully, painting as it were a living portrait, giving full expression to what they saw.

"We co-workers in the building of the West should be influenced, even dominated, by a spirit of action that shall produce results speaking of our day and generation; and to the extent that we permit ourselves to be so dominated by this spirit of progress, to that extent are we real and worthy of our calling. In the realm of architecture I would say that to solve our problems satisfactorily it behooves us to dip deep into the currents of life round about us, feel the pulse of the times and then actually execute the ideals of the present hour; and if we do this work truthfully, intelligently, our efforts must be enduring."

Let us see, therefore, if he still holds to his old teaching. To elucidate this I can do no better than to let him describe this building in his own words, which I have taken down as follows:

"The Winona Savings Bank represents a new theory in bank construction, founded on American ideals of art and architecture. The plan and general design follow no precedent either in this country or abroad and are therefore original and American in spirit.

"The general theme was to evolve a structure that should be practical and fitting in every respect to house such locally strong and influential financial institutions as the Winona Savings Bank and the Winona National Bank.

"The architecture was to express the idea of service and of beauty; the building was to be so arranged and designed as to be of practical and educational value to the community and thus to be in harmony with our democracy and our Americanism."

"With these fundamental purposes in mind, it will be noted that the exterior design directly reflects the general aspect of the interior plan; that is to say, the interior purpose of the edifice is clearly portrayed on the façades.

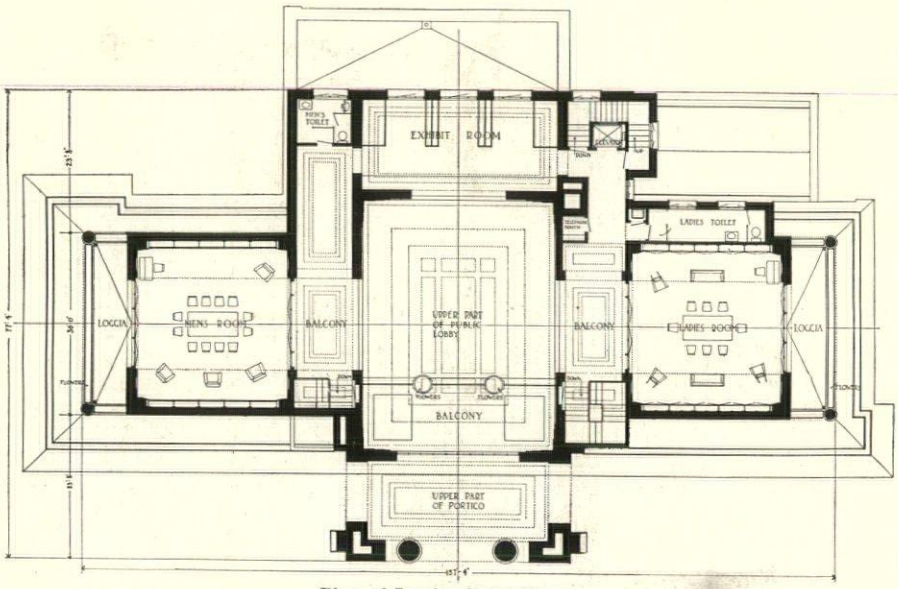
"The center is monumentalized by a pylon treatment heroic in scale and representing strength and conservatism. As one approaches the building, the massive scale of the central entrance is enhanced by the two polished granite columns which dominate this exterior effect. The columns are monolithic, weigh thirty-two tons each, are thirty-six feet high and are treated in an original manner for column work from the base to the capitals.

"The capitals of the columns are carved, embodying an original type of ornament founded on the American lotus flower and leaf, which motif appears and reappears throughout the exterior and interior design of the building in granite, in decoration, in marble and in art glass work.

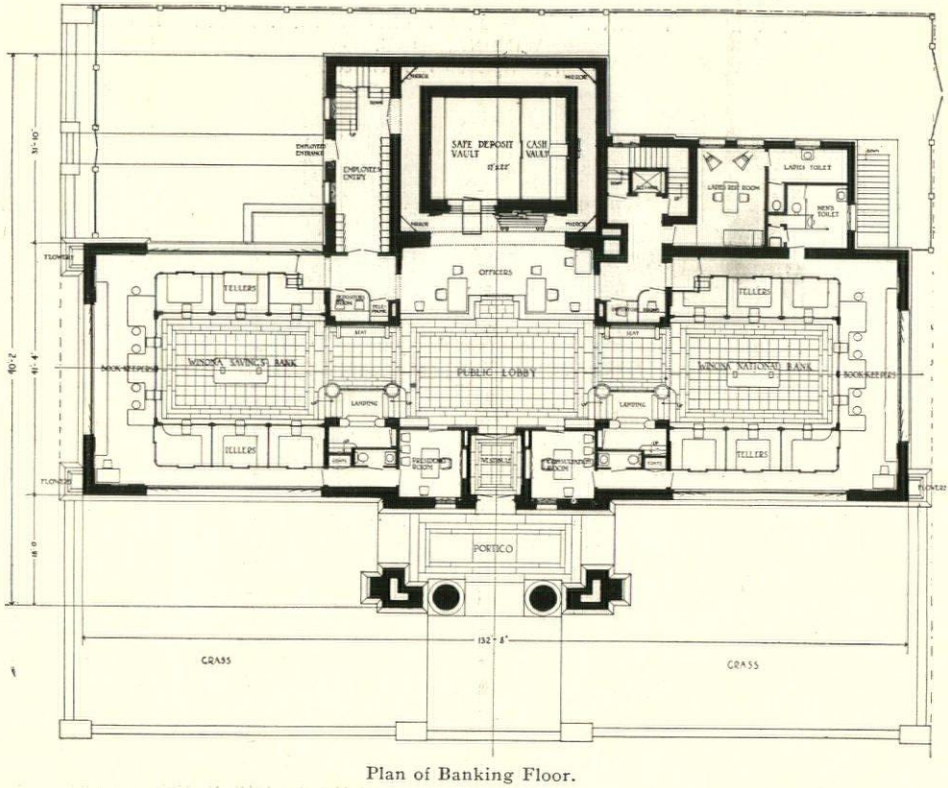
"The large exterior wall surfaces typify strength and solidity, necessary for a monumental building. This effect is in no way impaired by the windows on either side of the entrance; in fact, these large window openings aid in the breadth and simplicity of the design.

FRONT VIEW—WINONA SAVINGS BANK AND WINONA NATIONAL BANK, WINONA, MINN.
George W. Maher, Architect.

REAR VIEW, FROM THE EAST—WINONA SAVINGS BANK AND WINONA NATIONAL BANK, WINONA, MINN.
George W. Maher, Architect.

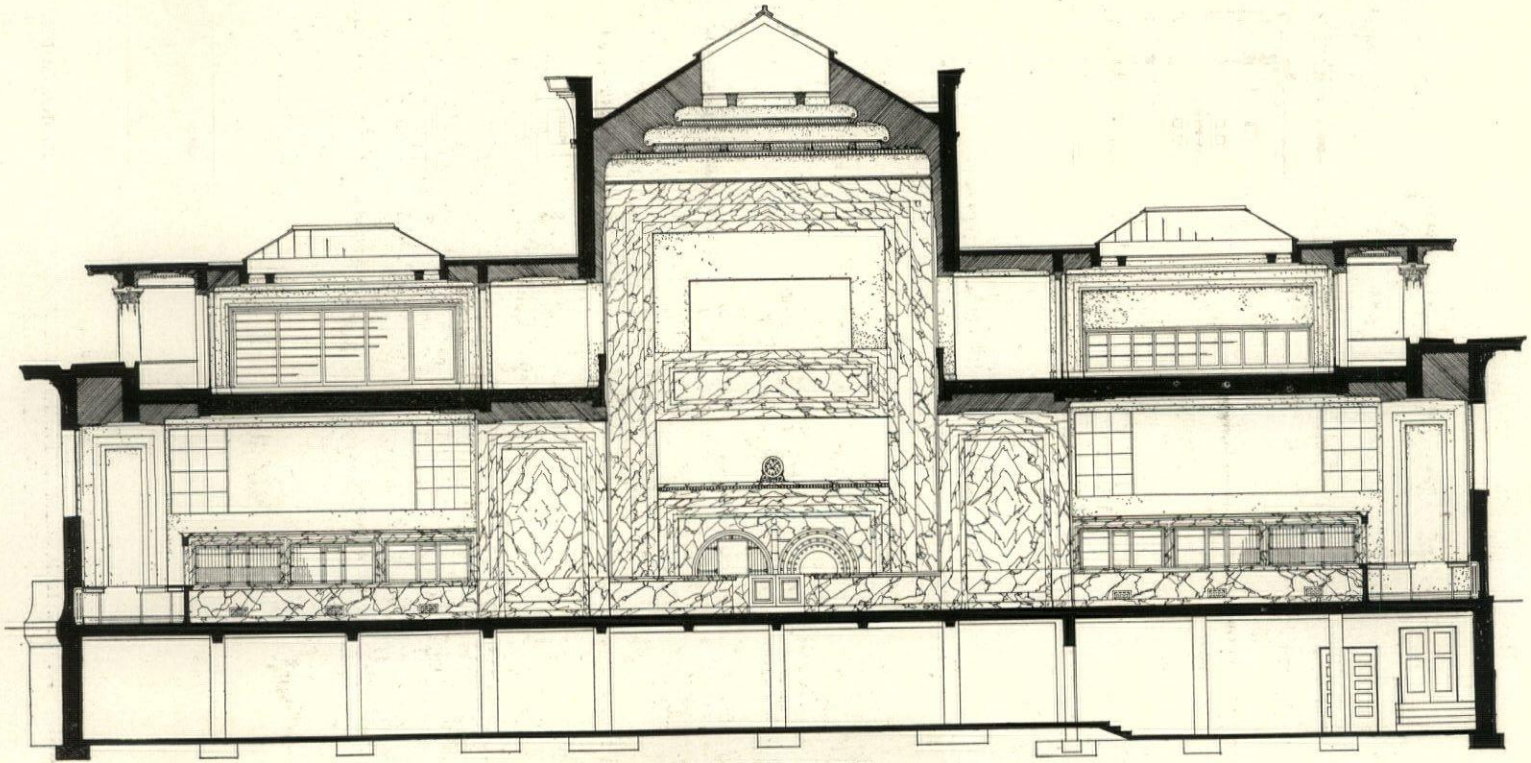


Plan of Institutional Floor.



Plan of Banking Floor.

WINONA SAVINGS BANK AND WINONA NATIONAL BANK, WINONA, MINN.
George W. Maher, Architect.

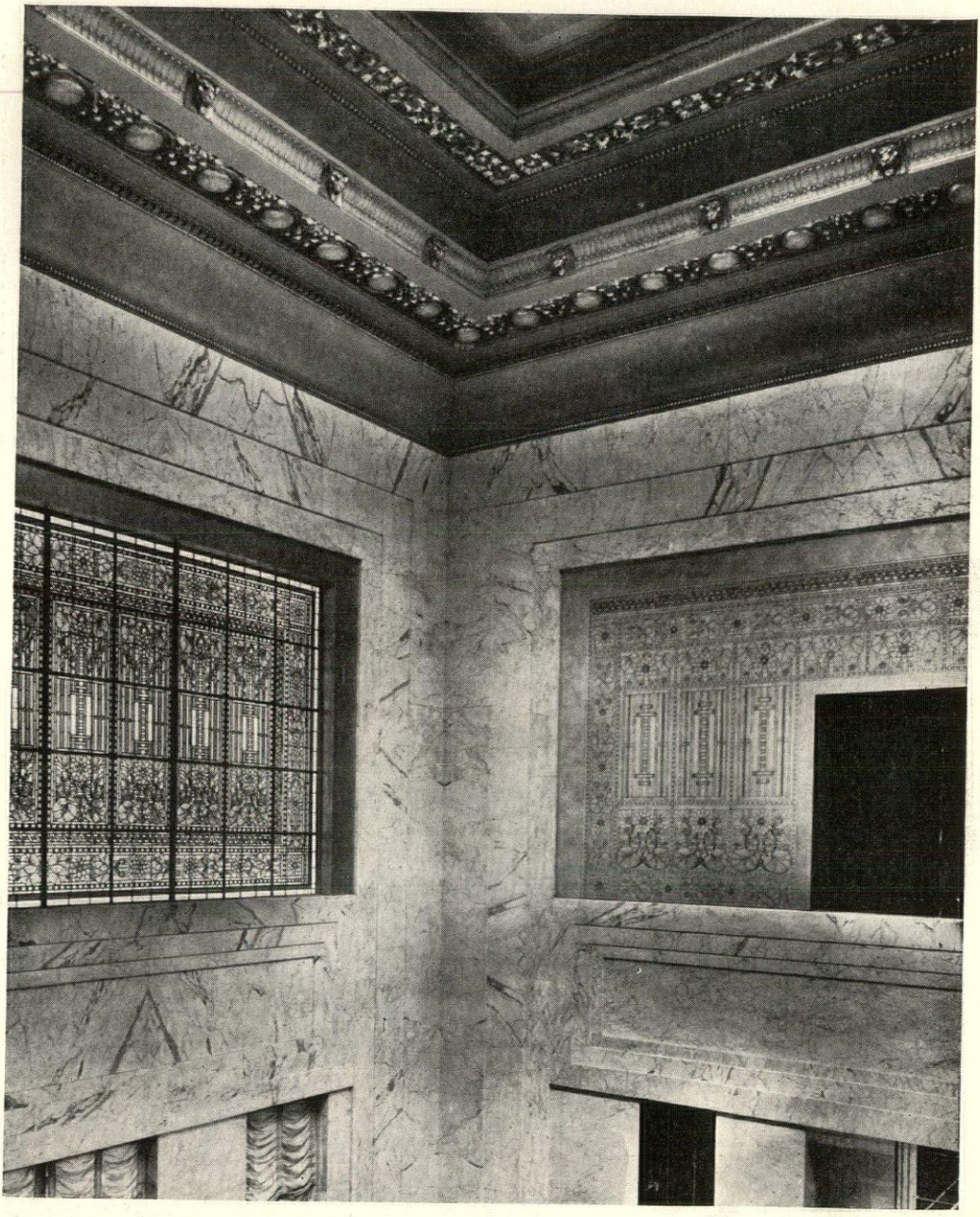


LONGITUDINAL SECTION

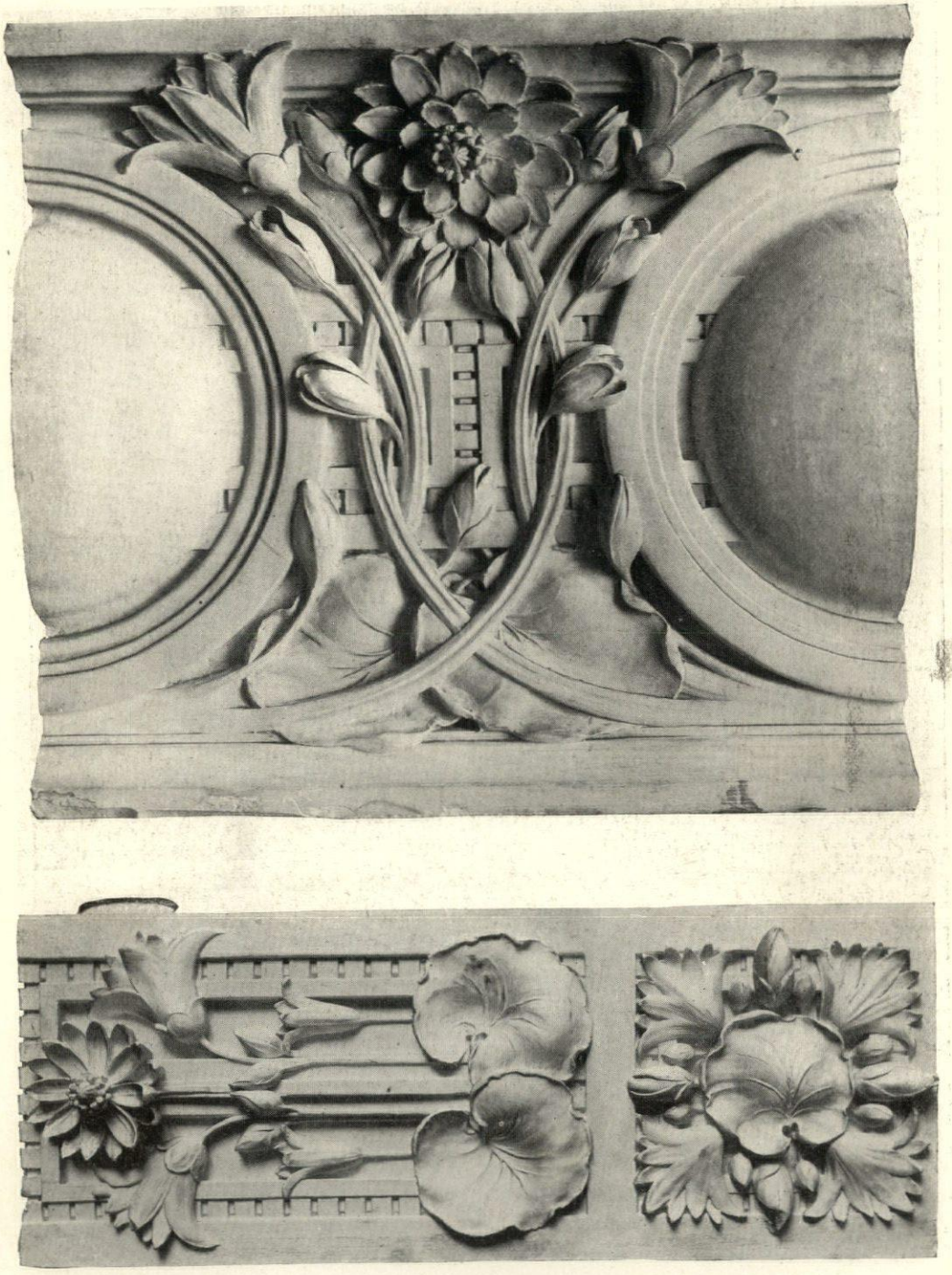
WINONA SAVINGS BANK AND WINONA NATIONAL BANK, WINONA, MINN. GEORGE W. MAHER, ARCHITECT.

EMPLOYEES' ENTRANCE—WINONA SAVINGS BANK AND WINONA NATIONAL BANK, WINONA, MINN. GEORGE W. MAHER, ARCHITECT.

MAIN ENTRANCE, UNDER PORTICO—WINONA SAVINGS BANK AND WINONA NATIONAL BANK, WINONA, MINN. GEORGE W. MAHER, ARCHITECT.



CORNER OF PUBLIC LOBBY, SHOWING CEILING ORNAMENTATION. ALL ELECTRIC LIGHTS ARE CONCEALED IN COVES BACK OF THE CORNICE PROJECTIONS.



CEILING ORNAMENT IN PUBLIC LOBBY. AMERICAN LOTUS CONVENTIONALIZED—WINONA SAVINGS BANK AND WINONA NATIONAL BANK, WINONA, MINN.
George W. Maher, Architect.

PUBLIC LOBBY, LOOKING TOWARD COMMERCIAL DEPARTMENT—WINONA SAVINGS BANK AND WINONA NATIONAL BANK, WINONA, MINN. GEORGE W. MAHER, ARCHITECT.

ENTRANCE TO MAIN STAIRS FROM LOBBY—WINONA SAVINGS BANK AND WINONA NATIONAL BANK, WINONA, MINN. GEORGE W. MAHER, ARCHITECT.

"One of the architectural features of the exterior is the main cornice treatment, which extends in a simple and direct manner entirely around the building, thus binding the various architectural effects harmoniously together. The under side of this cornice is panelled and enriched. The secondary horizontal treatment of wall surfaces above the main cornice indicates the interior housing of the institutional features of the bank on the second floor."

As one enters the building the general arrangement is unfolded immediately. The great steel vault is opposite the main entrance, and stands isolated in a large niche or recessed room especially planned and large enough to allow space entirely around the sides, back and top of the vault. The public lobby forms the architectural and decorative key to the interior. The beautifully modeled ceiling rises fifty feet above the marble floor. The lobby is abundantly lighted through an art glass ceiling, as well as from the large stained glass window underneath the open front entrance portico. This window forms one of the striking features of both the interior and the exterior design, since the lotus flower and leaf motif, already mentioned, are woven in a subtle manner in the beautiful glass work, both in the drawing and in the color.

The decorative scheme of the interior is simple and quiet. The American lotus flower and leaf theme is employed on the wall surfaces and again in the modeling of the ceiling ornament. The sides of the public lobby are lined with broad bands of white Italian English-veined marble, extending from the floor to the ceiling. The marble is so designed and arranged in panels that the beauty of the polished surfaces is at once apparent. The wainscoting extending around the bank floor is of imported Alps green marble. The floors throughout are of marble of a white effect. The various floors, including the mezzanine floor and balconies, are arranged around this public lobby so that the spectator can view the richness of the design of the lobby from different convenient levels.

The workings of the banks below can also be seen from these levels and balconies, thus giving the spectator an insight into the practical operations of a bank. On one side is the Winona Savings Bank and on the other the Winona National Bank. These are equipped with all methods for efficiency in banking. The various departments of both banks are abundantly lighted by large window spaces extending entirely around the three sides of each room. The window surfaces are filled with polished plate glass combined with stained glass and are placed above the level of the clerks' heads and back of them, thus obtaining the best and most practical method of day lighting. The electric lighting is especially designed for practical purposes and also for illumination. Indirect or reflected lighting fixtures are concealed back of screens or modeled ceiling projections, in order to avoid glare to the eye.

The institutional departments on the second floor, one for men and the other for women, are reached by two spacious marble stairways. The institutional departments are intended to make this bank an educational contribution to progressive banking. The institutional rooms are provided with every facility to accommodate the patrons and the general public. The rooms have tables and easy chairs, stationery, and every convenience that is found in fully equipped club rooms. Wash rooms and rest rooms are conveniently arranged off the men's and women's institutional rooms, for the use of the bank patrons and the public. Between these two rooms, on the second floor, and also overlooking the public lobby, is a large exhibition room that will be available for many different purposes as it may be needed.

The State of Minnesota is becoming famous for its new banks showing progressive tendencies in architectural design. They are to be found in the smaller cities, especially those where the support comes mainly from the surrounding rural districts. They have proved attractive to visitors, who have recognized in them works of art as well as of utility; they have therefore exerted an educational influence in communities heretofore indifferent to architecture because of conventional and prosaic design.

MEN'S ROOM, ON SECOND FLOOR—WINONA SAVINGS BANK AND WINONA NATIONAL BANK, WINONA, MINN. GEORGE W. MAHER, ARCHITECT.

It requires courage to introduce anything that can be regarded as an innovation, but when the innovation meets with acceptance by an intelligent community, it becomes thereby a part of its daily life, which the architect has interpreted in language which he only can speak. From all available accounts this building has been accepted by the people of Winona.

CAPITAL OF GRANITE COLUMN AT MAIN ENTRANCE.

RECENT DEVELOPMENTS IN THE THEORY OF VENTILATION

By Charles L. Hubbard

THE term, recent, as used above, has a somewhat broader meaning than is usually given to it, as the developments referred to had their beginning some ten or twelve years ago. However, it is only within the past three years or so that a general discussion of the matter has appeared to any extent in the technical journals, and at the present time investigations are still being carried on to reduce these theories to a practical working basis. While considerable matter along this line has beeen published, it has appeared to any extent in the technivarious heating, medical, and school journals, and has usually taken the form of a radical presentation by the adherents of either the *natural* or *artificial* system according to their personal belief.

It is proposed in the present article to review the matter in a simple manner, giving what seems to be the general opinion of a majority of those who have made a special study of the subject and who should be able to give reliable information to those interested. As these new developments, when finally worked out, are likely to call for more or less change in building construction, as regards the ventilating arrangements, it would seem that the matter should have an especial interest for the architect.

Air has two principal functions: a chemical and a physical; it aerates the blood and absorbs the body heat. In order to perform the first of these it must contain a sufficient amount of oxygen and a minimum of harmful gases. Absorption of bodily heat depends upon the temperature, humidity and motion of the air. If the air of a room is not renewed its oxygen is gradually consumed and it becomes laden with heat and moisture from the bodies of the occupants.

Until within a comparatively short time all efforts toward better ventilation have been directed to chemical improvement instead of physical.

The theory upon which all systems of ventilation were formerly designed was that the percentage of oxygen must be maintained as nearly as possible to correspond with that of outside country air and that the proportion of carbon dioxide, or carbon acid gas, must be kept below a certain maximum. The method employed for obtaining this condition was that of dilution or the supplying of large volumes of fresh air at the room temperature or higher, depending upon the system of heating employed. Normal outside air contains approximately 21 per cent of oxygen and from 3 to 5 parts of carbon dioxide in 10,000 parts of air. It has been assumed, arbitrarily, that the carbon dioxide should not be allowed to rise above 10 parts in 10,000, and for the best results 6 to 7 parts have been considered the limit.

The harmful results of an insufficient air supply were supposed to come principally from the poisonous effects of the carbon dioxide coupled with the corresponding diminution of oxygen. Later it was thought the effect of poor ventilation was due, not only to the presence of carbon dioxide, but to certain harmful gases and organisms which were given off in the process of respiration. As these substances were suposed to exist in a fixed proportion to the carbon dioxide, the latter was still consdered to indicate the quality of the air, although in itself it was thought to be less harmful, especially in small quantities.

The common allowance of 30 cubic feet of air per occupant per hour is based on an increase of carbon dioxide from 4 parts in 10,000 of air to slightly less than 7 parts. A maximum of 6

parts in 10,000 calls for a supply of 50 cubic feet per minute under the same conditions. As already stated, the sole object of ventilation was one of dilution, so as to keep the carbon dioxide content and its accompanying products of respiration below a certain percentage. While this has been the accepted theory of the heating engineer and the general public until a comparatively recent date, there has been some doubt among those engaged in laboratory research as to the importance of the chemical purity of the air to the exclusion of its physical characteristics, and it was only with the advent of the air washer that we began to learn of the advantages of air "conditioning."

The perfection of the air washer was the outgrowth of the demand for a filter which would be more effective and more nearly automatic in its action than the older forms of dry filter, which were extremely bulky when made of the proper proportions and required frequent removal for cleaning in order to limit the resistance to air flow. While the primary use of the air washer was for the removal of dust and soot from city air, its field was soon extended to air moistening, cooling, and the removal of some of the products of respiration.

Although most of the ventilating systems at the present time are designed along the same general lines as in the past (with the exception of air washing in large city buildings), the *theory* of ventilation, as accepted by many of the leading authorities at home and abroad, has radically changed, the idea being that the physical characteristics of the air we breathe are of much greater importance than chemical purity.

While there are still some who give considerable importance to the chemical theory, a majority of those who have made an exhaustive study of the matter seem to have discarded the older theory and recommend that future development in the design of ventilating equipment be along the line of improvement in temperature and humidity control and in air movement.

Briefly stated, the chemical composition of the air, as regards contamination through respiration under ordinary conditions, is negligible, as compared with the removal of bodily heat and moisture. It will be interesting at this point, before considering the physical effects of air, to examine briefly into the reasons for this change in theory in regard to the chemical characteristics, as related to bodily health and comfort.

In order to show the relative importance of changes in the percentage of oxygen and carbon dioxide in the air for breathing, it is necessary to have a clear understanding of the process of respiration and the changes which take place in the air within the passages of the respiratory tract. At the beginning, it should be clearly understood that the lungs are never filled with *pure* air, even under the most favorable conditions, because breathing is only a frequently repeated slight dilution of the air remaining in the throat and larger bronchial tubes after expiration.

So far as its chemical composition is concerned, this is air which has passed out of the lungs, and after being mixed with a certain proportion of outside air, during the next breath, is again drawn into the lungs as a mixture which does not even remotely approach chemically pure air. This results in making respiration a continuous instead of an intermittent process, and so provides for a constant supply of oxygen which is necessary to the life of the tissues.

Thus we see that any changes in the proportion of oxygen and carbon dioxide, which are likely to occur in the air of a poorly ventilated room, will have no appreciable effect upon the air within the lungs.

As previously stated, pure outside air contains about 21 per cent. of oxygen, and this hardly ever falls below 20 per cent. in the poorest ventilated room. As the air in the lungs contains but 16 per cent. under normal conditions, it is evident that any changes which may take place in the oxygen content of the surrounding air will have but slight effect internally. Furthermore, the supply of oxygen in the lungs is not dependent upon the outside conditions, but is regulated by the amount of carbon dioxide

dissolved in the blood, and this, in turn, acts upon certain nerve centers which control the depth and rate of breathing. If the carbon dioxide falls too low, stimulation of the nerve centers ceases, and the process of respiration does not take place until the proper proportion has again been accumulated. The normal proportion of carbon dioxide in the air of the lungs is about 5 per cent., and is kept at this point automatically by the action of respiration. Under these conditions the only effect of breathing in an excess of this gas with the surrounding air is an unnoticeable increase in the action of the lungs through faster and deeper breathing.

Thus we see that the amount of carbon dioxide remaining in the blood depends entirely upon internal conditions rather than external, and is entirely automatic in its action—the rate of ventilation of the lungs being the means by which a proper balance is maintained between the oxygen and carbon dioxide.

It is also evident that our chief safeguard against a want of oxygen by the body tissues is a definite accumulation of carbon dioxide, and this is maintained by rebreathing the "dead-space" air, so called, contained in the throat and larger bronchial tubes.

Besides the necessary reinspiration of the dead-space air, it is also known that one usually takes in again a part of the breath entirely expelled from the body during the preceding expiration. When standing alone in a room a person will rebreathe from 1 to 2 per cent. of the air he has just exhaled. When lying in bed he will rebreathe from 2 to 6 per cent. or more, depending upon his position, and even in the open, if there is a shield to break the wind, a small proportion is taken back with nearly every breath.

While the above seems to prove the fallacy of the older method of reasoning, it is interesting to note the results of certain experiments which have been carried out from time to time. Although a large amount of investigation has been done in this direction, space allows the mention of only a few results.

As far back as 1842 Leblanc found that an animal could survive exposure to atmosphere containing 30 per cent. of carbon dioxide, provided the proportion of oxygen was 70 per cent., and recover quickly from the depression produced by this mixture.

Pettenkofer, in 1849, demonstrated that the symptoms produced in crowded places were due neither to an excess of carbon dioxide nor a deficiency of oxygen. He also found that air containing 1 per cent. (100 parts in 10,000) of carbon dioxide could be breathed for hours without discomfort, and laid down the doctrine, accepted by sanitarians, that the percentage of carbon dioxide was only a guide to the other harmful properties contained in the atmosphere.

Later tests in an English brewery, where carbonic acid gas was compressed and bottled, showed the air of the workroom to contain from 0.14 to 0.93 per cent. of this gas (14 to 93 parts in 10,000). Work was carried on continuously in 12-hour shifts, the men having their meals in the room. Some, it is stated, had followed this employment for eighteen years without detriment to health.

Other experiments have shown that the air may contain from 3 to 4 per cent. (300 to 400 parts in 10,000) of carbon dioxide before increased respiration will be noticed by an individual at rest, but percentages over 1 per cent. (100 parts in 10,000) diminish the power to do muscular work.

The widespread belief in the presence of organic poisons in the expired air is mainly based on the statements of Brown-Séquard and D'Arsonval, and it has been assumed by sanitarians that the carbon dioxide must be kept below 10 parts in 10,000 of air to prevent harmful results from this condition, the percentage of carbon dioxide being taken as an index of their amount.

The evil smell of crowded rooms has long been accepted as proof of the existence of such poisons. As a matter of fact, such odors come from secretions of the skin; from food eaten, such as onions and garlic; decayed teeth; the bad breath of dyspepsia; soiled clothes, etc., etc. While such a mixture of odors is offensive and disgusting, it has been

proved to be harmless, so far as its direct effect upon health is concerned.

The theory of Brown-Séquard and D'Arsonval was based on three series of tests, as follows: In the first case, water with which they had repeatedly washed out the air tubes of a dog, was injected into the blood-vessels of a rabbit. In the second, they injected the water condensed from the exhaled breath of a man; and in the third, the water condensed from the breath of a dog. The principal symptoms recorded were dilation of the pupil, acceleration of the heart, and paralysis of the lower limbs. The larger doses caused, as a rule, labored breathing, retching and contracted pupils.

Extensive investigations carried out along this same line more recently have proved this theory at fault and seem to show that the results were due to the injection of comparatively large quantities of water, or to its containing infectious bacteria, rather than to any harmful organic matter.

For example, an experiment was arranged where the breath of one dog was exhaled directly into the lungs of another continuously for nearly seven hours without harmful results.

In other cases the exhaled breath of human beings was condensed, then dried, sterilized, mixed with distilled water, and injected beneath the skin of rabbits and mice. Here, as before, no sign of disturbance was shown. In comparison with this, both rabbits and a puppy were killed by injecting sufficient quantities of pure distilled water.

A considerable portion of the above data has been obtained from the Smithsonian Miscellaneous Collections, Volume 60, No. 23, which gives a large number of other tests along similar lines.

Having shown, in a general way, the course of reasoning followed in discrediting the older theory of ventilation, let us now see what has been advanced to take its place.

More than thirty years ago Hermans suggested that the results of poor ventilation might be due, in some way, to heat rather than the chemical condition of the air, and recent investigations have been carried out along this line.

Experiments show that an ordinary adult will produce, and must be relieved of, sufficient heat in the course of an hour to raise the temperature of 1,000 cubic feet of air 15 or 20 degrees. In addition to this, a considerable amount of moisture is given off, partly by perspiration and partly as vapor in the air exhaled from the lungs.

Unless this heat and moisture are promptly removed the body becomes surrounded by an envelope of stagnant air, having the same effect as an oppressive day in the summer, with a high temperature and excessive humidity.

The remedy for this condition is evidently suitable temperature and humidity regulation and air movement, which combination forms the basis of design for the latest systems of ventilation.

The physiological effect upon the human body of overheating is a derangement of the vaso motor system, that is, the nerves which regulate the circulation through the blood-vessels, other than the action of the heart. For example, a cool wind striking the skin, stimulates, through the sensory nerves, the vaso motor constrictors, which causes the small vessels near the surface to contract and drives the blood deeper in the tissues and so preserves the bodily heat. A warm wind, or other source of external heat, causes the superficial vessels to dilate and draws the blood to the surface, thus cooling it more rapidly and maintaining the normal bodily temperature. Health, and life itself, depend upon a uniform temperature of the blood, the usual sunstroke or heat prostration being the result of a very slight rise in temperature. When the heat regulating functions of the body are interfered with by an envelope of still air, at a high degree of temperature and humidity, the usual discomforts of a sultry day or a badly ventilated room are experienced.

Briefly stated, living beings constantly produce and give off to their surroundings an excess of bodily heat. This heat must be disposed of, and is constantly carried away from the body, partly in the air exhaled from the lungs, but

chiefly through the skin by radiation and conduction assisted by the evaporation of perspiration. It is evident that the prompt removal of this heat will depend upon a surrounding atmosphere neither too hot nor too moist, and furthermore, that the process will be hastened if the air is in motion.

Either too high a temperature or too much moisture in the air will retard the cooling of the body, and when these two conditions occur at the same time, as is usually the case in a poorly ventilated room, the result is doubly harmful.

According to this conception, the problem of ventilation is one of physics and not of chemistry. It seems strange that although more than thirty years have elapsed since this doctrine was first advanced, so little has been known of it outside of laboratories, and that the theory of an excess of carbon dioxide and a mysterious organic poison has prevailed so persistently until the present time.

An interesting coincidence which may be mentioned at this point is, that the usual allowance of 30 cubic feet of air per occupant per minute, based on the amount of dilution to maintain a certain standard of chemical purity, is also the amount of air which is required to remove the heat and moisture given off by one person when introducing it into the room at a temperature 10 degrees less than the room temperature, which is about as low as is possible without causing drafts or chilling the occupants.

This fact is not only of general interest, but serves to show that our modern ventilating systems, while designed upon a wrong assumption, may be made to fulfill the requirements of our later ideas, pending future developments in the way of greater efficiency and effectiveness.

Thus far the new theory of ventilation has been stated as a fact without giving any of the reasons leading up to its adoption.

Investigations in this direction have been under way for a number of years and are quite fully reported in the publication of the Smithsonian Institution previously referred to. Only a few of the simpler experiments will be mentioned in the present article.

In a series of tests at the Institute of Hygiene in Breslau, and reported in 1905, normal individuals were placed in a cabinet of about 80 cubic feet capacity and confined for periods up to five hours until the carbon dioxide rose to 100 to 150 parts in 10,000. No symptoms of illness or discomfort were felt, and the chemical impurity of the air had no effect upon the mental activity of the occupant so long as the temperature and humidity of the air were kept moderately low. Raising the temperature to 75 degrees and the humidity to 89 per cent., with the carbon dioxide at 120 parts in 10,000, caused much discomfort. Breathing outside air through a tube gave no relief under these conditions, while breathing air from the cabinet by those outside caused no discomfort.

Circulating the air within the cabinet, by means of a fan, without changes in temperature, humidity, or chemical composition, removed the disagreeable symptoms experienced by the occupants. When the chamber was cooled to 62 degrees there were no feelings of discomfort, although the carbon dioxide rose to 160 parts in 10,000.

Experiments reported in Bulletin 175, U. S. Dept. Agriculture, page 235, show that a man can live many days in a closed calorimeter chamber in comfort, without damage to his health, and having not the slightest knowledge of any defect in ventilation when the carbon dioxide rises to 100 to 200 parts in 10,000, so long as the air in the chamber is kept cool and dry.

Recent investigations have also been carried out along a similar line in the Physiological Laboratory of the London Hospital Medical College with practically the same results.

In this case the chamber was of wood made air tight with suitable insulation, and equipped with an electric heater, a coil through which cold water could be circulated, humidifying apparatus, and two electric fans for circulating the air within the chamber. Without going into details, the results showed that decreased oxygen and an increase in carbon dioxide

up to 200 to 500 parts in 10,000 had little effect upon the pulse, while the temperature and humidity had a profound effect. The feelings of discomfort which were produced depended upon the excessive heat and humidity and were relieved by cooling and stirring the air by means of the water coil and fans. The carbon dioxide could be suddenly raised to 200 parts in 10,000 without the occupants becoming aware of it. Those outside the chamber could breathe air from within, through a tube, without experiencing any of the discomfort felt by those inside when the temperature and humidity were high, while the breathing of outside air by those within the chamber brought no relief.

A series of tests carried out some time ago by the Chicago Commission of Ventilation seemed to show that there was a temperature and humidity range within which the occupants of a room were comfortable, and this range has given rise to what is called the "comfort zone." This means that there is a maximum temperature with a minimum relative humidity, and a minimum temperature with a corresponding maximum relative humidity, between the limits of which the occupants of a room are comfortable. In other words, there seems to be no *best* temperature or *best* relative humidity; but the maximum temperature at which one is comfortable will be associated with a minimum relative humidity and the minimum temperature for comfort will have associated with it a maximum relative humidity.

Under the conditions of the tests made, it was found that a temperature of 64 to 70 degrees with a corresponding relative humidity of 55 to 30 per cent. seemed to be the limit; that is, the comfort zone was between 64 degrees with 55 per cent. humidity, and 70 degrees with 30 per cent. humidity.

We have heard much recently of the necessity of more humidity in the air we breathe, the atmosphere of our dwellings and public buildings being likened to that of an arid desert.

While a certain amount of moisture adds to our comfort, too much is injurious to health, as shown by the experiments just described. Taken alone, a certain degree of humidity does not signify very much, within certain limits, but must be considered in connection with the existing temperature; the combination being what produces comfort or discomfort. It is probably safe to say, where no special provision is made for humidity control, that during the winter our dwellings are too dry and our audience halls and theatres too moist. This is due to the proportion of cubic space per occupant, being large in the former and small in the latter case.

While much has been said of the harmfulness of too dry an atmosphere and its effect upon the mucous membrane of the respiratory passages, there seems to be some reason to doubt that lack of moisture, within practical limits, has any particular effect in this direction.

The membranes of the throat and nose are kept moist by the secretions from certain glands provided for this purpose and not by the moisture in the air which we inhale. Of course the dryer the air the greater will be the tax upon these glands, but the surfaces themselves will remain moist so long as the function of the glands is not overtaxed. It seems more likely that the sensation of smarting in the throat and nose, which is often experienced in a dry atmosphere, is due to dust rather than a low degree of humidity.

While dry air does not necessarily contain more dust than moist air, a low humidity tends to extract moisture from the floors, furniture, and other objects and thus liberates a certain amount of dust which is readily picked up by the moving air. It is probable that one of the most important beneficial effects of outdoor sleeping is breathing a comparatively dust free air. The relative humidity is higher at night and the amount of dust in the air consequently low.

The most extensive investigations in both theoretical and practical ventilation are being carried out in this country by the Chicago Commission on Ventilation and the New York State Commission on Ventilation.

The former was organized in February, 1910, and has done a large amount

of practical work along the line of ventilation as related to schools, churches, theatres, industrial buildings of various kinds, and street cars. The work is carried on partly in laboratories, especially equipped for this purpose, and partly in buildings in actual operation, where tests are conducted under practical working conditions.

The New York Commission was organized in June, 1913, and began its actual work in December of the same year.

The phases of the problem which have been given special study may be classified as follows:

Chemistry of the Air—Oxygen, carbon dioxide, organic matter, odors, ozone.

Air Conditioning—Temperature, humidity, dust.

Mechanics of Ventilation—Air volume, air movement, heating of air, cooling, recirculation, natural and artificial ventilation.

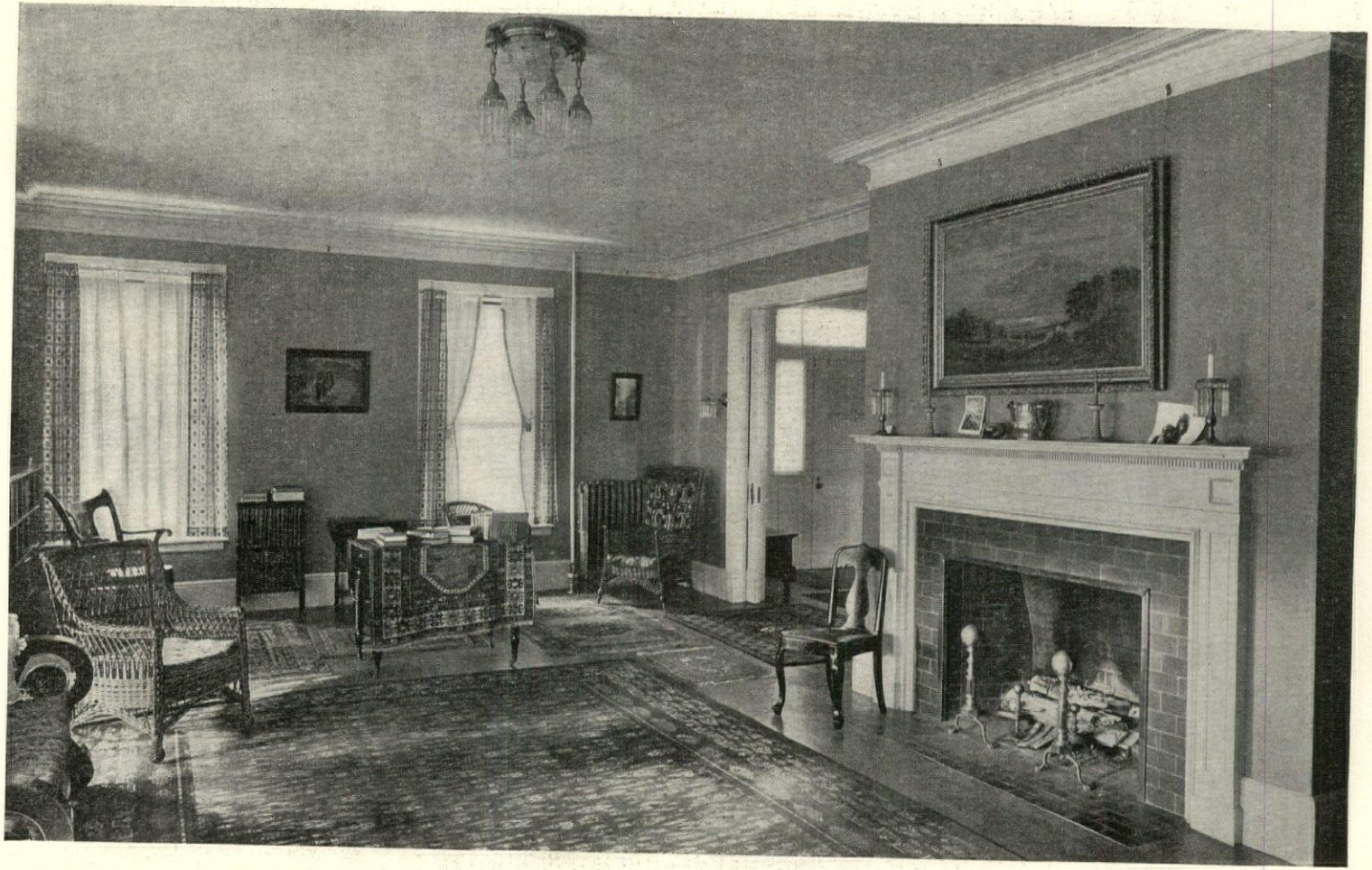
Efficiency of installation and operation. Ventilating apparatus.

The laboratory is equipped with a ventilation chamber having a capacity of 1,150 cubic feet, which is provided with apparatus by which the air of the chamber may be confined and rebreathed, or renewed at any desired rate, may be maintained at any desired temperature and humidity, may be kept quiet or in motion, may be removed, washed and recirculated, and may be given any desired chemical composition.

In this chamber from one to six persons may be confined for any length of time. On certain days they may engage in definite mental tasks, while on other days they perform a definite amount of physical work under a given combination of air conditions. By the quantitative study of a considerable number of bodily functions, such as temperature, sensitiveness of the skin, blood-pressure and pulse rate, respiratory exchange, the production of heat, duration of digestion, various changes in the urine, etc., an endeavor is being made to learn in what respects, if any, the physical and mental efficiency are altered by changes in air conditions.

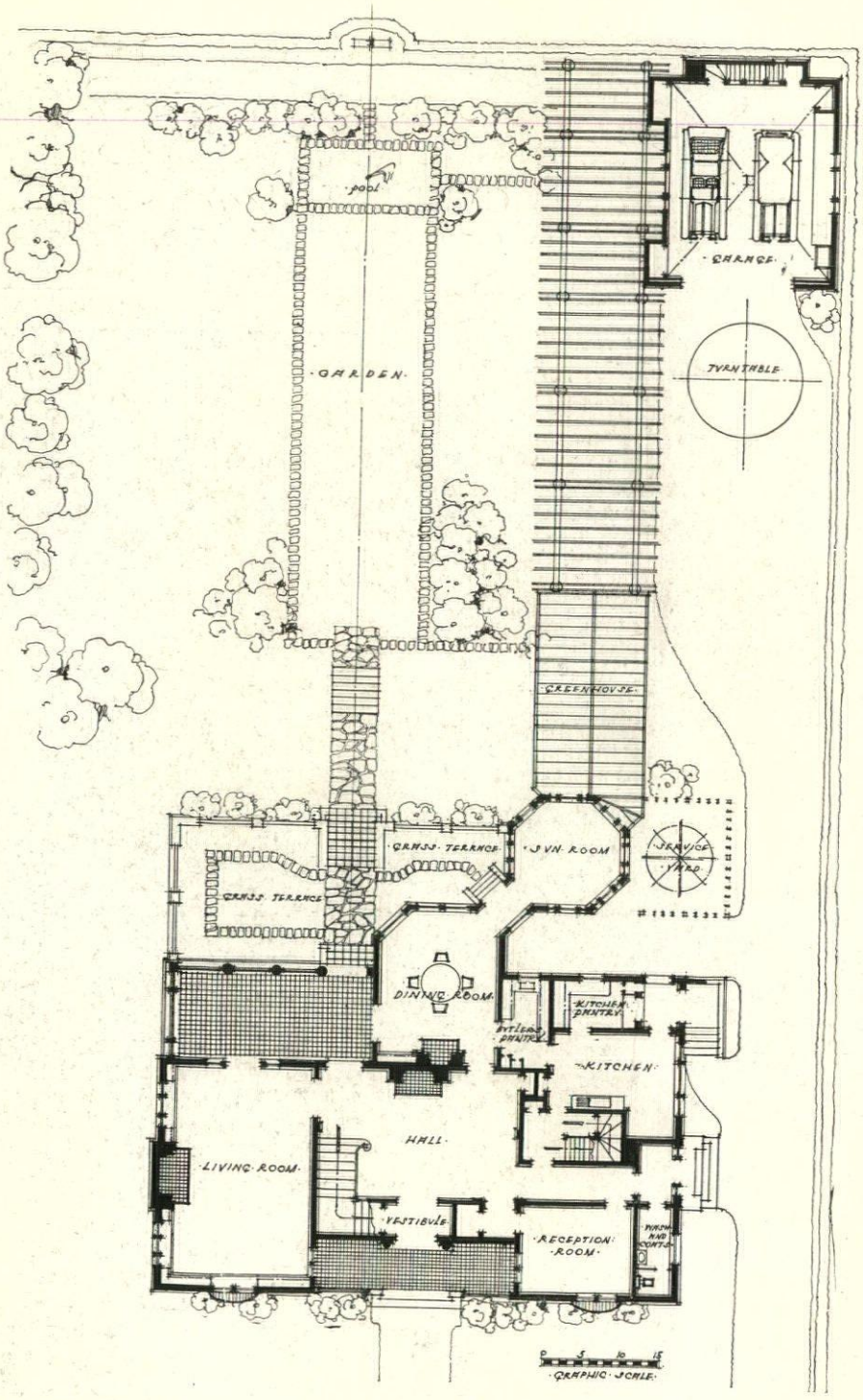
In addition to laboratory investigations, outside work is being carried on under the direction of members of the laboratory staff.

Both the Chicago and New York Commissions have been very conservative in giving out conclusions, it being the policy of those in charge to thoroughly investigate the various problems from all sides before making any definite recommendations.



ALTERATION FOR BUTTERFIELD HOUSE, AMHERST, MASS. JAMES M. RITCHIE, ARCHITECT.

ALTERATION FOR BUTTERFIELD HOUSE, AMHERST, MASS. JAMES M. RITCHIE, ARCHITECT.



HOUSE AT SWAMPSCOTT, MASS.
JAMES M. RITCHIE, ARCHITECT.

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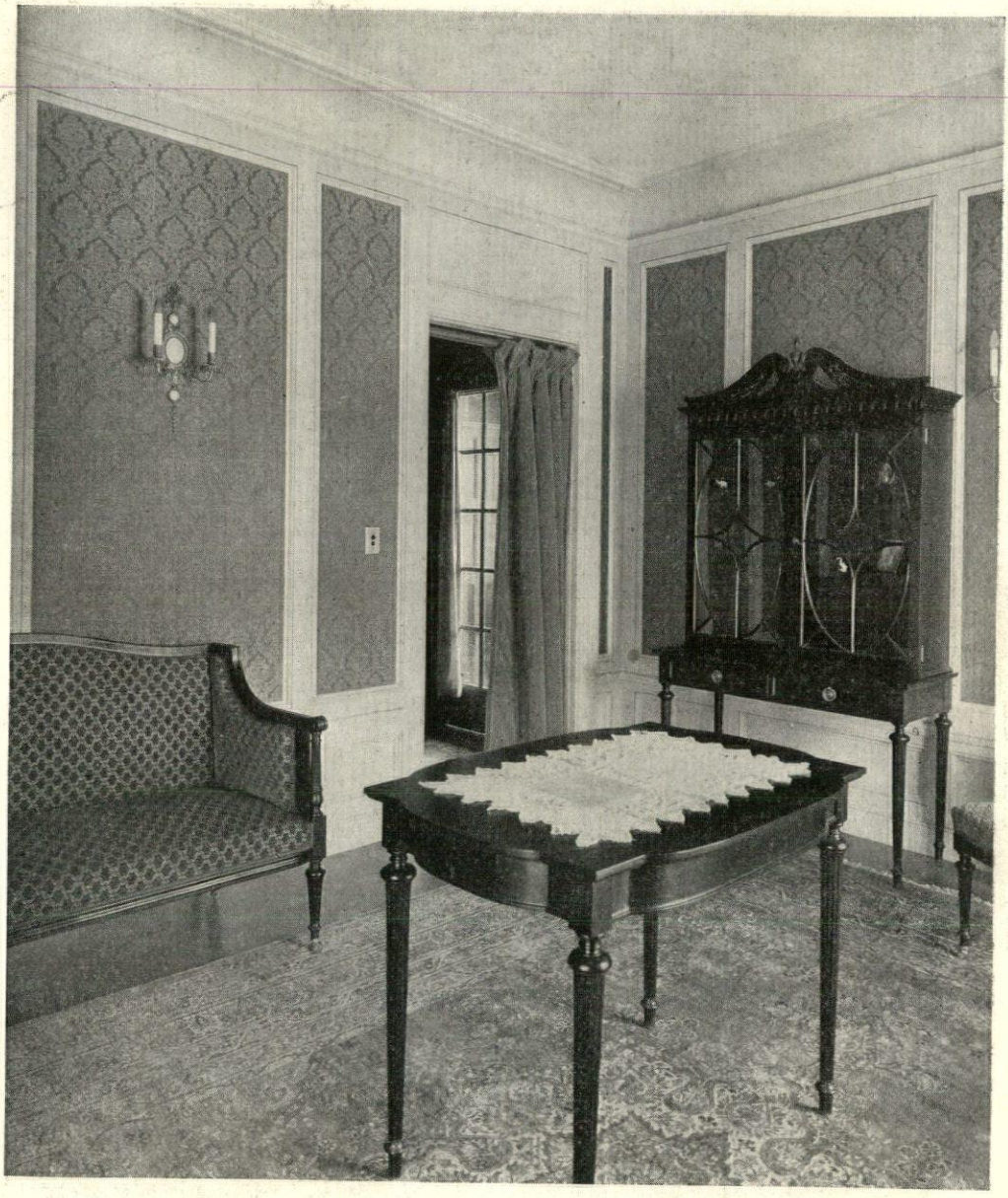

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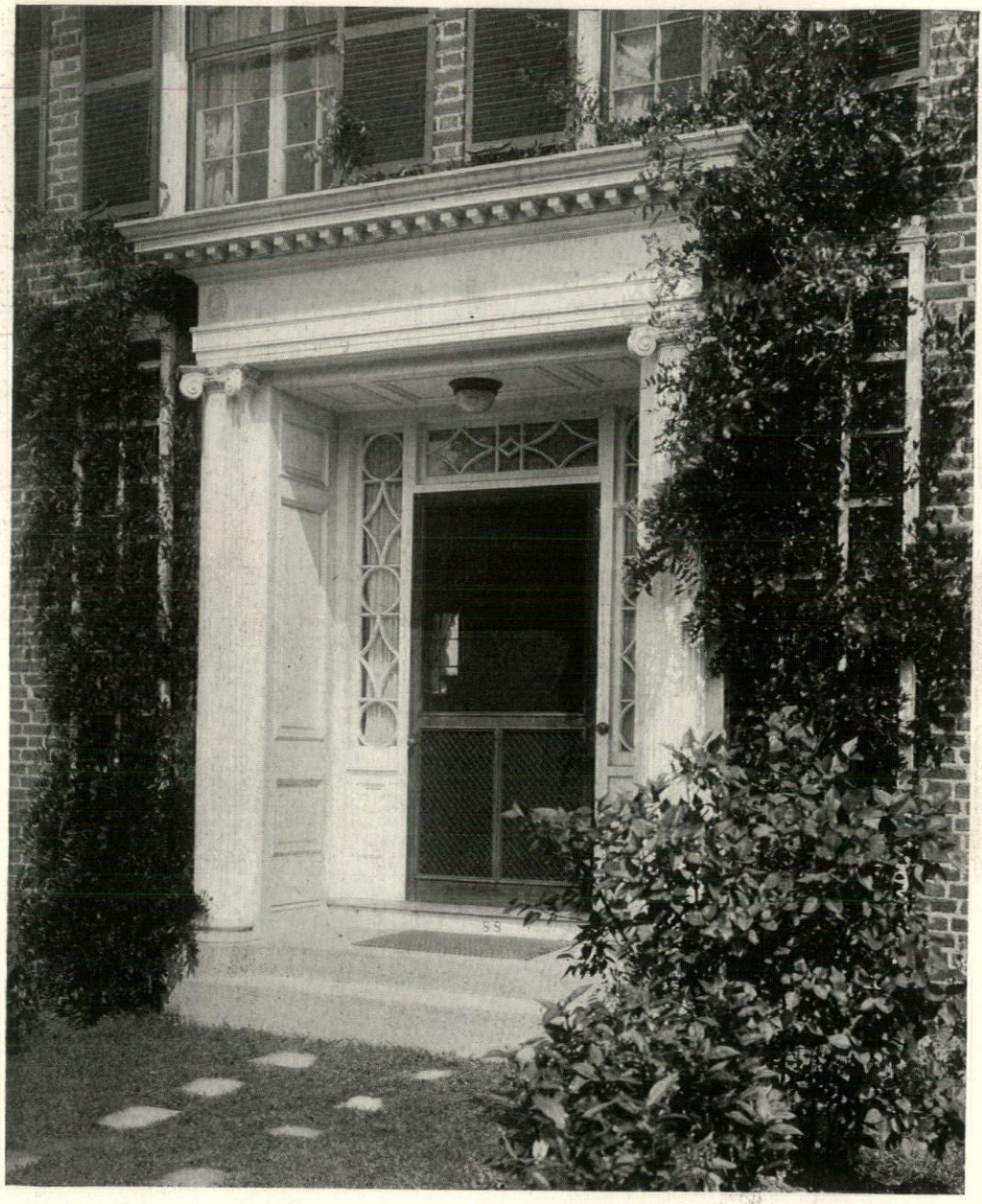
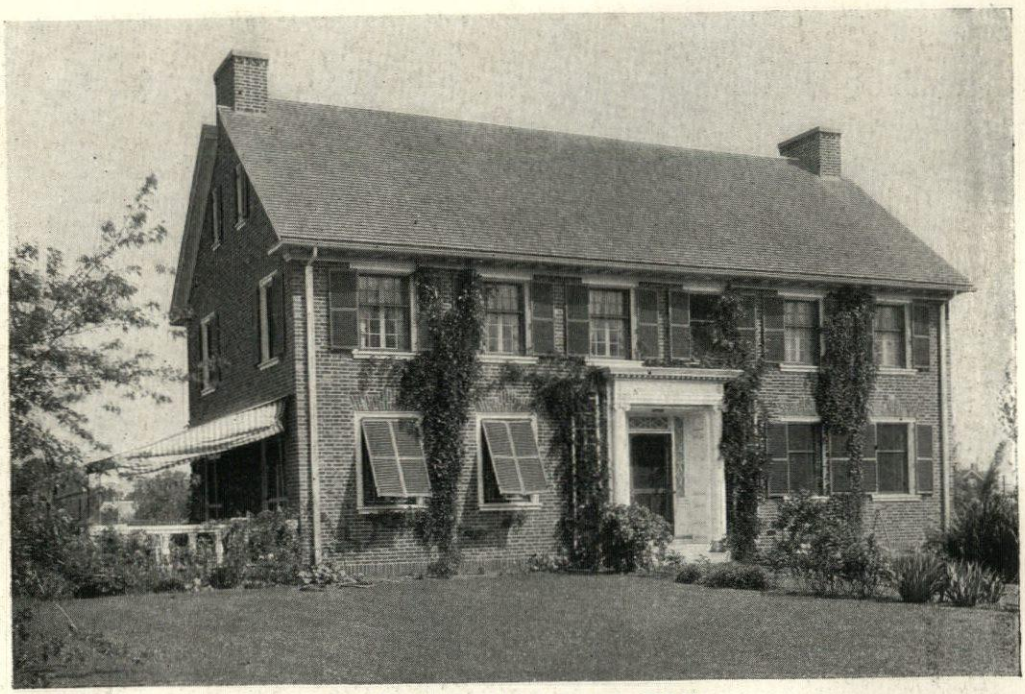
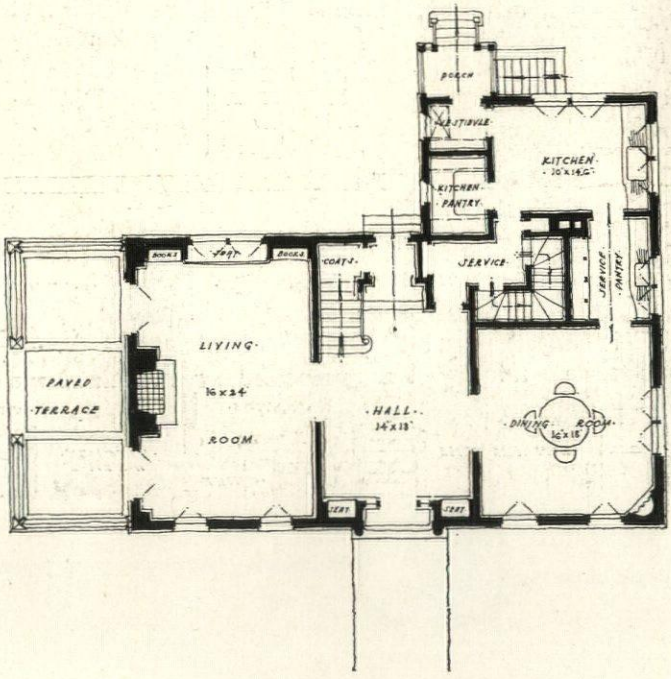


HOUSE AT PHILLIPS BEACH, MASS.
JAMES M. RITCHIE, ARCHITECT.

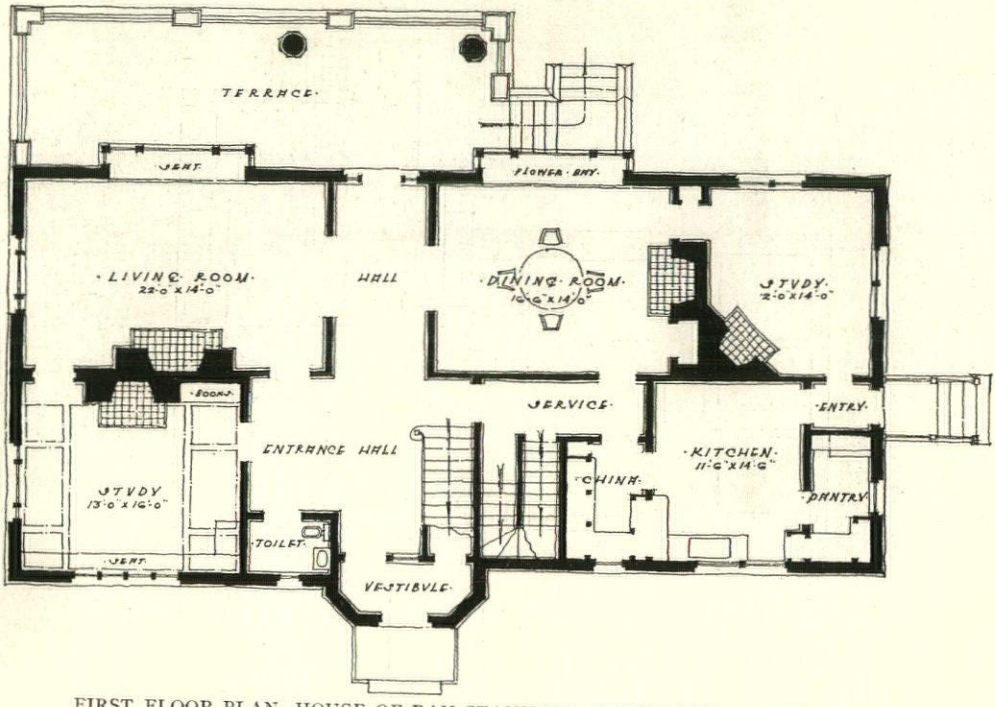


HOUSE AT PHILLIPS BEACH, MASS.
James M. Ritchie, Architect.



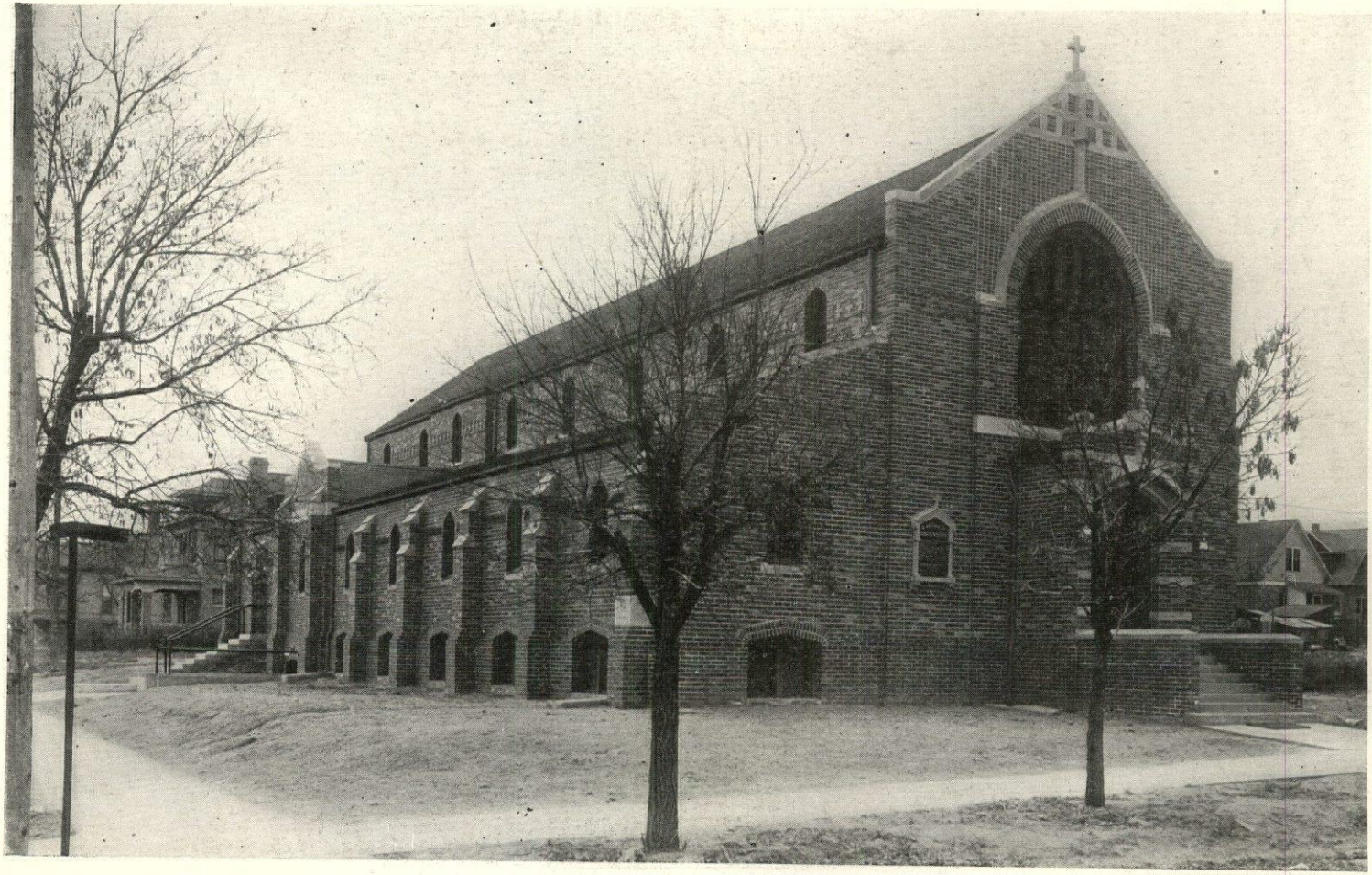
HOUSE AT PHILLIPS BEACH, MASS.
James M. Ritchie, Architect.

HOUSE OF RAY STANNARD BAKER, ESQ., AMHERST, MASS.
James M. Ritchie, Architect.



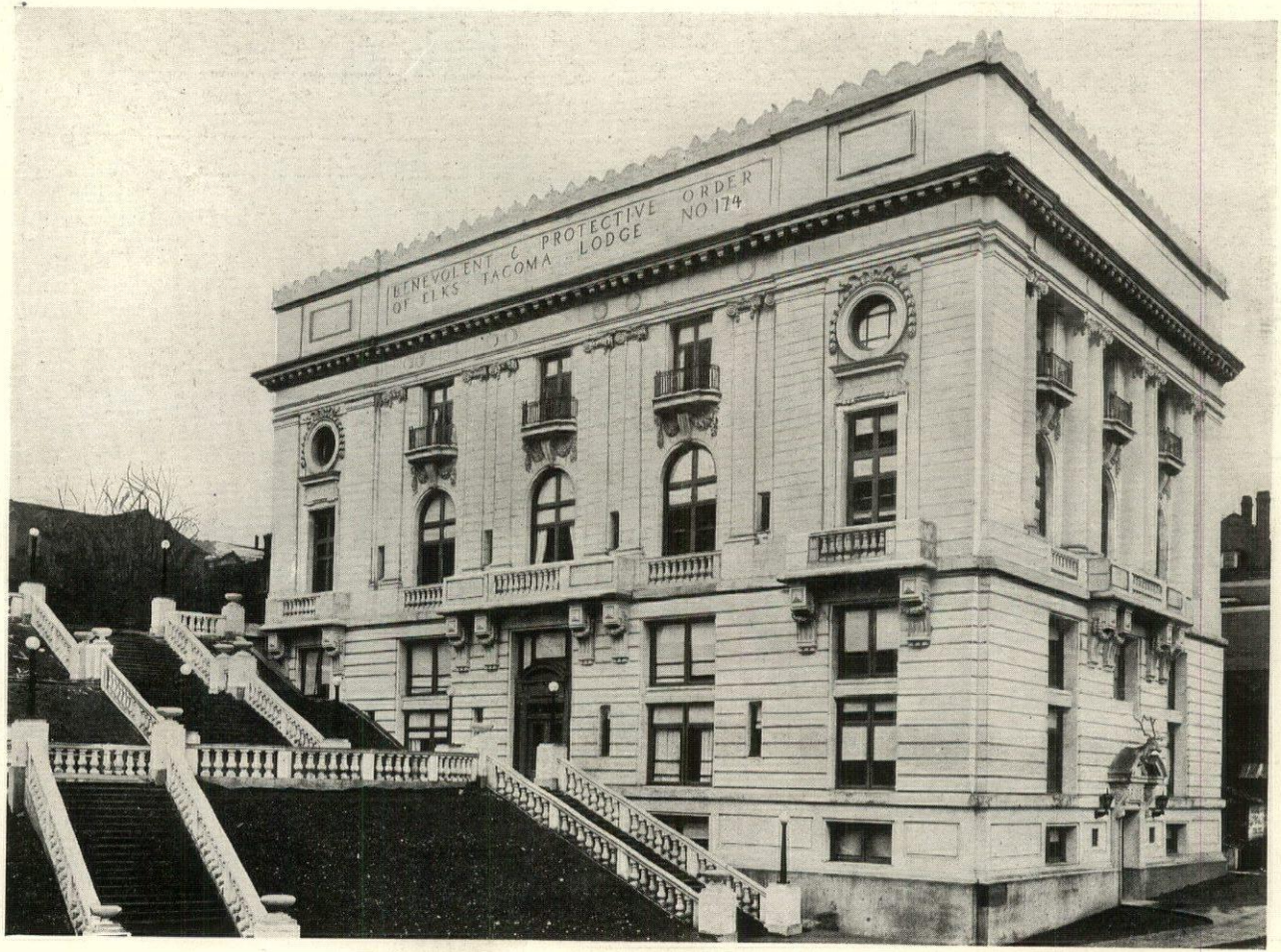
FIRST FLOOR PLAN—HOUSE OF RAY STANNARD BAKER, ESQ., AMHERST, MASS.
James M. Ritchie, Architect.

DETAIL OF ENTRANCE FRONT—HOUSE OF RAY STANNARD BAKER, ESQ., AMHERST, MASS. JAMES M. RITCHIE, ARCHITECT.



CHURCH OF THE ASCENSION (EPISCOPAL),
PUEBLO, COLO. WETHERELL & GAGE, ARCHITECTS.

CHURCH OF THE ASCENSION (EPISCOPAL), PUEBLO, COLO. WETHERELL & GAGE, ARCHITECTS.



THE ELKS CLUB OF TACOMA, WASH.
E. FRERE CHAMPNEY, ARCHITECT.

THE ELKS CLUB OF TACOMA, WASH.
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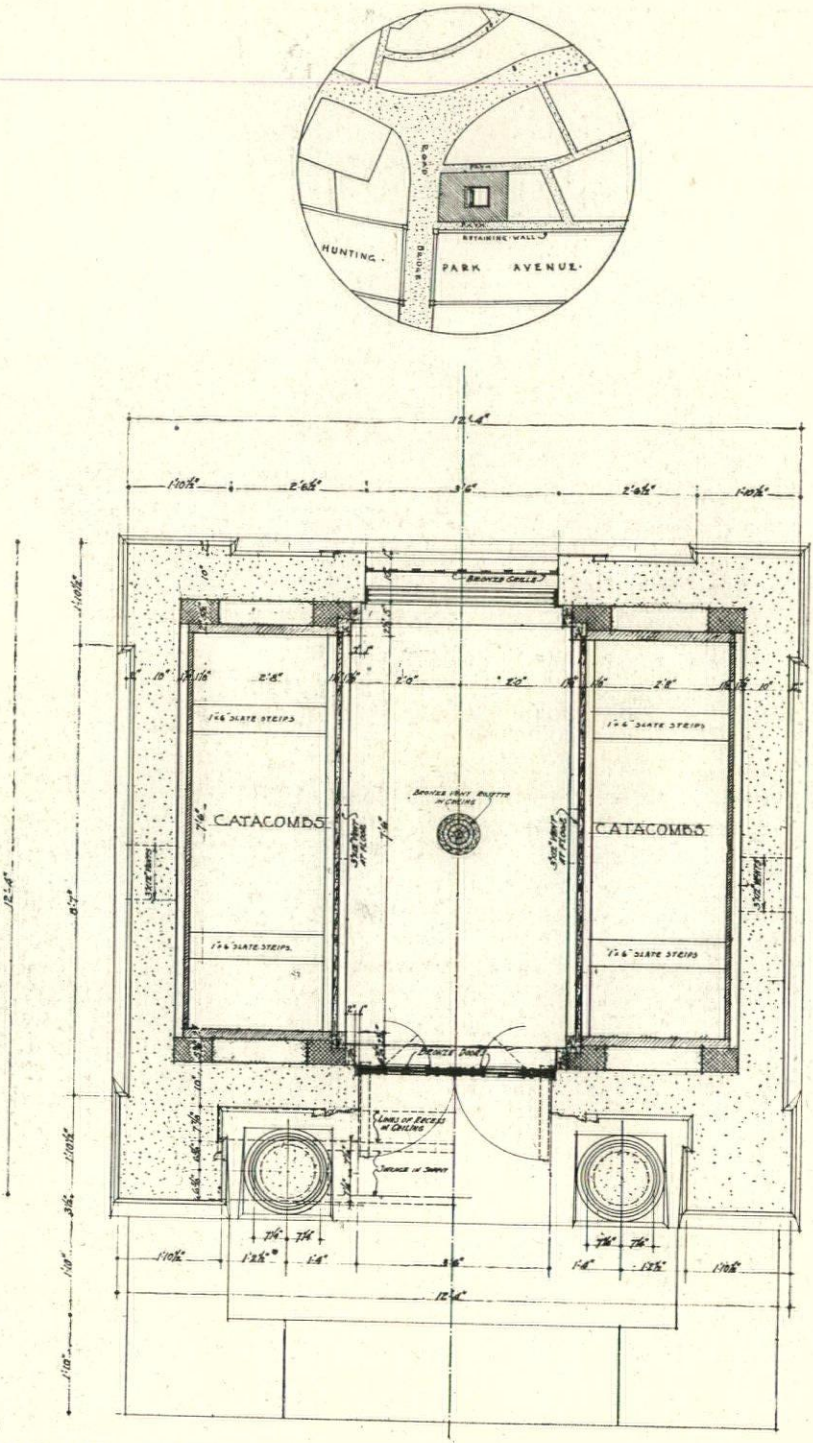

FLOOR PLAN AND LOCATION PLAN—WEBB MAUSOLEUM, LAUREL HILL CEMETERY, PHILADELPHIA. GILLESPIE & CARREL, ARCHITECTS.

WEBB MAUSOLEUM, LAUREL HILL CEMETERY, PHILADELPHIA. GILLESPIE & CARREL, ARCHITECTS.

OWN HOUSE, AT CONCORD, MASS.
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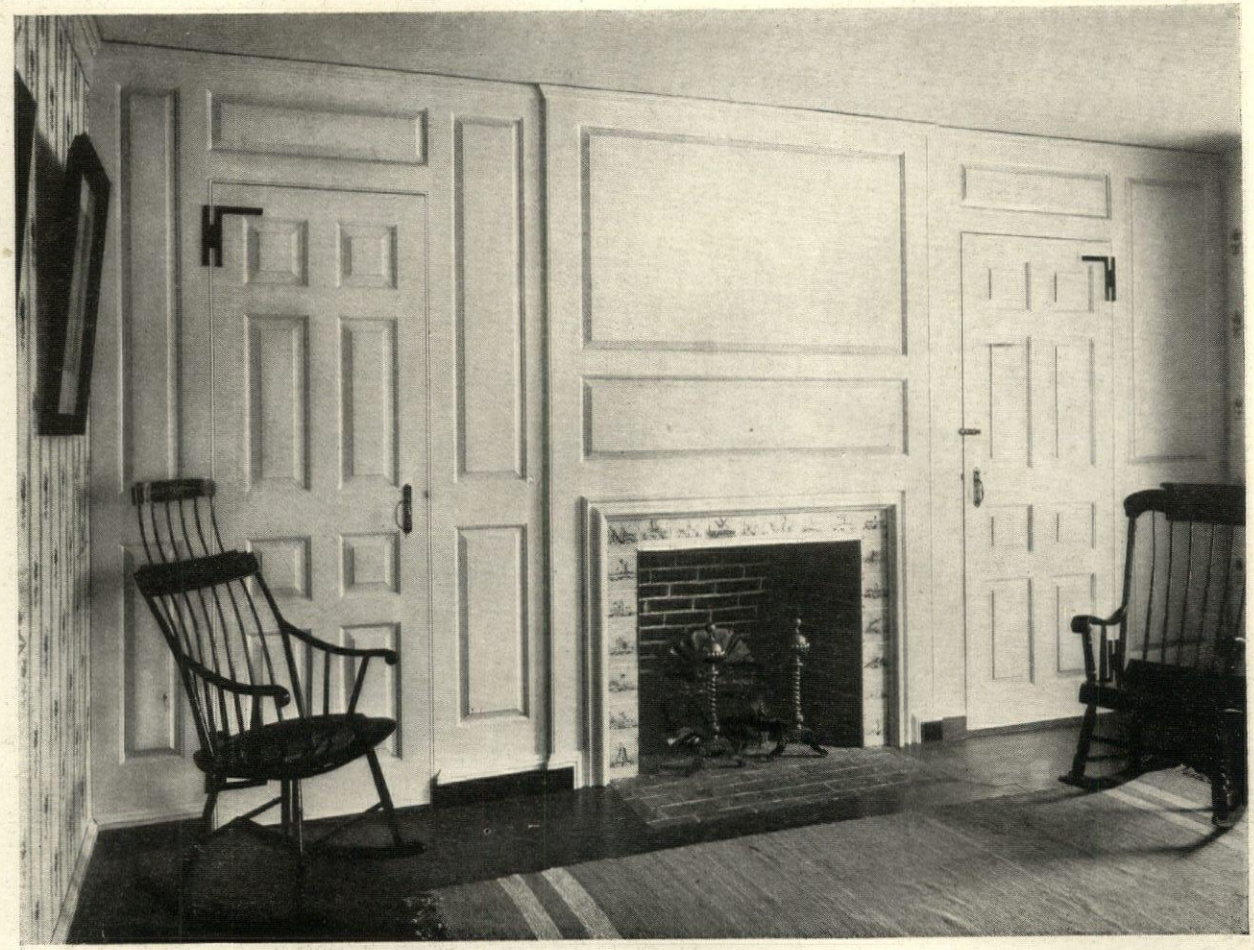

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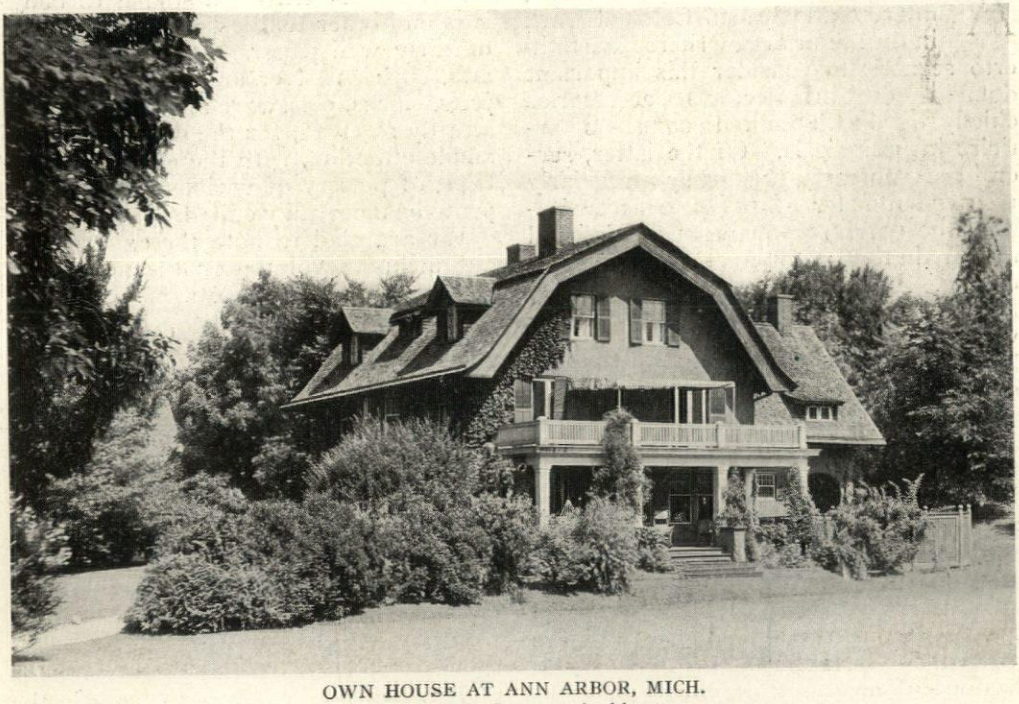
OWN HOUSE AT ANN ARBOR, MICH.
Samuel McC. Stanton, Architect.



OWN HOUSE AT ANN ARBOR, MICH.
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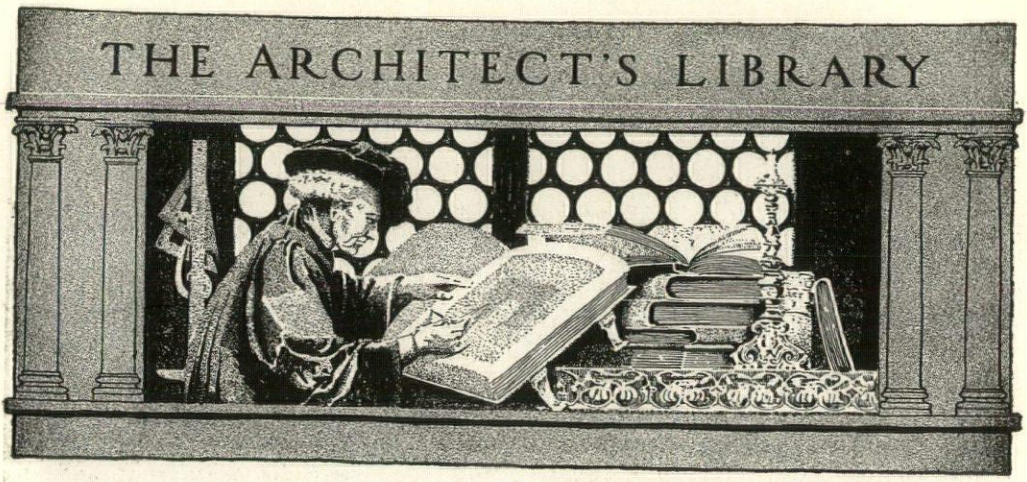


BOOKS ON COLONIAL ARCHITECTURE

By RICHARD FRANZ BACH

Curator, School of Architecture, Columbia University

Part IV.—The Minor Arts

ALTHOUGH a constantly increasing interest attaches to Colonial work in the minor arts, writers have hitherto seen fit to consider this important domain of architectural accessories chiefly within the limited compass of articles in periodicals. Of the latter, several seem to carry practically a regularly reserved number of pages to accommodate the necessary quantum of Colonial matter that public interest apparently demands. In fact, it may be said that the field has been to a great extent overworked in the case of a number of popular and non-technical periodicals which maintain a strong architectural interest, but offer too frequently material of inadequate substance and authority in the Colonial as well as other building styles. It is hoped that the near future will witness extended research and far-reaching study concerning the varied minor arts of our early time, and the gathering of available material into carefully produced and profusely illustrated volumes. There are needed, for instance, more extensive collections of measured drawings of furniture and of architectural metal work; likewise more extended studies of hangings and other textiles, and, incidentally, of early wall papers. The other minor arts, such as silver and other metal objects, clocks, glassware and the like, have already received, for the present at least, ample attention, with the exception, perhaps, of pottery of various kinds, a field yet to be more fully edited.

We are glad to note the existence of one inclusive volume on the minor arts in our formative time, namely, that by Walter A. Dyer, entitled *Early American Craftsmen* (New York; The Century Company; 1915. Octavo, pp. XII + 387, ill. $2.40), a work carefully written and presenting in very readable form a number of phases of Colonial craftsmanship. This comprises a series of sketches of the lives of the more important personalities in the early development of the industrial arts, offered in connection with many illustrations in all the crafts treated and maintaining throughout a generous care for the guidance of the collector of Americana. Mr. Dyer deserves full credit for undertaking the first general work in the more limited field of the lesser crafts; as

has been noted, much has yet to be written along these lines before Colonial art shall have in this respect received its due, but the present volume makes a highly praiseworthy beginning.

The initial study concerns Samuel McIntire, the master carpenter of Salem, and beyond question our earliest master craftsman in any province of art. This imposing figure belongs in that category of craftsmen who combine in themselves the more distinct professions of architect, contractor, builder, decorator and manufacturing artisan, and all this without suggestion of the inadequacy of a jack of all trades. His craftsmanship was essentially one of tools and materials; it was a craftsmanship implying a mastery of detailed execution as well as design.

We may agree fully with the present author that the achievements of the men of the stamp of McIntire, "especially as shown in the private houses of New England and the South, constitute our chief claim to a national and indigenous school of architecture. For although these houses were modeled on the style prevalent at the time all over England, they show the common classical and stereotyped forms used with a justness of proportion, a nicety of detail, and a refinement and grace which distinguished them from all other buildings of the period."

Perhaps no single locality gathers together so many threads of unique craftsmanship as does that ancient town of Massachusetts which was the sphere of activity of Samuel McIntire. Salemites seem to have been blessed with considerable fortunes due to fishing and trade over seas, and to their credit be it said that they were content to dispose of their incomes at home, achieving in their comfortable homes of wood an elegance and good taste comparable with similar qualities in the best manor houses of the Old Dominion. McIntire profited readily by the building activity made possible through the successful trading of his fellow citizens, and worked out his skill in entire buildings as well as in minutest details. He succeeded notably in doorways and interior woodwork, particularly in mantels, paneling and stairways, and handled all with an ease and breadth of artistic feeling, as well as an understanding of his materials and their essential technique, that are truly remarkable in view of his restricted opportunities. This representative of the finest traditions of personal craftsmanship have latterly been given individual attention in a fine volume by Frank Cousins and Phil Riley, which will be noticed in a later paper.

Mr. Dyer's chapter on McIntire is followed by one on Duncan Phyfe, whose position in American furniture design is to a certain extent comparable to that of Sheraton in the mobiliary art of England. Although there are many hundreds of pieces of Sheraton design and no small number of these are ascribed to him as personal products, the fact remains that Sheraton himself designed and executed but one piece, while, on the other hand, his book of designs formed the basis of scores of objects later manufactured and inaccurately assigned to him as executant.

Duncan Phyfe probably manufactured not more than one hundred pieces of furniture, but to him in similar fashion are assigned many others that should more properly be labeled "after the manner of Duncan Phyfe." This difficulty of attribution really deserves but brief notice, since it is a limitation which in the nature of things must characterize all types of art, because art is so largely the result of schools that follow the dictates of masters; the difficulty must in greater degree characterize any type of product, more especially of craftsmanship, in which later restoration, polishing, painting and the like may obliterate the marks of original designers.

Duncan Phyfe's sphere of influence was centered in New York City; he worked in various manners indicating plainly the vogue of his day, first in the Adam and Sheraton versions from about 1795 to about 1818, then in an Americanized form of the Empire style for about a dozen years following, and finally in the type of aberrations unfortunately so widespread in the years from 1830 to 1847. Unquestionably his best work belongs in the time preceding 1812.

Subsequent chapters of the volume under discussion are concerned with American Windsor chairs, the clock makers of

Connecticut, Eli Terry, Seth Thomas and Silas Hoadley. Then follows a chapter on the Willards and their clocks. Other minor arts are likewise discussed, notably American glassware, and the work of Baron Stiegel, the versatile Paul Revere and other American silversmiths and braziers, likewise the early potters and their work, more especially the fine old pottery of Bennington.

Throughout his volume Mr. Dyer has maintained a uniform quality of good writing and good illustrative material. It is issued not only as a work of information for students of the crafts of our early time, but also as a text book for the collector of Americana. We do not hesitate to say that it has amply fulfilled its mission and to venture the hope that any further editions of the volume may be granted a more dignified format.

Mention should also be made of another volume by Mr. Dyer, preceding that just reviewed by five years in date of publication and entitled *The Lure of the Antique* (Octavo, pp. xii + 499, and 159 photos. New York; The Century Company; 1910. $2.40). This is, according to its title page, a book of ready reference for collectors of old furniture, china, mirrors, candlesticks, silverware, pewter, glassware, copper utensils, clocks and other household furnishings of our American forefathers and purports likewise to act as a handy guide for the determination of age, style, maker and genuineness of individual pieces, probable contemporary values being given in terms of dollars in the illustrations. The volume is an excellent handbook and a very creditable literary performance throughout.

It does not behoove us here to make extended mention of the large number of works that have been issued concerning the various minor arts of our early time; suffice it to say that these volumes have been of uniformly good text quality and generally well illustrated. In passing, however, the following should be especially noted. The metal field has been especially well handled, from an architectural viewpoint, in plates issued in connection with the various collections of plates that have been mentioned from time to time in these pages. Plate and silver work, on the other hand, has received specialized treatment at the hands of excellent authorities, as, for instance, in the fine handbooks published by the Boston Museum of Fine Arts under the titles *American Silver, the Work of the Seventeenth and Eighteenth Century Silversmiths*, exhibited at the Museum of Fine Arts, Boston, June to November, 1906, and edited by R. T. Haines Halsey (Crown octavo; pp. 100, with 29 photographs. Boston; Museum of Fine Arts; 1906), and *American Church Silver of the Seventeenth and Eighteenth Centuries, with a Few Pieces of Domestic Plate*, exhibited at the Museum of Fine Arts, Boston, July to December, 1911, and edited by John Henry Buck (Crown octavo; pp. xxvii + 163, and 38 plates. Boston; Museum of Fine Arts; 1911). Both of these volumes are thorough in execution and in editorial supervision, and their illustrative material alone would warrant their value to the student of things Colonial. Over the name of John Henry Buck, who may be rated as the foremost authority in this field, was also issued *Old Plate, Ecclesiastical, Decorative and Domestic; Its Makers and Marks* (Crown octavo; pp. 327, ill. New York; The Gorham Manufacturing Company; 1903). This volume should be regarded as a standard work and will offer a mine of research in a fascinating type of art. There are numerous text illustrations, line drawings, reproductions of makers' marks and other devices that are valuable for purposes of identification and dating of pieces. In addition to the undoubted quality of its text and illustrations, Mr. Buck's book must be considered a decided success in book making, since it presented in many ways a distinct problem in typography. And finally, due credit must be granted the Gorham Manufacturing Company, which is not in any sense a publishing concern, for its good will in fathering so useful a publication. Of similar character, but treated in much smaller scale, is a volume by George Munson Curtis entitled *Early Silver of Connecticut and Its Makers* (Octavo; pp. 115, and 38 plates. Meriden, Conn.; The International Silver Company; 1913.

$1.25), which is likewise very well written and produced, and is illustrated with excellent plates and line drawings.

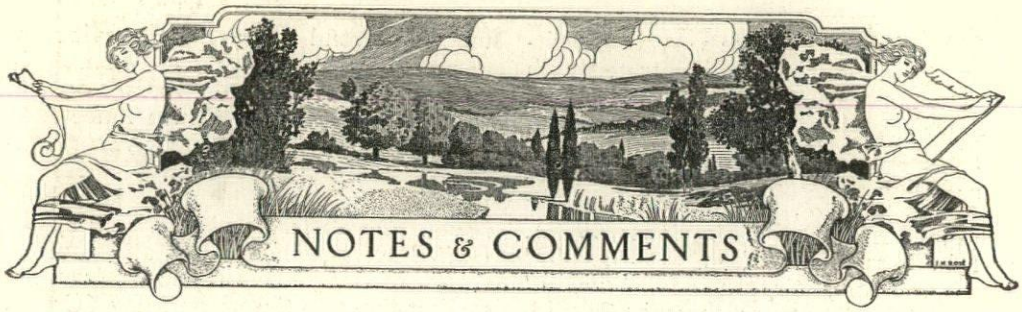
Pewter and other alloys have been amply dealt with in Edwards J. Gale's *Pewter and the Amateur Collector* (Octavo; pp. xiv + 97, and 43 plates. New York; Charles Scribner's Sons; 1909), and in Mrs. N. Hudson Moore's *Old Pewter, Brass, Copper and Sheffield Plate.* (Small octavo; pp. xiii + 239, ill. New York; Frederick A. Stokes & Co.; 1905). Both of these publications are of distinct value, but of limited application for us here, because their pages are devoted to styles and countries other than those to which we have restricted ourselves in these papers.

But by far the finest single piece of literary work in the field of American silver work is in the form of a huge catalog edited by E. Alfred Jones and entitled *The Old Silver of American Churches.* (Pp. lxxxvii + 566, and 145 plates. $40.) This is in folio form, the pages measuring eleven by fifteen inches, and presents the most thorough study of any of our early minor arts thus far given to the public. The volume was compiled under the auspices of the National Society of Colonial Dames of America and privately printed and published for this body in 1913 at Letchworth, England. Its illustrations will merit extended study.

In connection with early metal work in this country the activities of the Revere family, and notably those of the historic Paul Revere himself, must not be disregarded. The Revolutionary importance of the latter has probably been the chief reason for the number of books covering his silver and other metal work individually. We may mention among others E. H. Goss' *The Life of Colonel Paul Revere* and Arthur H. Nichols' *The Bells of Paul and Joseph W. Revere.*

The field of pottery and glassware is too far beyond our present province to merit more than passing mention. The foremost authority in the former domain is without doubt Mr. Edwin Atlee Barber, Curator of the Pennsylvania Museum and School of Industrial Art at Philadelphia. Over his name have been issued *The Pottery and Porcelain of the United States,* which offers an historical review of American ceramic art from the earliest times to the present day (Crown octavo; pp. xxi + 539, ill. New York. G. P. Putnam's Sons; 1901), and *Tulip Ware of the Pennsylvania German Potters.* (Octavo; pp. 233, ill. Philadelphia; Pennsylvania Museum of Industrial Art; 1903. $1.) An interesting volume devoted solely to China is that by Alice Morse Earle entitled *China Collecting in America* (Octavo; pp. xi + 439, ill. New York; Charles Scribner's Sons; 1906), which, however, has again a limited value for us here because distinctly American porcelain and china have so small a space assigned them within its covers. In the field of early glassware Mr. Barber again appears as the author of *American Glassware, Old and New,* which offers a sketch of the glass industry in the United States and is prepared as a manual for collectors. (Duodecimo; pp. 112, ill. Philadelphia; Patterson & White Company; 1900. Out of print.) Obviously the name of Stiegel must loom large over the whole of the sphere of glass making and designing in our formative time. No less than three excellent books are devoted to his activities alone, namely, A. S. Brendle's Henry William Stiegel, J. H. Sieling's Baron Henry William Stiegel and Frederick William Hunter's *Stiegel Glass* (Imperial octavo; pp. xvi + 272, and 12 plates in color from autochromes by J. B. Kerfoot. and with 159 half tones. New York; Houghton, Mifflin & Company; 1914).

Our next paper will be devoted to books dealing with Colonial furniture.



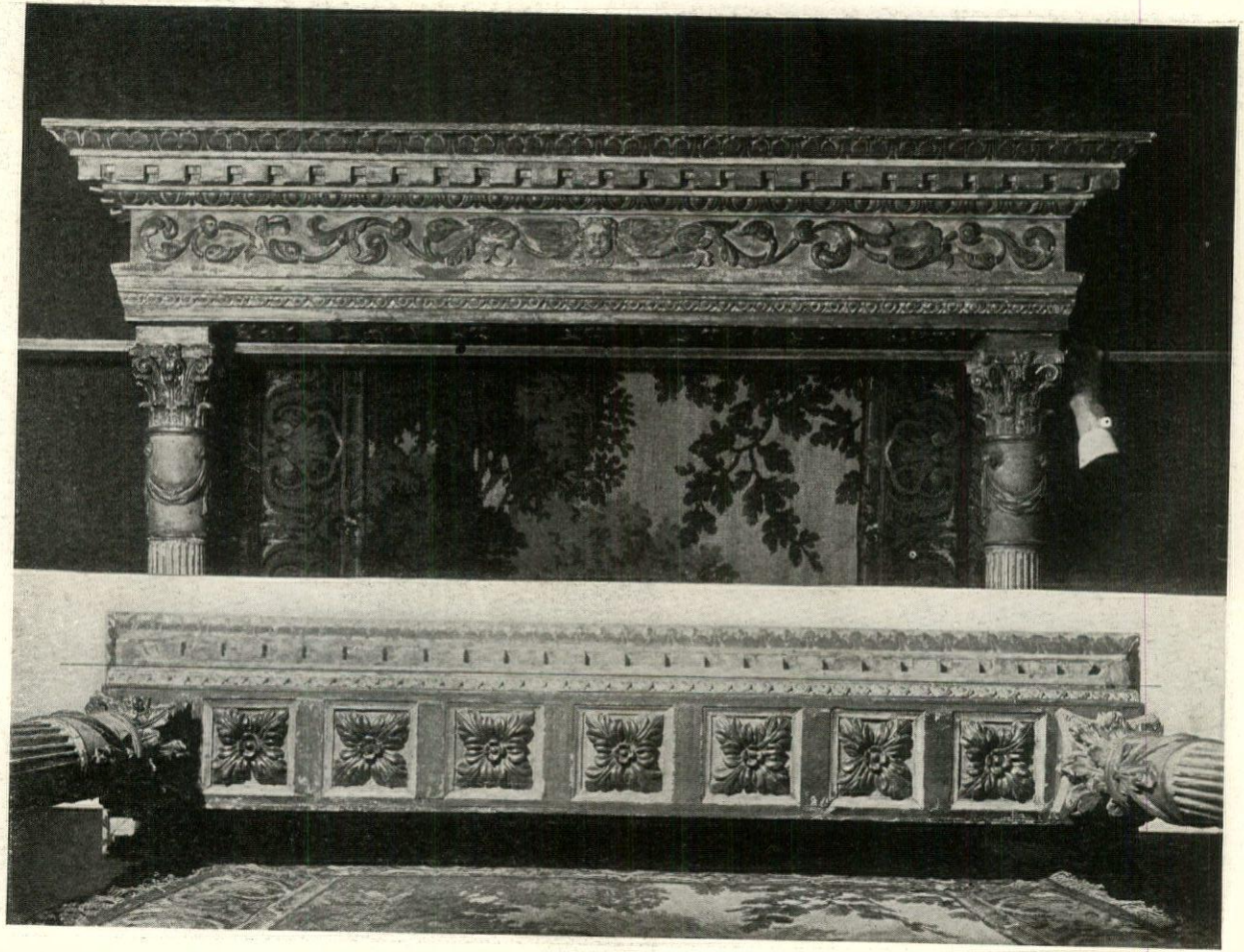
Some Interesting Fragments of Renaissance Architecture.

"Giovanni Pisano, the lad whose uncle had just finished the great leaning tower, lingered at his work in the little workshop where he did his carving. The shop was in the alley just east of the Bishop's garden. . . . Giovanni lingered because of a certain panel. It was of wood, about two spans square and richly carved with a shield bearing the arms of a noble family. About the shield was a heavy ornamental scroll, deeply undercut and with long sweeping lines. The boy turned the panel this way and that—to the right and to the left. Walking across the room, he turned it upside down and set it upon the top of a shelf. Then, going to the bench, selected a large pair of wood compasses, which were tipped with ivory points, and proceeded to measure and compare the various dimensions of the panel. 'Yes! It is not square,' he muttered, 'but it looks quite so.' By skilful manipulation of the lines in the carving on the edge of the panel and by means of the proportions of the shield itself, which formed the central motif, he had succeeded in obscuring the fact that the extreme boundary of the panel was not a true square. 'I will test it,' he said, and, taking the panel under his arm, he left the shop and alley and wound a devious way to his chum, Rienzi, the armorer. A strong shoulder pressed against the iron laden door of his friend, sent it creaking open. The interior of the smith's shop was disclosed, reeking of the soot of many forge fires, hung with armor, some rusty, some glossy and fresh from the hammer. In the midst of the litter, his finger on the point of the glistening blade of a newly tempered dagger, stood Rienzi. 'What hast thou done now, Giovanni? Thine eyes like two suns look into my dusty cell. Why the fresh beaming of so much joy?' 'I finished the panel for the Bishop's door and I have brought it for you to see.' He stood the panel on the shelf, back of the vise, where the light from a small window fell full upon the carving. 'It is well, Giovanni, but why so free in thy way with the forms—should not more of absolute symmetry prevail in the ornament?' 'Nay, I think not, replied Giovanni. 'It is just my play, anyway. The panel is square and true at least, think you, staid armorer?' 'Square? What meanest thou? Why jokest thou? Surely is the panel square, else hadst a hard time to fit it in the door. Ave Maria!' 'But, Rienzi, should I tell you that the panel was not square, how much wouldst wager me that it is not out more than the width of a finger either way?'

"Reaching under his leathern apron, Rienzi drew forth a long mole skin bag, which bulged a little with coin and laid it on the open table near. 'Now, a pest on thy foolishness, I will wager the price of the Cardinal's dagger that my compass will prove thy panel to be square within the breadth of my little finger.' Giovanni leaped for the compass for which his friend had reached. Gauging the height of the panel accurately was the work of a moment; then swinging the tool deftly to the right, so that its span covered the width of the panel, he laid his two fingers into the space intervening between the edge of the panel and the ivory point of the compass. The stolid Rienzi looked askance. Then the ruddy hue of his countenance grayed a little. 'The evil eye,' he muttered. But Giovanni laughed a silvery laugh and took the purse. Then they were friends again, for these Machiavellian tricks came thick and fast from Giovanni and Rienzi had really learned to like them."

In the accompanying photographs we have shown two Italian doorways and an old Spanish picture frame. These were done at a time when the craftsmanship of architecture was deemed to be an essential

PLATE A.



PLATES C AND D.

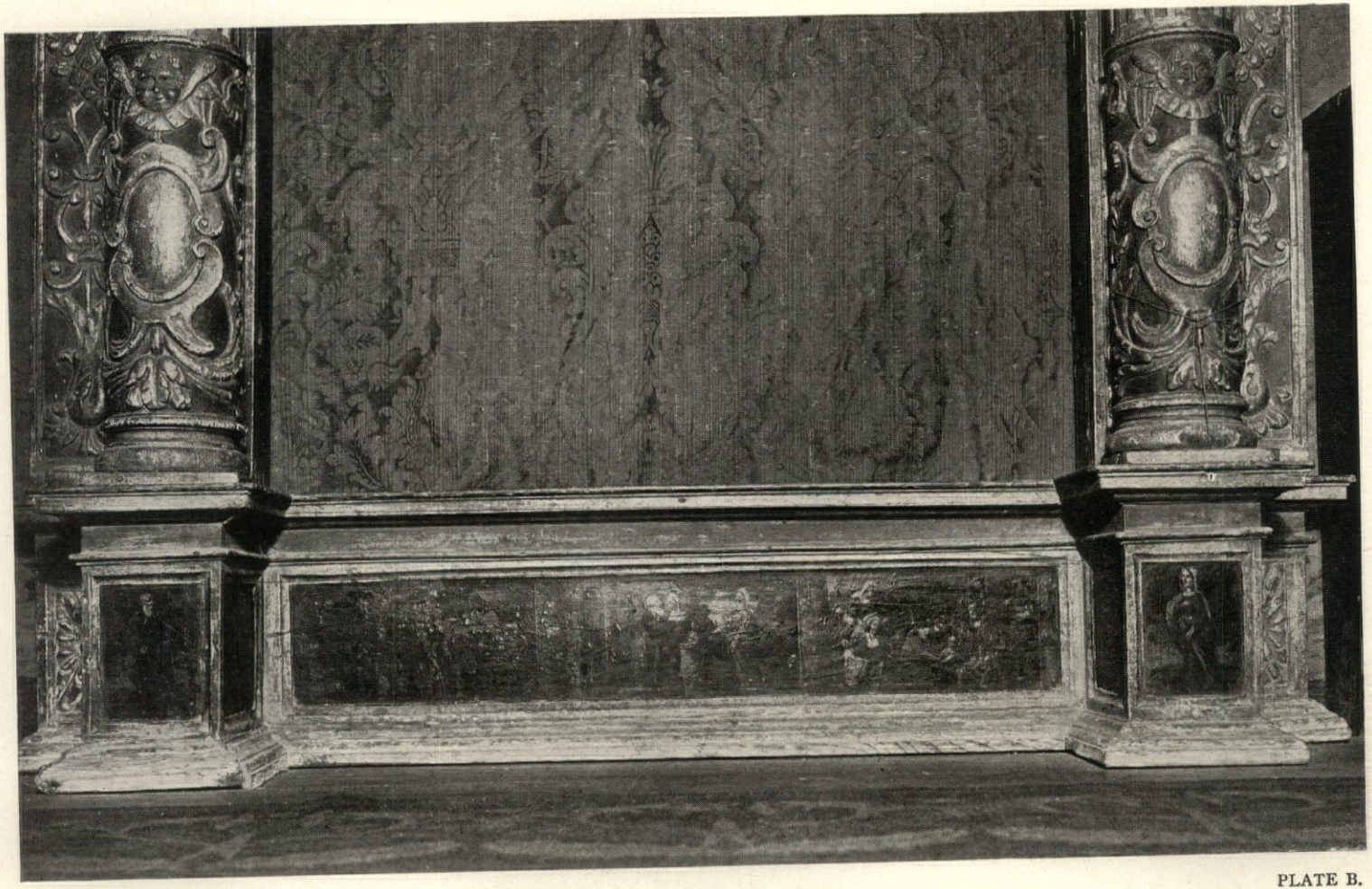
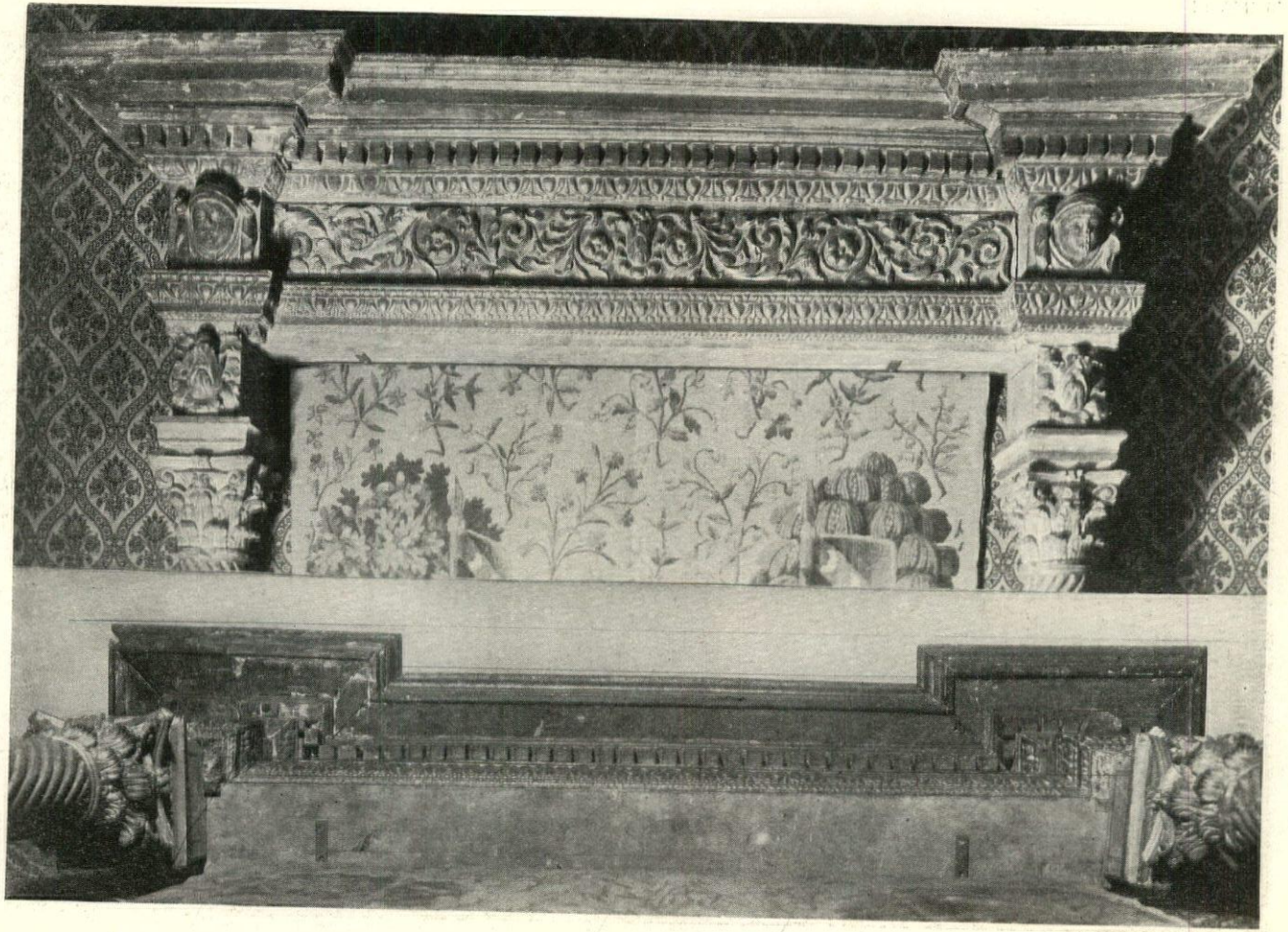


PLATE B.



PLATES F AND G.

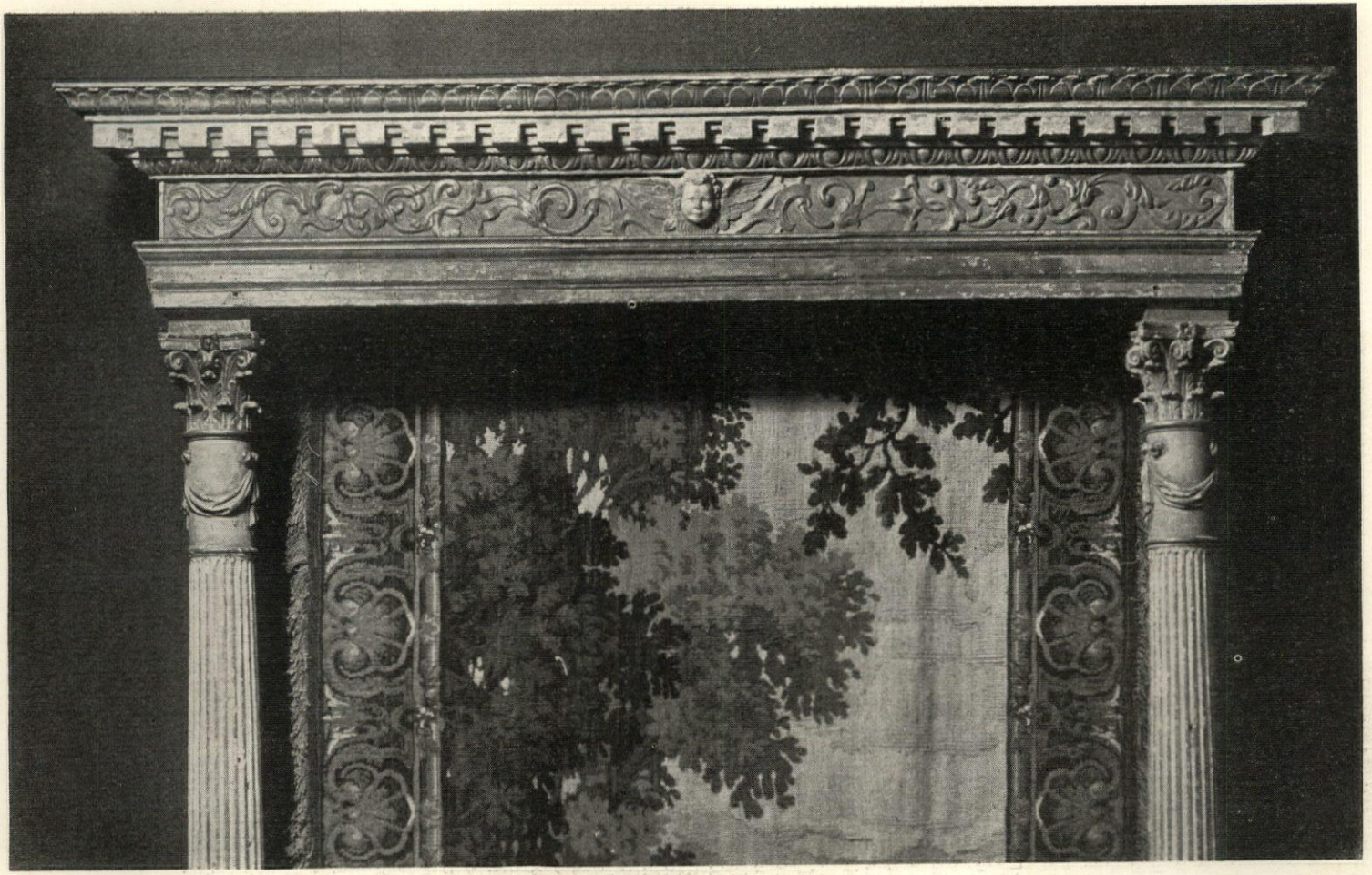


PLATE E.

part of the lost art. The eternal egg-and-dart, the ogee molding and all the other paraphernalia of architectural details were fashioned by artisans who had learned, like Giovanni Pisano, the value of a line in architectural composition.

Observe in Plate A the thickening of the cornice in the architrave molding of the entablature. Note that the section of the architrave ogee mold is noticeably stronger at the center. The shadow which tapers off to the pilaster is evidence of this. Apparently the entire length of the molding has been carefully modeled to produce this effect. Notice also that the egg-and-dart molding is carved more deeply in the center than at the ends, and that the modillions are irregularly spaced.

In Plate B, which is the bottom of the picture frame shown in Plate A, we note the gentle curving of the top of the base panel; also the curving of the sill of the picture opening in correspondence therewith.

Plates C, D and E show different parts of another fragment. In C we note the seeming curve of the top member of the cornice, due perhaps to a bungled splicing of the ornamental molding, but more probably so made with intention to soften the outline. It is clear that the section of the architrave molding is heavier at the center than at either end. Whether the artist thought to save himself the trouble of modeling the entire length of the molding by setting in a short piece of the bolder section, or whether it is a mere accident, we do not know. It is significant, however, that the change from a weaker to a stronger section occurs at the center of the motif. It is also noticeable that the section of the leaf mold in the crowning member, the spacing of the dentils, the egg-and-dart carving, and the architrave section all denote a change in the middle quarter. On the reverse side, Plate E, the refinements are not so evident, but by study of the plan, looking up, as shown in plate D, the ornament of the architrave is perceived to be more shallow at the ends than at the middle. In this same Plate D it may be noted that the panels in the soffit differ in size and in the character of the modeling. The center panel is comparatively flat, the other panels are perceptibly deeper, and the rosettes on either hand are more deeply carved than the center rosette. There seems to be a progression, indicating added strength in each succeeding panel from the center out.

In Plates F and G there is a quite definite curving of the members of the bed molds of the cornice, which is clearly indicated by the deepening of the shadow toward the center. (These refinements are quite evident in spite of the wrecked condition of the crowning member.) The curve of the crowning member is shown in the photograph of the plan, Plate G. In this photograph also note the varying size of the dentils and the varying depth of the architrave molds; also that there is no correspondence between the spacing of the egg-and-dart molding and the dentils immediately over.

These examples of ancient architecture (sixteenth century) are now on sale in San Francisco, having been recently brought thither by collectors. They are richly carved, colored and gilded, toned by time to the subtle grays. It is stimulating to be reminded through them of other days when these gray whites were white, these reds like the red on a Cardinal's coat, and the blue as cobalt of the sea—and to know that in the color drama of which they were part, these fragments were but brilliant counterpart and complement to the rich trappings of rooms filled betime with the silks and satins and jewels of a people so discriminating as to note with pleasure minute fragments of form.

A lively appreciation of the value of subtle coloring in the rendering of architectural forms is stimulated by such examples. These trivial ornaments cast adrift on the shores of the Pacific in the midst of an alien civilization, poignantly point the finger of criticism at our modern methods in architecture. These simple egg-and-dart moldings, carved so carefully, so gracefully graded to suit some fine eye! How can we look with complacency upon the wagon load of egg-and-dart moldings just arrived from the factory to be placed in the drawing room of our favorite client?

Surely the love of simple things, made beautiful with care, is here made manifest, stimulating us with the thought that in the wide range of architecture there is a wealth of opportunity in a similar direction. And the architecture of the Renaissance, to many merely a derivative style, without claim to dignity or virility, as compared to the classic types, through such examples as these claims our larger human interest. These sermons in wood and gilt and color point away from a too formal, too symmetrical handling of our problems in architecture, even point away from a too great insistence on what may be termed "the ideals of the Beaux Arts." The sane,

but sometimes puerile insistence on mere mass and composition and function, leaves little room for a kindly look at meaningful detail, subtlety of line and wealth of color.

The rendering of architectural details with finesse and imagination is so altogether worth while that the question naturally arises, Why do we not do our work more often in this way?

The answer to the above question can be found partly, perhaps, in the fact that our great schools of architecture, which no doubt have dominated to a great extent the aims of our well trained architects, are not equipped, either through sympathy or knowledge, to teach these intimate and subtle tricks of the craftsman's art.

The schools naturally aim to give the formula for correct architecture, and if the term "correctness" may be deemed to omit the idea of inspiration and a consideration of the abstract values, the schools have accomplished their task. Too much cannot be said in appreciation of the rock-bottom value of technical education, as purveyed. We have been saved from the perdition of being illogical and illiterate in architecture, but we have not been instructed in many interesting phases of architecture, as practiced by the ancients. We have been amply fed on the A, B, C's of architecture, and when I say A, B, C's it is to be remembered that, whereas many great architects have passed through successfully the influence of the Beaux Arts training, there have been few buildings built in strict harmony with the precedents of that training that may be called great in the sense that we call some of the Gothic cathedrals great.

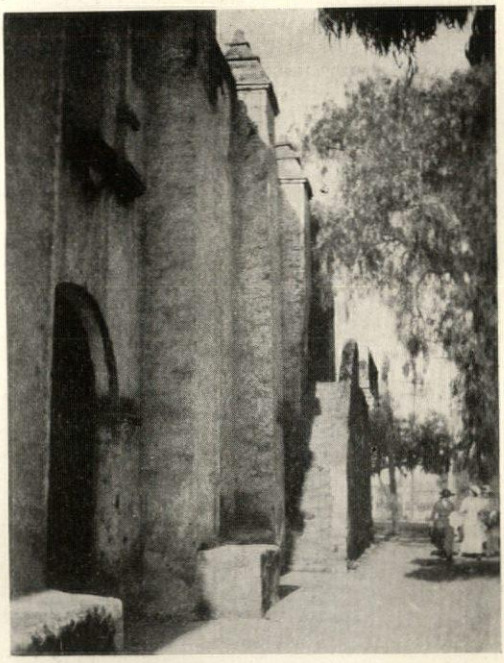
There is something beyond the T-square and triangle and compass and Vignola for the architect. The poet does not always linger with his sonnet, the traveler with his handbook, or the cabinet maker with his glue pot. There are other things in architecture and in architectural composition than mass and general proportions and function. In the subtleties of the Greek and Renaissance architecture we learn that curves as delicate as those of a butterfly's wing, or as suave as the swing of a glacier, may find a fitting place in the façade of a building or in the bedmolds of some otherwise insignificant doorway.

WILLIAM L. WOOLLETT.

The Old Spanish Mission of San Gabriel.

But a short ride outside the bustling city of Los Angeles, with all its indications of the modern progress that Californian cities display, stands the remains of one of the most picturesque of the old Spanish missions, that of San Gabriel, Arcángel. Every tourist in the Golden State becomes familiar with the names and with snatches of the history of the Spanish missions that are standing as memorials to the missionary spirit of the Old World Spaniards. To the visiting architect, however, this little chapel of San Gabriel is of more than passing interest, for it tells the story of the skill of the Spanish padres in things architectural, of their clinging to Old World tradition and precedent, and yet of their adoption of the materials of the new land.

If one visits this old mission landmark at sunset, when the last tourist has taken the car for town, when the post-card and curio vender has ceased to show his wares and the last rays of the setting sun gilds the ancient bells in the campanile from which the Angelus is sweetly sounding, he cannot but be impressed by the quaint charm and almost mediaeval atmosphere that seems so foreign to American haunts.



MISSION OF SAN GABRIEL, ARCANGEL, NEAR LOS ANGELES, CAL.

The old mission of San Gabriel was founded, according to records, in September, 1771, by one Padre Somero. The first wooden buildings, covered with tiles and surrounded with stockades, were constructed by natives under his direction. The masonry church which now remains was not completed until much later. It is a long, low structure, measuring about one hundred and forty feet in length by twenty-five feet in width, while the height does not exceed thirty feet. The walls are very thick and composed of a mixture of rubble stones, cement and brick. These walls are supported by ten buttresses supposedly designed to counteract the thrust of an arched roof. Such a roof is reported to have been partially destroyed in one of the earthquakes and a tile roof is now seen in its place. The buttresses are terminated with pyramidal copings which are divided into three unequal portions by projecting ledges.

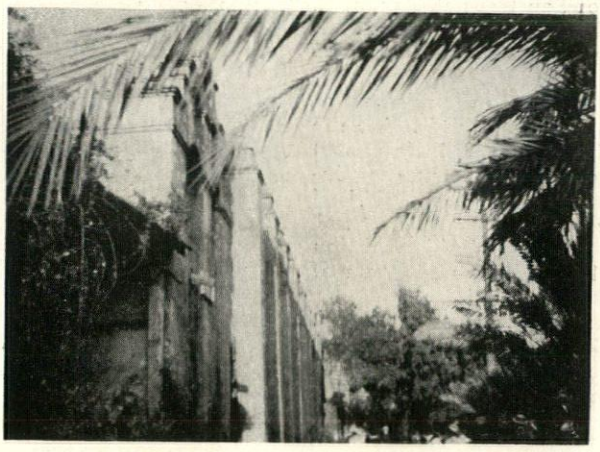
The most interesting feature of the exterior is the campanile, a solid wall pierced at unsymmetrical intervals with seven arches built to correspond to the size of the bells which were to be hung within them. The bells were of various sizes, yet in spite of the irregularity in the arrangement of the arches, the whole bell tower is beautiful in outline and harmonious in general effect—quite worthy a motive for the pictures, songs and stories that it has inspired. At the side, away from the building, the wall is cut back with irregular steps to the crowning arch feature, each step being capped with a simple projecting molded cornice. The crowning aperture is spanned by an elliptical arch which is surmounted by a small iron cross of delicate lines.

At the other end of the street façade, a narrow exterior stairway leads up from the ground level and adds a picturesqueness that is aided by the tropical growths of palm and pepper tree.

The interior one feels to be marred somewhat by modern remodeling that can scarcely be in keeping with the original construction. Several quaint pictures on the walls and the old statues on the altar are touches of unusual interest, while in the baptistry a font of hammered copper tells of the handicraft skill of the mission work shops.

The charm of the little place may be due to some extent to the historical associations, but more, no doubt, to the pleasing originality of the architectural forms and the beautiful harmony of the rich coloring. The Californian climate is kind to the old stucco walls and lends its soft greens of pepper and eucalyptus trees and luxurious forms of date and banana palms as a graceful setting to the dull earth tones of the walls and roofs. The high notes of color in the rambler rose and fragrant clematis add richness and splendor to the crumbling stucco, and over all prevails that unaccountable charm, that atmosphere of inbred beauty doubly enhanced by years of sacred service.

RALPH S. FANNING.



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