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ARCHITECTURE

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THE AMERICAN ARCHITECT AND BUILDING NEWS.

VOL. LXII. No. 1196.

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NOVEMBER 26, 1898.

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THE Boston *Transcript*, which is always interested in anything concerning the artistic welfare of the city, gently reproaches us for suggesting that there might be no great harm in removing the Museum of Fine-Arts to a different location, perhaps on the Back Bay Park, saying that "the educational nature of this fine collection would be very much reduced and its original purpose seriously abridged" by taking it to a place so "very much out of the way," and although it agrees with us that Copley Square is "a kind of centre of radiation for all points of the compass," it thinks that this is a good reason for keeping the Museum there, on account of "its convenience to the public," and that, when the great railway-station at Dartmouth Street, close by, is completed, "it will be still more accessible to patrons near and remote." As to the fire-risk in its present quarters, it considers that, especially with a supply of sea-water, such as will probably soon be available in Copley Square, the Museum has little to fear, and it thinks that the public interest should not be sacrificed to an alarm that has been "magnified beyond all due proportions."

THIS states the objection to the change very distinctly, but, if the risk of fire has been unduly magnified as a reason for removal, the public convenience should not be similarly magnified as a reason against it. That a "centre of radiation" for traffic is necessarily a good place for a museum of fine-arts is a very questionable proposition, and the completion of the Dartmouth Street railway-stations is likely to be a doubtful advantage to the study of the fine-arts in their neighborhood. Certainly, the Trustees, if they were choosing a fresh site for their building, would not be likely to prefer the immediate vicinity of a railway-station, and it is very doubtful whether they would select the "centre of radiation" for a dozen lines of electric-cars, notwithstanding the possible increase in the number of their "patrons" which might be derived from the multitude of shoppers who would find the galleries a convenient place for meeting or resting. It is related that the officials of the British Museum once had to issue a public notice, begging those of their "patrons" who utilized their rooms as a place in which to gossip and eat lunch not to drop their chicken-bones through the registers in the floor upon the heating-pipes, on account of the unfavorable effect of this proceeding on the ventilation; yet the British Museum is in a very quiet place, tolerably remote from any "centres of radiation," while Copley Square, which is already a very busy place, will, when the railroad-stations are done, and the retail shopping-district extended through and beyond it, be thronged with people who would find the Art Museum, especially on free days, a most tempting lounging-place. Although the suburban shoppers, with their bundles of dry-goods and baskets of refreshments, would add to the "patronage" of the Museum, they would be far from adding to its value or attraction for lovers of fine-arts. At present, its collections are of great use to students, who can copy at their convenience, and who will not welcome invasion from a crowd of new "patrons," however convenient it may be for the latter to come there. For this reason, it seems to us that the Boston Art Museum would be quite as well off in a place like the neighborhood of the southern portion of the Back Bay Park, which, while very close to the centre of population, and near the great lines of communication which pass from northeast to southwest through Huntington Avenue, Boylston and Tremont Streets, and from northwest to southeast through Massachusetts Avenue, would be likely to be for many years devoted to the best class of dwelling-houses and public buildings, and, for that reason, comparatively free from the dust, smoke, noise and loitering crowds of a quarter given up to business. The Boston Music Hall, which will accommodate more than four thousand people, and is intended to be used night and day for public entertainments, will soon be built within a stone's throw of this portion of the Park, and the Art Museum depends far less than the Music Hall on the casual public, while it needs much more the unobstructed light, air and space which it can get in the neighborhood of a park, and nowhere else. In this last respect the present Museum is already rather badly off. While the sculpture-galleries are tolerably well lighted, although too narrow and crowded for their use, the lighting of the picture-galleries is, to say the least, poor. A few of the large rooms, occupied by the pictures belonging to the Boston Athenæum, have a moderately good light, but some of the most valuable and interesting paintings ever brought to Boston have been shown, as loans, in a room, the windows of which had to be covered, in the afternoon, with dark shades, to prevent the sun from falling on the pictures. Of course, this is not the fault of the Trustees, who must use in the best way that they can a building not adapted to their present wants, but one cannot help feeling, in a visit to the Museum, that its collections merit, and need, a better place to show them. In addition to all this, the present site is too near the railroads for the proper preservation of pictures. Students of the loan collection, remarking the general dinginess of the frames of the pictures, must form a high idea of the generosity of owners, who are willing to expose their property to a deterioration evidently so rapid; and an atmosphere which is bad for gilt frames is equally, though less rapidly, fatal to paintings. The people of Boston are famous for their conservatism, and the fact that the Art Museum is now on Copley Square is, to most of them, a good reason for keeping it there; but there are also good reasons for having it somewhere else, independent of the risk from fires, which, it must be remembered, even with a supply of sea-water at hand, might result, if the Pierce Building, or the roof of the Dartmouth Street stations, or of the Irvington-Street Armory, should be burned, in the ruin, by smoke and salt-water, of property which no insurance could replace.

THE curious accident which occurred on the Brooklyn Bridge last summer has only just been adequately explained.

On one of the warmest evenings of the hot month of July a dray-horse dropped dead from heat, some two hundred feet out from the Brooklyn side, on the main span of the bridge. This catastrophe checked traffic completely for a time, and the teams and cars, continually arriving and stopping, covered the bridge from the obstruction to the New York tower, loading this portion, as is estimated, to about three times the normal amount, while the space between the dead horse and the Brooklyn tower had probably less than the normal load. While the crowd was at a standstill on the bridge, a loud noise was heard, and the roadway moved and settled. After the bridge was cleared an examination was made, and it was found that four of the trusses carrying the roadway had failed by the buckling of the channels of the lower chord, but that the structure was kept from falling by the stay-ropes. The buckling itself needed, however, to be explained, and Mr. Collingwood, an engineer of reputation, has made an interesting study of the whole affair, for the *Railroad Gazette*. Our readers will easily surmise that Mr. Collingwood finds a sufficient explanation for the accident in the unequal strains caused by the combination of an unusual load, and abnormal expansion due to the heat of the air. It is calculated that the length of the great cables must have been so much increased by the heat as

to allow the middle of the bridge to drop more than thirteen inches from its ordinary position. As the roadway is supported partly from the cables, by vertical stays, and partly from the towers, by independent diagonal stays, some of which are fixed to the top of the towers, while others slide over them, it is evident that, as expansion would affect these members unequally, some of them would be strained to excess, while others would be relieved of their load. The irregular tension in the stays would naturally cause unequal strains in the trusses supported by them, which might be expected, if they became too severe, to show themselves by failure of the chords. It is probable that the great engineer who designed the bridge foresaw the danger that might come from unequal expansion, for his successors have protested against the manner in which it is now used, and the designer of the Hudson River bridge is understood to have adopted a different method of supporting the roadway. With a knowledge of the cause of the trouble, the future safety of the bridge against such accidents will undoubtedly be provided for; but the building world generally will find much interest in this remarkable illustration of the effect of unequal strains caused by expansion.

A VERY instructive decision was rendered a few days ago by the Appellate Division of the New York Supreme Court, in a case involving the custom of architects. The New York Steam Company, intending to erect a new power-plant, accepted a proposition of Mr. L. K. Davis to design and supervise the work, for three per cent on the total cost, "payments to be made on monthly estimates"; adding a proviso, which was accepted by Mr. Davis, that the agreement should terminate in twenty-four months. When the plans and specifications were done, Mr. Davis called for a payment of two per cent on the estimated cost of the work. This was refused, and he entered a mechanic's lien against the property. Suit was brought to enforce the lien, and his claim was rejected; and, on appeal, the decision of the court below was affirmed. The ground of this decision was, in general, that the claim was not made in accordance with the contract. This provided that payments should be made on monthly estimates, and the plaintiff gave no evidence of any such monthly estimates, or of any fact entitling him to payment on the obvious construction of the contract, but, instead of this, brought his action on the entirely different theory that he was entitled to a payment of two per cent on the completion of the plans and specifications. This claim was supported by evidence of a custom of architects entitling them to a payment of two per cent under such circumstances; but the Court held that this evidence should not have been admitted, as it was in direct conflict with the written agreement of the parties, and the latter must evidently govern. The counsel for the plaintiff argued that the agreement for monthly payments referred only to supervision, and not to the preparation of the plans and specifications; but the Court thought that there was nothing to show that the parties contemplated anything of the kind. "For the totality of his work "the plaintiff was to receive compensation, regulated and de-"fined, both as to time and amount. That was the contract "he chose to make, and it cannot be varied by parol or custom."

THE persons responsible for the new Pennsylvania Capitol have lost no time since the decision of the courts in their favor, and the building has the roof already on. There is, however, no provision as yet for heating or plumbing apparatus. The first specification, if we remember rightly, omitted to mention these, and we do not know whether it is intended to put them in under the present appropriation. The walls, also, are of rough brick, without any sign of the marble casing which it is proposed to add when the State appropriates more money for the purpose, and it is a question whether to whitewash them, for the sake of improving their appearance, or leave them as they are. If we might venture some advice, it would be to leave them in their present condition. Whitewash has it uses, but they are mainly confined to the inside of buildings, and anything more shabby and discreditable than a whitewashed exterior brick wall, after a season or two of rain and snow, is hardly to be found in architecture.

A PASSING notice may be given to the death of John W. Keely, the author of the renowned "Keely Motor," on which large sums of money have been spent, without, so far as is known, producing any practical result. Although we have ourselves never had the slightest faith in the idea that a new force had been discovered by Mr. Keely, it is fair to say that a great many highly intelligent people have believed in his invention, and it is charitable to credit the assertion of his biographers, that he himself also believed in it. Some months ago, the stockholders, who have paid Mr. Keely's expenses, and provided him with a comfortable living, for nearly thirty years, prevailed upon him to promise that he would reveal his secret to some person or persons of discretion, so that it might not die with him. It is understood that the promise has been kept, and the legal settlement of his estate will undoubtedly bring to light whatever there may have been of reality in his discoveries.

THE opening of the Cernuschi Museum of Japanese and Oriental art in Paris, which has just taken place, furnishes M. Charles Lucas with an occasion for an interesting notice of it and its founder, in *La Construction Moderne.* Cernuschi is principally known in this country as the most enlightened and influential of all the advocates of a bimetallic standard of currency, but his original ideas as a financier were among the least of those by which he merited distinction. He was an Italian, as his name indicates, and was born in Milan; but the energetic disapproval which, as a young man, before the revolution of 1848, he manifested in regard to the tyranny of Austria and the Pope, led to his expatriation; and he settled in Paris, where most of his subsequent life was spent. Even here, he was too candid in expressing his views on political subjects, and, just before the war of 1870–71, he was expelled from France, in consequence of having given practical expression to his sentiments in regard to imperialism, by a gift of one hundred thousand francs to the "Anti-plébiscite Committee." In a few months, imperialism had ceased to exist, and he returned to his home, only to find himself the object of the suspicions at once of the Commune and the Versailles army, both of whom meditated shooting him; but circumstances rescued him from each danger in turn, and the restoration of peace and quiet in the country found him, although still a liberal of advanced ideas, a citizen beloved and respected by all parties. His foresight as a financier had already made him very rich, and, in 1871, while France was still suffering from the agitation which had nearly proved fatal to himself, he thought it advisable to make a long journey to the East, accompanied by M. Théodore Duret. The Japanese civil war was just over, and, in the social disturbance which followed the dethronement of the Tycoon, great numbers of works of art, particularly those belonging to the convents attached to the Buddhist temples, had come upon the market. M. Duret was already a good judge of Oriental art, and M. Cernuschi, with the aid of his friend's advice, spent large sums in buying the best things that could be found. Returning to Paris, in 1872, he bought a lot in what is still, to our mind, the most charming location for residence in the city, at the corner of the Avenue Velasquez and the Parc Monceau, and built there a beautiful house, with galleries expressly arranged for showing his collections. This house, designed by M. Bouwens van der Boijen, a pupil of Labrouste and Vaudoyer, gained the Grand Medal awarded by the Société Centrale for private architecture. The distinguished owner was always liberal in opening his house to persons interested in his collections, and at his death, in 1896, bequeathed the whole to the City of Paris. Some slight changes have been made in the arrangement, and cases prepared for the collections, so that it was not until the present month that the definite opening of the Museum could take place.

MADAME MAILLOT, a daughter of the great French architect, Félix Duban, has presented to the Académie des Beaux-Arts fifty thousand francs, the income from which is to be given every year as a prize to the winner of the Prize of Rome for that year, on condition of his faithful fulfilment of the duty of preparing, during his stay at the Villa Medici, a scheme for the restoration of some ancient work. If the candidate fails in this, the money is to go to the student who has best performed this duty. It seems, to our ideas, a little strange that a woman should take an interest in a question of architectural education so vexed as that of the advantages of hypothetical restoration of ancient monuments, and an architect's daughter, with us, would be no more likely than any one else to concern herself about the subject; but the fine-arts in France are matters of conscience, and there are many French women intellectual enough to take a serious interest in artistic controversies, and to do what they can to promote the cause which they favor.

ARCHITECTURAL ACOUSTICS.[1]

THE acoustical problem by which the architect of an auditorium is confronted is threefold — that of securing the greatest loudness, throughout the hall, of a sound produced at some chosen place, proportional loudness of all component notes, and the greatest distinctness of successive enunciations. These three are the necessary, as they are the entirely sufficient, conditions for good hearing. Each, however, can be secured only at the partial expense of the others. The solution of the problem is, therefore, essentially a compromise. Moreover, it is a compromise that must be met differently according as the hall is to be used for speaking or for music, and if for music differently for different kinds. It is in the solution of this problem that I hope to be of service.

The simplest auditorium is, of course, the open air. In this case, however, the sound diminishes rapidly in intensity as it spreads uninterruptedly to a greater and greater distance. A wall immediately behind the speaker would reflect to the audience the portion of sound otherwise lost in that direction. A ceiling overhead, side-walls, and a wall behind the audience would save even more. Should these surfaces be perfect reflectors, no matter how they might be placed, all the sound reflected from wall to wall would ultimately reach the audience. In fact, however, walls, though good, are not perfect, reflectors, and there is more or less loss. Moreover, the sound that has suffered many reflections and has travelled far will arrive too long after the sound coming directly to be of service in re-enforcing it. It is desirable, therefore, to so shape the room, so turn the walls, and so incline the ceiling as to reflect the sound directly on the audience. Surfaces not so available should be deadened into being poor reflectors. These considerations lead immediately to the following recommendations, which, however, are not always practically available: A wall immediately behind the speaker, angle walls cutting off the corners of the room at each side of the speaker, and a sloping ceiling, not high, immediately above him are advantages. A curved ceiling over the audience, or one with sloping sides, is favorable. On the other hand, there is no especial advantage in giving to the room an ellipsoidal shape, as is often stated. An accurately ellipsoidal shape, with the speaker at one focus — an often-recommended arrangement — would profit but one particular point in the room, the other focus, and would make of the whole a whispering-gallery. Again, a room shaped like a paraboloid — and this also has been proposed — would be positively bad, unless the axis of the paraboloid were very much inclined to the horizontal — never part of the plan. Indeed, the conic surfaces have been merely words to conjure by. There is no simple, geometrical surface ideal for this purpose, for the variables — reflection, diffraction and absorption — make the problem very complex. Each case must be worked out on its merits. To return: a curved ceiling over the audience, reaching low behind the speaker and at the rear and sides of the hall, is good; but a curved ceiling having the speaker at the centre of curvature is the very worst possible. The rear-wall and the more distant side-walls are, on account of distance, likely to be valueless or worse than valueless, except to the audience near them. They may, therefore, to advantage be low, or occupied by galleries, which, when furnished with cushions or filled with people, are poor reflectors.

In considering any special case it is to be borne in mind that the sound coming directly from the speaker is diminished in intensity not merely on account of the distance but also from absorption by the garments of the audience over which it passes. Therefore, if the ceiling be very low, hearing, while good in front, will be bad in the rear of the hall. This is especially true beneath a low gallery. Here there is a double disadvantage: the sound enters the opening in front diminished in intensity by travelling over the audience; and, screened by the gallery, this part of the house gets no benefit from the reflection by the ceiling. The expression of persons occupying such positions is that the sound seems smothered. On the other hand, the sound that enters the gallery, having travelled farther above the audience, has lost less by absorption, and is more re-enforced by reflection from the ceiling. The hearing in the front rows of the gallery is, therefore, excellent, and the gallery may well have a greater depth than the balcony below it. In both, the seats should rise more rapidly than on the floor in front, not merely for seeing but for hearing purposes, and also to avoid leaving bare walls to reflect prejudicial sound to other parts of the hall. In even the gallery the depth cannot much exceed the clear height above it without giving cause for complaint.

Throughout all speculation in regard to reflecting surfaces there is one point that must not be lost sight of: reflection from any extended surface is regular only when the minor inequalities, as ceiling decorations, panelling, ornamental niches, recesses of doors and windows, are small in comparison with the wave-length of the sound; otherwise the reflection is diffused.

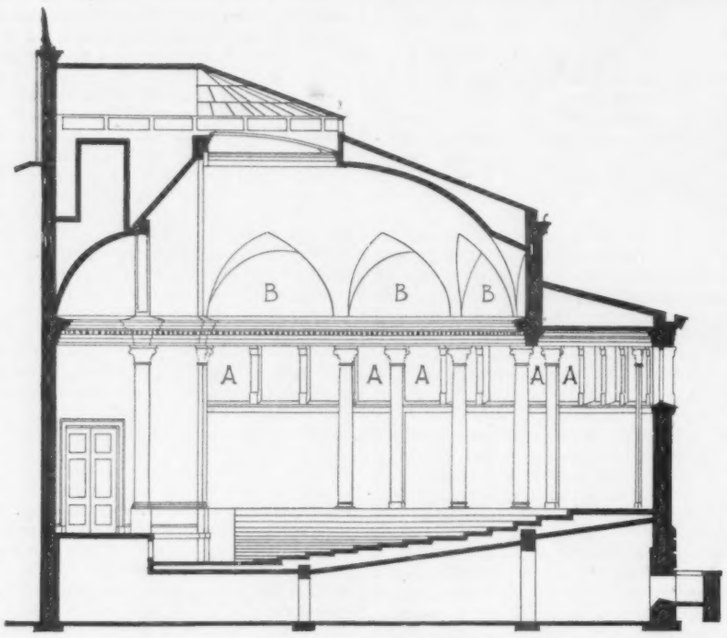
The next phase of the architect's problem is much more intricate, and only an outline may be here attempted; in scientific acoustics it is called "interference." Up to this point the direct and the reflected sound have been spoken of as if always re-enforcing each other when they come together. A moment's consideration of the nature of the sound will show that, as a matter of fact, it is entirely possible for them to oppose each other. Thus the sounding body in its forward motion sends off a wave of condensation, which is immediately followed through the air by a wave of rarefaction produced by the vibrating body as it moves back. These two waves of opposite character taken together constitute a single sound-wave. The source continuing to vibrate, these sound-waves follow each other in a train. Bearing in mind this alternating nature of sound, it is evident that should the sound, travelling by different paths — by reflection from different walls — come together again, the paths being equal in length, condensation will arrive at the same time as condensation and will re-enforce it, and rarefaction will, similarly, re-enforce rarefaction. But should the one path be a little shorter than the other, rarefaction by one and condensation by the other may arrive at the same time, and at this point there will be comparative silence. The whole room may be mapped out into regions in which the sound is loud and regions in which it is feeble. When there are many reflecting surfaces the interference is much more complex. When the sound changes in pitch the interference system is entirely altered in character. These are not merely theoretical considerations. A room in the Harvard physical laboratory has been partly mapped. This room, known as the "Constant-temperature Room," is of the simplest possible character. The four walls, the ceiling, and the floor are plain — there being no windows, and the door being flush with the wall. This room has been of great service during the past three years as a place in which to try preliminary experiments on a small scale before passing to the more complicated conditions of a large hall. One occurrence in this room will illustrate the point under consideration: The source of sound was a middle-C organ-pipe blown by a steady wind-pressure. The observer, on changing the position of his head by ten or twelve inches, could hear the note change in the most positive manner from middle C to the C an octave above. The explanation is simply this: The organ-pipe did not give a single pure note, but gave a fundamental middle C accompanied by several overtones, of which, in this case, the strongest was the octave C. Each of these notes has its own interference system, and near the observer the region of silence for one system happened to coincide with the region of re-enforcement in the other, and *vice versa*. Thus the observer in one position heard the fundamental note, and in the other the overtone. The confusion that this phenomenon is capable of producing in the complex and rapidly-changing sounds of the human voice is evident. Such is the pathology of "interference"; but I am unable to propose a cure for it that would be generally applicable, although in the case of one hall it was possible to relieve somewhat this particular difficulty. Until recently it seemed possible to formulate a general line of procedure, but this now seems doubtful.

The third phase of the problem, while in many ways not so intricate as the last, deserves careful consideration, because in it lie the most frequent and needless failures. Sound, being energy, once produced in a confined space, will continue until either transmitted by the bounding walls or transformed into some other kind of energy, generally heat. This process of decay is called "absorption." Thus in the lecture-room of Harvard University, in behalf of which this investigation was undertaken, the absorption was so slight, and the residual sound was audible so long after the source of sound had ceased, that it was quite impossible, by speaking loudly or gently, to make one's self understood at the other side of the room. Even a very deliberate speaker would utter twelve or fifteen syllables during the audibility of one. With a large audience present it was not so bad, but was still intolerable. Such a misfortune as this may arise from two causes: If it occur in a room when the audience is small the prominence of the defect may be due to the absence of sufficient absorbing power in the material and the furnishing of the room; if the defect continues when a large audience is present it arises also from a failure to have so shaped the room as to adequately employ the great absorbing power of an assemblage of people. In this particular case, the appearance of the room being very attractive and the lighting excellent, alteration of shape was out of the question, and it was desirable that any permanent device should be inconspicuous. It was requested that some accurate numerical measure of the acoustical quality of the room should be secured, and that the investigation should be conducted in as quantitative a manner as possible. The resulting experiments have extended, more or less interruptedly, through the past three years. The first method for determining the rate of decay of the sound, and therefore the amount of absorption, was by means of a sensitive, manometric gas-flame measured by a micrometer telescope. Later, photographing the flame was tried; but both methods were abandoned, for they both showed, what the unaided ear could perceive, that the sound as observed at any point in the room died away in a fluctuating manner, passing through maxima and minima. Moreover, they showed what the unaided ear had not recognized — but immediately afterward did — that the sound was often more intense immediately after the source ceased than before. All this was interesting, but it rendered impossible any accurate interpretation of the results obtained by these or similar methods. It was then found that the ear itself, aided by a suitable electrical chronograph for recording the duration of audibility of the residual sound, gave a surprisingly sensitive and accurate method of measurement. For example, in the constant-temperature room of the physical laboratory it was possible to detect by this method the alteration of the rate of absorption of sound produced by a piece of hair-felting a foot square placed anywhere on the floor; it was easy to detect the difference between the effects produced by a man

[1] A paper read at the Thirty-second Annual Convention of the American Institute of Architects, November 2, 1898, by Prof. W. C. Sabine, of Harvard University.

or a woman coming into the room, and to detect, though with considerable difficulty, even a slight difference made by a change in the clothes of the observer. Thus failure to record the clothing worn in a certain series of experiments made it necessary to discard over 3,000 observations. In a large auditorium, of course, such small differences could not be noticed, but the method was one of remarkable delicacy. It was also very constant in its results, provided the experiments were undisturbed by outside noises. Proper conditions could be secured only at night between twelve and four o'clock, and all the experiments were performed at that time.

Considerable additional accuracy is gained by taking the average of a large number of observations in each case instead of relying upon a single one. This method in the hands of different observers gives almost identical results, provided they practise sufficiently and are not of abnormal hearing. Three gentlemen have devoted the necessary time to test this point. Experiments have been carried on in the following rooms belonging to the University: the large lecture-room above referred to, two rooms in the physical laboratory, of which one is the Constant-temperature Room, Saunders Theatre, Appleton Chapel, and four rooms in University Hall, including the Faculty Room; also Steinert Hall in Boston, devoted to chamber-concerts, and the First Parish Church in Brighton.



Section of Lecture-room in the Fogg Museum Building, Cambridge, Mass.

The relative absorbing power of various substances was tested in the following manner: Having determined the duration of the residual sound in some room when entirely empty, a small amount of some standard substance was brought into the room and the duration of the residual sound was again determined. This was repeated as more and more of the substance was brought in. The results were then plotted on co-ordinate paper, giving what might perhaps be called a calibration curve of the room. For example, in the lecture-room, whose plan of elevation is shown in the first diagram, the duration of the sound was 5.62 seconds. Hair-cushions of high grade were obtained from Saunders Theatre. On introducing 27 running feet of these cushions the duration of the residual sound fell to 5.33 seconds; 56 feet brought it down to 4.94 seconds. This process was continued until 1,500 feet had been gradually introduced into the room, and the cushions covered all the chairs, the aisles, the platform, and, hanging from the ceiling, they covered the wall at the back of the room. The duration of the residual sound fell to 1.14 seconds. These results when plotted gave the curve shown in the diagram. This experiment, requiring of course several nights' work, having been completed, all the cushions were removed, and the room was in readiness for the test of other absorbents. Curtains of chenille, 45 inches wide and 56 feet in total length, were draped in two of the spaces between the columns. This reduced the duration of the sound to 4.51 seconds. Referring to the curve, it is obvious that this amount of chenille, when so draped, is equivalent to 100 feet of cushions. The curtains were then removed, draped in front of the rear-wall, and again tested. They were then draped beside the platform. From these experiments in which the curtains occupied first one part and then another of the hall the result was deduced that, on an average, 23 square yards of chenille draped as a curtain were equivalent to 15 square yards of cushion. Oriental rugs of the highest grade — thick, heavy Herez, Demirjik, and Hindoostanee — were tested in a similar manner. Cretonne cloth, canvas, and hair-felting were tried, with the comparative results indicated in the table.

RELATIVE ABSORBING POWER.

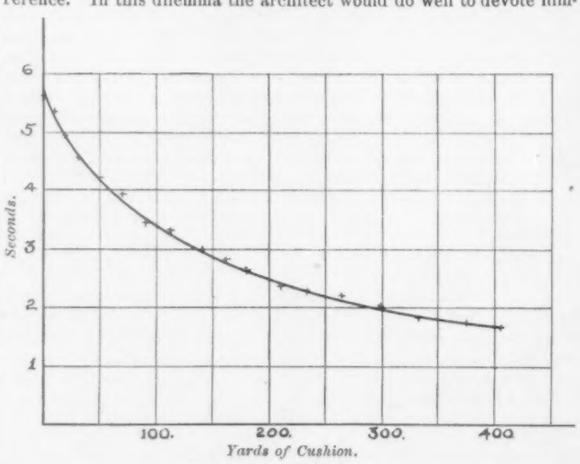
Hair-cushions on seats	2.03	per square yard.
Heavy Oriental rugs on floor	.56	" " "
Chenille draped as a curtain	1.32	" " "
Cretonne cloth hanging flat	.33	" " "
Canvas " " "	.71	" " "
Hair-felting against the wall, ½ inch thick	1.0	" " "
" " " " " 1 " "	1.8	" " "
" " " " " 2 inches	2.4	" " "
Audience, per person	1.3	
Individual man sitting clear	1.8	
" woman sitting clear	2.2	

Some observations were also made on the effect of cushion coverings; experiments in the laboratory with rubber gossamer showed that the covering, no matter how impervious to air, provided it be soft and flexible, had no effect on the absorbing power of the cushions. This result was confirmed in Appleton Chapel. After testing this room with the leather-covered cushions in their ordinary positions they all were turned over, thus exposing a canvas-covered side. The difference in the duration of sound was scarcely perceptible.

Perhaps the most interesting of these results is the one measuring the absorbing power of an audience. It was obtained through the kindness of 121 persons, who in the summer of 1897 submitted to the experiment. Of this number 66 were women and 55 were men. The experiment was not performed so late at night as might be desirable, but this was partly compensated for by having two observers. Their results agreed almost exactly. The result given in the table is the average absorbing power per person, without distinction between men and women. Other experiments on individuals were made in the laboratory in the fall, when heavier clothing was worn, and gave, on the average, as the absorbing power for man 1.8 and for woman 2.2. Here, unlike the preceding case, the individuals were not screened by neighbors and near chairs. Another result is interesting as a partial answer to a question that is frequently asked in regard to the effect of beams and girders. An openwork scaffolding, consisting of about 400 feet of plank and 600 feet of scantling, gave almost no appreciable absorbing effect. It may have had another effect, but that is a subject too intricate and tedious to be discussed here.

It must not be thought that an absorbent is always desirable, or, if desirable, that it is so at any point.

This completes the independent discussion of the three factors in the architect's problem — loudness, interference and distinctness — and brings us again to the initial proposition that the solution of this problem as a whole is necessarily more or less a compromise. Loudness — all the loudness, it is safe to say, that an architect can secure, provided it be as uniform as possible over the hall — is desirable. Interference, with its consequent distortion of chords and complex sounds, is, with equal positiveness, undesirable. Loudness can be obtained only by the superposition of direct and reflected sound — and superposition of sound cannot be had without the danger of interference. In this dilemma the architect would do well to devote himself to the consideration of loudness alone. Interference is, practically, a less noticeable evil than either deficient loudness or excessive residual sound. Residual sound, always an evil in a hall used for speaking, can be reduced to a minimum by so inclining surfaces as to bring all the sound, by one reflection, upon the audience — always the



Duration of Residual Sound.

most active absorbent factor in a room. This will also make the loudness a maximum. In order that the hall may remain good when the audience only partly fills the hall the chairs should be provided with cushions — the next most active absorbent material on our list. While the residual sound should be a minimum in a room devoted to speaking, to military music, perhaps also to orchestral music, it probably should not be a minimum in a room designed for chamber-concerts, and especially if designed for piano-music. In the latter case the effect of the residual sound is to increase the fulness of tone of the instrument, and to diminish its staccato effect. A suggestive incident occurred in the recent investigation conducted by the Department of Music of the University to determine whether a certain room was suitable for a series of chamber-concerts to be given in connection with one of its courses. The test, by a very select audience of experts, was made with piano-music, and was conducted under such conditions — size of audience, etc. — that the duration of the residual sound was 2.5 seconds. The room was pronounced satisfactory. On the whole, however, this use of the auditorium as a contributor to the æsthetical value of the musical production, rather than as a vehicle of exact transmission, is a too serious complication of the problem.

The preceding suggestions have been on the supposition that the architect could control his design by acoustical considerations alone. This is, of course, not the case. The artistic appearance of the hall, adherence to conventional forms — as a lofty ceiling in a church, adequate and pleasing lighting by day and by night, adequate and uniform ventilation — all make demands at times incompatible with acoustically ideal conditions. A hall having proved faulty under trial, it may become necessary to diagnosticate the case and prescribe the remedy. There is no simple treatment that can cure all cases. There may be inadequate absorption and prolonged residual sound; in this case absorbing material should be added in the proper places. On the other hand, there may be excessive absorption by the nearer parts of the hall and by the near audience, and the sound may not penetrate to the greater distances. Obviously the treatment should not be the same. There is such a room belonging to the University, known locally as Sever 35. It is low and long. Across its ceiling are now stretched hundreds of wires and many yards of cloth. The former has the merit of being harmless, the latter is like bleeding a patient suffering from a chill. In general, should the sound seem smothered, or too faint, it is because the sound is either imperfectly distributed to the audience, or is lost in waste places. The first may occur in a very low and long room, the second in one with a very high ceiling. The first can be remedied only slightly at best, the latter can be improved by the use of reflectors behind and above the speaker. On the other hand, should the sound be loud but confused, due to a perceptible prolongation, the difficulty arises from there being reflecting surfaces either too far distant or improperly inclined. The most immediate remedy in this case is covering these surfaces with some absorbent material — curtains or hair-felting. The lecture-room referred to above may be taken in illustration. Hair-felting $\frac{3}{4}$ of an inch thick was placed in the 14 vertical, marked *A*, rectangular places beside the windows, covered with thin tinted asbestos paper, and protected by wire guards. Hair-felting $1\frac{1}{2}$ inches in thickness, similarly protected, was placed in the 7 vertical, semicircular offsets in the dome marked *B*. The platform was covered with carpet doubly lined. The result was pronounced entirely satisfactory.

The above is a partial account of perhaps the first quantitative experimental investigation of this subject. There is a little more that might be given, and there is a great deal more that might be investigated, but a further research would be laborious and very expensive.

REPORT ON THE "SHATTUCK PRIZE" COMPETITION FOR ARTISANS' HOUSES.

HENRY D. DUPEE, ESQ., SECRETARY OF THE EXECUTIVE COMMITTEE, MASSACHUSETTS CHARITABLE MECHANIC ASSOCIATION: —

Dear Sir, — In the limited competition for "Designs for Artisans' Houses" there were eleven competitors, of whom seven were from Boston and one each from Canada, Chicago, Milwaukee and Pittsburgh.

Among the designs submitted, two general schemes for the occupancy of the land by the buildings were represented, one in which the blocks of buildings surrounded a square or series of squares, with the object of gaining the most efficient light and air areas and also to afford grounds for recreation or gardens, and so interest the tenant in his home surroundings; the other in which the blocks are in parallel rows, with the evident object of converting the area into the most profitable investment without much thought of philanthropy except that a tolerable minimum of both light and air have been provided for. The first scheme, of hollow squares, seemed to us to be in the spirit of the purpose of this competition and of what your Committee had in mind in framing their programme and it is certainly to be commended in preference to the second scheme, of parallel blocks, which forbids any pleasantness in the surroundings and cuts off too much light and air.

Nearly every design showed careful study both in planning and in the consideration of the scheme as a pecuniary as well as a philanthropic investment. The widely different estimates of cost, however, which varied from 8 to 19 cents per cubic foot and from $3.82 to $8.00 per square foot, made evident the discrepancy between a fair and very generous return on comparatively the same outlay. It was necessary to reduce the various estimates to a single standard, which was made for a cubic foot 15 cents, and for a square foot $7.00, for a building of four stories in height and a basement. On this basis, it was found that the difference between the various plans was very slight in the estimated percentage of returns and that such a property if carefully administered should return a net profit of between 4 and $4\frac{1}{2}$ per cent. The scheme of parallel blocks made a somewhat better showing, but simply on account of covering more land with buildings.

Of the plans with hollow squares there were three, which, in convenience, good sanitary arrangement and effectiveness of composition, seemed to us to merit especial commendation, namely, those of Messrs. R. C. Sturgis, A. W. Longfellow, Jr., and Peabody & Stearns.

While some of the other plans had advantages over that of Mr. Sturgis in one particular or another, yet on the whole it seemed to us that in the combination of desirable qualities that of Mr. Sturgis was superior; we therefore adjudge the prize to him. His plan was the most skilful one offered, and was at the same time very simple in conception. His arrangement of blocks was not only an effective aid to good lighting and ventilation but equally so in producing a very attractive architectural effect without material increase of cost.

Mr. Longfellow showed a very carefully studied plan, which had many practical merits. Its private corridor with water-closet opening from it, rather than from a living-room, is a very attractive feature, but the arrangement of plan and the treatment of the elevation lacked the attractiveness of other designs. Mr. Longfellow's exterior simply fills unbroken walls with windows and is almost devoid of architectural treatment. That architectural effect is not incompatible with strict economy is shown by Mr. Sturgis's design.

Messrs. Peabody & Stearns showed in a brilliant drawing a very skilful and attractive group of masses, but in planning there was lacking the simplicity and effectiveness and the practical advantages of Mr. Sturgis's design. The enclosed fire-escapes or secondary staircases are an excellent practical feature.

The plan by Messrs. Cabot, Everett & Mead was simple and well ventilated, and had advantages in the planning of its unit, but the arrangement of its buildings on the ground was too monotonous, and gave but restricted light and air.

Another type, which was represented by Mr. Preston, proposed a central corridor running continuously through the blocks, off which the tenements opened. This corridor was closed at regular intervals by fireproof doors. Mr. Preston claimed that this plan gave the greatest safety in case of fire, and it also might be a little less expensive to build, on account of the fewer entrances and stairways. But such a plan did not compare favorably with the others we have referred to, in giving the tenant a sense of privacy for his family, which was felt to be of the highest importance, and the danger from fire could well be met by proper fire-escapes. Nothing could be more dreary and unhomelike than these long corridors. The other designs were variations of the types already referred to, but failed on account of complications in the planning, or inadequate allowance of light and air.

The conveniences of various plants in common, such as laundries, kitchens, heating, etc., and also the scheme of suitable shop-space as shown in some of the designs and not in others have not influenced the jury in making its decision. It was felt that the proper basis of comparison should be the effective housing of the artisan, and that the conveniences above referred to must depend not only on the class of mechanics catered to but the locality in which the house would be built.

IN the open competition for the housing of fifty artisan households in the suburbs of a city there were twenty-nine competitors, of whom nine were from Boston, eight from New York, three from Philadelphia, two from St. Louis and one each from Baltimore, Brooklyn, Cambridge, Chicago, Cincinnati, Milwaukee and York, Pennsylvania.

For the occupancy of the land by the buildings, in this competition, as in the limited, two schemes were represented: one in which the houses were isolated, planned for one, two, three and four families, and the other in which the block system was used. The materials of construction were wood, brick, half-timbered work, with rough-cast, and were employed either alone or in combination.

Most of the designs were interesting in one way or another, but almost invariably erred in being too elaborate in the exterior treatment of the buildings. There was much less judgment shown in this respect than in the limited competition. The exterior should be attractive but simple. Many motives here shown were entirely out of place in the solution of such a problem. Half-timbered work, roofs treated so picturesquely as to practically destroy a good part of the room-space of the second story, double gables so arranged as to catch snow, with every probability of leaking roofs, are clearly things to be avoided. Not enough thought in design was given to the question of cost of preservation or ability shown in making the simpler forms attractive.

Many of the plans adopting the block system were very attractive, the architecture simple and good, but the jury did not consider that this was the ideal type for suburban homes. Cheap land in the suburbs allows of more isolation for the family, which would generally be the reason why the better class of artisan would prefer to live so

far from his daily work. The jury decided that the "semi-detached," or double, house should be the accepted basis of any scheme of building such as here proposed as affording the maximum of privacy with the maximum of surrounding land.

The wide range of estimates of construction gave as wide a range in the net income on the investment, but a careful reduction to the same basis of cost showed that it would be safe to promise between 4 per cent and 5 per cent income, although 6 per cent and over was promised in some cases.

The prize in this competition is awarded to the firm of Messrs. George E. Barton & George G. Will, of Boston.

The ground is very attractively laid out, so that a pleasing composition is obtained in the relation of the houses to one another, the planning of each house is good and economical and the exteriors of the buildings are charmingly designed. The scheme as a whole is a first-rate example of a very attractive fitness to the end in view. It is sincerely to be hoped that many of the designs may be published, as in nearly all there are individual good points deserving careful consideration.

The problem is a very interesting one and the seriousness shown in its consideration by every competitor fully proves the wisdom of your Committee in choosing such a field in fulfilling the mission of the Shattuck fund. Very truly yours,

(Signed) F. W. Chandler,
H. Langford Warren,
John M. Carrère.

Illustrations

[*Contributors of drawings are requested to send also plans and a full and adequate description of the buildings, including a statement of cost.*]

COMPETITIVE DESIGN FOR "SHATTUCK PRIZE" FOR ARTISANS' HOMES. [OPEN COMPETITION.] SUBMITTED BY MR. GEORGE S. DREW, JR., ARCHITECT, NEW YORK, N. Y.: TWO PLATES.

[Issued with the International and Imperial Editions only.]

IN submitting the accompanying sketches in open competition for the "Shattuck Prize" the author premises: —

1. That the proposed site is approximately level throughout, and at, or very slightly above, the elevation of the highway upon which it fronts.

2. That a public system of sewerage and water-supply exists in the said highway.

3. That the suburb is sufficiently populous to create a demand for a few neat and attractive shops upon its principal thoroughfare.

4. That each family contains one productive member whose earning capacity ranges from $12 to $20 per week.

5. That the cost of transportation to and from the city does not exceed 15 cents per day per capita.

From the following, it will be seen that, allowing for the cost of improvements common to all the tenants, such as streets, sidewalks, sewerage and water-supply, the ground value becomes $600 per family, which is fully equal to or somewhat above the urban average. In view of which fact and the necessary reduction in rental from the urban standard, consequent upon the increased cost of transportation and supplies, it becomes imperative to exercise the most rigorous economy in the design and disposition of the buildings, at the same time producing dwellings of a substantial and lasting character, convenient in plan and pleasing in exterior.

The plans herewith submitted are drawn to the scales specified in the printed conditions and the perspective is viewed from an imaginary elevation of 100 feet distant 300 feet from the salient angle.

They illustrate a group of buildings comprising fifty-two dwellings (the additional two being provided for the families of the superintendent and his assistant) of three, four or five rooms and cellar each. Each dwelling forms a complete home in itself, provided with its own toilet, sink and laundry-tubs and kitchen-range and boiler. There is also space for from eight to twelves shops fronting upon the main thoroughfare.

The buildings are designed in imitation of the picturesque half-timbered houses still common in England: the cellar and first story walls are of brick, while the upper walls are of the ordinary frame-construction covered externally with metal lath and plastered with gauged mortar, thus rendering them warm, substantial, and, in a large measure, fireproof. The roofs are slate. The interior finish comprises hardwood floors, whitewood trim, and good substantial hardware, the woodwork being painted or stained.

The plot is divided symmetrically, the centre line being at right angles to the highway; each half is again bisected by a private street 60 feet wide (forty-foot roadway), each extending back from the highway 250 feet, where they are transversely connected.

The cost has been carefully estimated, using the present prices of labor and material in the vicinity of New York as a basis, and amounts to 8½ cents per cubic foot, or to from $2.12½ to $2.44 per square foot.

Cost of 4 acres of land at 15 cents per sq. ft.	$26,136
" " Sewerage and water-supply systems	1,500
" " Grading streets and sidewalks	2,364
" " 12 buildings containing 1,200 sq. ft. and 30,000 cubic ft. each, at 8½ cents per cubic ft.	30,600
" " 2 buildings containing 960 sq. ft. and 24,000 cubic ft. each, at 8½ cents per cubic ft.	4,080
" " 2 buildings containing 2,400 sq. ft. and 60,000 cubic ft. each, at 8½ cents per cubic ft.	10,200
" " 4 buildings containing 2,165 sq. ft. and 62,120 cubic ft. each, at 8½ cents per cubic ft.	21,120
Total cost	$96,000

Yearly rentals from: —	
10 dwellings of 3 rooms each at $6.00 per month	$720
4 " " 4 " " " 7.50 " "	360
4 " " 4 " " " 10.00 " "	480
4 " " 5 " " " 11.00 " "	528
28 " " 5 " " " 12.00 " "	4,032
4 shops (corner) " 15.00 " "	720
8 " " 10.00 " "	960
Total income	$7,800

Taxes, insurance, etc.	$1,400	
Superintendent's wages	600	
Assistant's wages	420	
Possible vacancies	780	
Probable repairs	400	
Total annual expenses		$3,600
Net annual income		$4,200

Or 4¼ per cent upon the entire investment.

The author has not deemed it advisable to introduce into the scheme such common conveniences as steam-heat, electric-light and fuel-gas, the undertaking being on too small a scale and the area of distribution too large to permit of their being managed economically in their present state of development. Space has, however, been reserved in the "Common Green" for the future erection of such plants should the conditions become favorable.

It is suggested, however, that by a small sacrifice in the space devoted to shops, free baths and reading-room could be provided without reducing the net income below 4 per cent on the capital invested.

PLANS OF THE SAME.

PRIZE-WINNING DESIGN FOR "SHATTUCK PRIZE" FOR ARTISANS' HOMES. [OPEN COMPETITION.] MESSRS. GEORGE EDWARD BARTON & GEORGE G. WILL, ARCHITECTS, 19 EXCHANGE PLACE, BOSTON, MASS.

THESE houses have been designed for artisans, carpenters, stone-cutters, weavers, carvers, mill-hands, etc., who receive $3.00 a day, or from $15 to $18 a week.

For the scheme in general, we would only say that our sole idea has been to insure to each tenant a maximum of light and air in a well-built house, which should be economical in administration and which should not depend upon its neighbor for view and shade.

This class of tenant will probably be glad for the opportunity of having small gardens, but it is probable that among fifty there will be some who will not keep their houses up to the average, and to counteract the effect of such tenants nearly thirty per cent of the land has been reserved from the "Lots" account and placed under the head of "Improvements."

Each house has been placed to give it the advantage of the planting, road and park, and the cost of these improvements has been divided, and added to the cost per foot of used land (see table).

Each house is independent (save for, in some cases, a party-wall) of its neighbor.

All sewerage-pipes, plumbing, etc. are contained within the lines of each lot.

We can advise no communistic additions at the present day, the only suggestion is for a small building in the park to be used for a reading-room, and in which the chore-man might have rooms, and a gymnasium in the basement, to be opened to the tenants at a nominal fee. This could not be done for some years, but we have allowed 15 per cent of total rentals for loss of rent and repairs, and the savings from these accounts could be put into a reserve fund for this building.

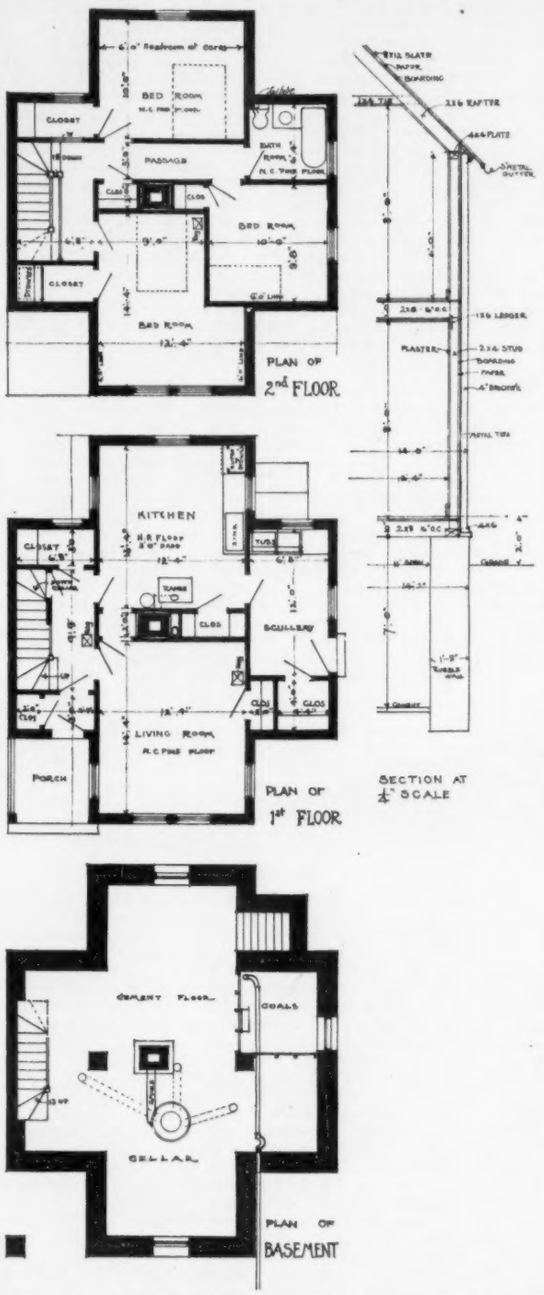
The lighting of streets will (as we pay taxes) be borne by the town, and whatever luminant is there used we can have introduced into the houses. If gas, the cost per house will be $20, an expense which can be borne without making any material change in the income. Electricity would be put in without cost (if near), and the expense (about one dollar a month) will be added to rent and be optional with tenant, who will, however, probably use oil.

Feeling it to be the best and briefest way of showing our ideas of the houses and of what they should contain, we include a plan at ⅛-inch scale. It has been upon such plans that we have based our estimates.

Brick is obviously the best material for such houses, but its cost and the probable dampness in an 8-inch wall are against it. Wood cannot be considered a good material with which to build for investment, constant damage and care reducing the income year by year.

We have chosen a system combining all the advantages of both methods without the disadvantages of either and costing between the two, viz, — a frame-house plastered on inside, outside boarded, covered with paper carried in continuous sheets over walls, eaves and

roof (making a windproof box), and then veneering the walls with 4 inches of brick anchored into boarding. The roof being slate, this makes a construction externally fireproof. The brick protects from



damage; paper, boarding, air-space and plaster ensure a dry and warm house.

The houses have been designed with light and air generally on two sides of a room and in many cases on three sides. A large combination back porch and scullery allows the removal of cooking in summer months out of the living-rooms.

The estimates include blinds, plumbing, kitchen-range and boiler, furnace and set-tubs, hard-pine floors, etc. (see estimate for full list). These estimates have been given with the understanding that all work would be done at the same time, and we have found that discounts for the fifty houses have in some cases reached 25 and 40 per cent.

Total income from rents		$8,352
Yearly expense: —		
Tax on 60 per cent cost of houses and land	$1,079	
Water, $10 a house, 4 stores, and $25 for park	565	
Insurance at 10 cents a $100 (5-year rate) on 60 per cent houses' cost	63	
Agent, 10 per cent of rents	835	
Chore-man	400	
Repairs, 5 per cent of rents	418	
Loss of rent, 10 per cent of rents	835	
		4,195
Profit on investment (3.02 per cent)		$4,157

ESTIMATE OF COST OF ONE HOUSE.

155	yards excavation, at 30 cents	$46
48	perch stone, at $4.00	192
18	M. brick, laid, at $14	252
7,500′	dimension spruce	120
3,000′	matched spruce boards and 1,200 square edged for floors	67
16	windows set and finished	128
	Front and back doors complete $20; 18 inside $90	110
225′	H. P. floor, put down $12 square	27
1,081′	N. C. " " " 10 "	110
650′	sheathing " " " 10 "	65
200′	base $20, 100′ shelving $10, 2 cases drawers $10	40
	Miscellaneous, carpenters' labor	130
508	yds. plaster (2 coats, outside plaster est. brickwork), at 30 cents	145
	Paper, hardware and nails	100
10	squares of slate (8 x 12 scrap cuttings) at $6.00	60
3	cellar windows	9
	Outside finish, gutters, verges, etc	65
	Front and cellar stairs	65
	Front porch and steps $35, bulkhead doors $6.00	41
2	galvanized-iron conductors, set	8
	Concreting cellar	12
4	pr. blinds	8
	Plumbing	150
	Painting	130
	Kitchen-range	15
	Furnace (18″ pot) set complete	50
		2,205
	House (Type A) 700 sq. ft. at $3.15	$2,205
	" " " 17,500 cubic ft. at $0.126	2,205

LAND AND IMPROVEMENTS.

174,240 sq. ft. land at 15 cents	$26,136.00	
45,000 " " " taken out for parks, roads, etc.		
129,240 " " " divided into lots		

COST OF IMPROVEMENTS.

Surveyor	$100		
Sewer	1,250		
Road light	1,200		
Sidewalks — rolled-stone	500		
Park and planting on sidewalks	200		
Fencing	2,000		
		5,250.00	
Total cost of land and improvements		$31,386.00	$31,386.00
Dividing by 129,240′ (land divided into lots) we get cost per ft. of improved land	$0.242		
33,682′ (area of houses) × $3.15 (price per ft.)		106,098.30	106,098.30
842,050 (cubic ft.) × $0.126 (price per ft.)		106,098.30	
			$137,484.30
Showing a discrepancy, which we have not time to investigate, of			24.02
			$137,508.32

SCHEDULE OF HOUSES AND RENTS.

2 stores	$20	12 houses	$12
2 "	17	12 "	11
8 houses	15	2 suites	10
8 "	14	2 "	8
6 "	13		

Name.	Area of House.	Cost of House, $3.15 sq. ft.	Area of Lot.	Cost of Lot, $0.24 sq. ft.	Cost of House and Lot.	Rent of Each Per Year.	†Rent Per Month.	Total Rent Per Year.	Number of Each.	Total Costs of Houses and Lots.
A_1	700′	$2,205.00	2,560′	$614.40	$2,819.40	$168	$14	$672	4	$11,277.60
A_2	700′	2,205.00	2,048′	491.52	2,696.52	156	13	624	4	10,786.08
B	616′	1,940.40	2,688′	645.12	2,585.52	156	13	312	2	5,171.04
C	772′	*3,088.00	2,048′	491.52	3,579.52	Store, 240	20	480	2	7,159.04
						Suite, 120	10	240		
D	756′	*3,024.00	2,048′	491.52	3,515.52	Store, 204	17	408	2	7,031.04
						Suite, 96	8	192		
E_1	564′	1,776.00	1,920′	460.80	2,236.00	132	11	264	2	4,472.00
E_2	564′	1,776.00	2,304′	552.96	2,328.96	168	14	336	2	4,657.92
F_1	816′	2,570.40	2,640′	663.60	3,234.00	168	14	336	2	6,468.00
F_2	816′	2,570.40	3,225′	774.00	3,344.40	180	15	1,440	8	26,755.20
G	608′	1,915.00	2,640′	633.60	2,548.60	144	12	576	4	10,194.40
H_1	597′	1,880.55	2,640′	633.60	2,513.60	144	12	576	4	10.054.40
H_2	597′	1,880.55	1,856′	445.44	2,325.44	132	11	528	4	9,301.76
H_3	597′	1,880.55	2,436′	584.64	2,464.64	144	12	576	4	9,858.56
H_4	597′	1,880.55	2,112′	506.88	2,386.88	132	11	792	6	14,321.28
								$8,352	50	$137,508.32

*$4.00 sq. ft.

†Add $3.00 for car-fare.

PLANS OF THE SAME.

[The following named illustrations may be found by reference to our advertising pages.]

GARDENER'S HOUSE, NIEDERRAD, PRUSSIA. FRANZ VON HOVEN, ARCHITECT.

This plate is copied from *Architektonische Rundschau.*

A GROUP OF CHURCHES.

[Additional Illustrations in the International Edition.]

COMPETITIVE DESIGN FOR "SHATTUCK PRIZE" FOR ARTISANS' HOMES. [OPEN COMPETITION.] SUBMITTED BY MR. CHARLES L. HILLMAN, ARCHITECT, PHILADELPHIA, PA.

It is deemed best that the scheme herewith presented be restricted to dwelling-houses. Places of entertainment and shops for the sale of food and other supplies are better situated at some distance from the dwelling-houses.

The houses are in blocks, for economy of erection and maintenance. The blocks are well segregated, and every house has an agreeable prospect: each house has a separate plot of ground.

MATERIALS.

Foundation-walls, rubble-masonry.

Walls of superstructure, hard red bricks, face-work to be relieved with some dark headers, and trimmed sparingly with light-colored stone.

Roof-covering, green slates.

Joists and floors, wood.

Partitions, 2-inch-thick planks, set vertically and plastered both sides.

Interior joinery, yellow-pine.

Heating, by means of individual warm-air furnaces.

The plan offers ample facilities for running sewers, drains, water and gas pipes, and electric wires, and for connecting each house therewith.

ESTIMATED COST, REVENUE AND PROFIT.

Total area of 50 houses	42,700	
" cubic contents of 50 houses	1,494,500	
Cost per cubic ft. of contents		$0.10½
" " sq. ft. on the ground		3.67
" " " " of floor		1.22
Cost of ground		$26,136.00
" " 50 houses		156,922.50
Fence, paving, grading, etc		10,000.00
Total investment		$193,058.50
Annual rental at $300 per house (average)		$15,000.00
Maintenance, taxes, repairs, water-rates, public lighting, supervision and care of grounds, collection of rents, etc.		4,670.00
Net income		$10,330.00
Gross income	7.75 per cent.	
Net income	5.2 " "	

PLANS OF THE SAME.

"EASTCOTE," PINNER, ENG. MR. W. HOWARD SETH-SMITH, ARCHITECT.

PROPOSED METHODIST CHURCH, WESTON-SUPER-MARE, ENG. MR. H. DARE BRYAN, ARCHITECT.

DESIGN FOR MUNICIPAL BUILDINGS, OXFORD, ENG. MR. G. W. WEBB, ARCHITECT.

ST. GEORGE'S CHURCH, STOCKPORT, ENG. MESSRS. AUSTIN & PALEY, ARCHITECTS.

NOTES AND CLIPPINGS

Forgery Extraordinary. — The extraordinary story of forgery and fraud which the treasury counsel, Mr. Bodkin, unfolded at Bow Street Police Court some days ago was resumed recently, when the accused, Herbert Davies, aged twenty-five, described as a "private surgeon," residing at Castlenau Gardens, Barnes, was brought up on remand to hear the evidence. He is alleged to have duped Lieutenant-Colonel Shipway of Grove House, Chiswick, by pretending to trace for him an important pedigree and coat-of-arms through ancient parish registers, wills, tombs and church effigies, over a few centuries, and to have thereby defrauded the confiding colonel out of £683. The prisoner's course of fraud, as alleged by the prosecution, may be briefly summarized: He is accused of having forged Shipway family entries into the old parish registers at Mangotsfield in Gloucestershire, so as to give support to the coat-of-arms which he invented for the colonel — a lion rampant, holding a weapon. Upon one of the hasps of the oak chest which contained the parish documents he is said to have had an entry engraved to pretend that the chest was a gift from a deceased Shipway. Coffins are said to have been exhumed by him in Mangotsfield Church, and upon one leaden coffin he is alleged to have forged the name "John Shipway," to pretend that the skeleton inside was that of an influential ancestor of the colonel. Entries were also carved in the belfry to give corroboration to the coat-of-arms. The church organ he is said to have taken down so as to tamper with effigies and carve Shipway inscriptions. Wills are alleged to have been stolen by him and obliterated, and false Shipway wills forged upon the parchment, these forgeries being again inserted among old diocesan registers of Gloucester and Worcester. Having "discovered" all these things he communicated them to the colonel as genuine relics. — *London Mail.*

The Pyramids of Napata. — "The opportunity for making an excursion to the Pyramids of Napata presented itself recently," writes the London *Graphic's* artist correspondent from the Soudan, "and I eagerly embraced the chance of visiting these interesting and little-known relics of the past. The pyramids lie clustered together on the western side of Gehel Barkal Mountain, a huge mass of sandstone rock which rises majestically out of the desert, as Gibraltar rises from the sea. This mountain, though of no great height, is a landmark for many a mile round, and from Merawi camp the pyramids themselves were plainly visible above the belt of palm-trees on the opposite bank of the Nile. These pyramids are six in number, and, with one exception, all are in a wonderfully perfect state of preservation. None of them, however, is of any such vast dimensions as the pyramids at Gizeh; the highest probably not exceeding sixty feet. They appear to have been built in groups of three, placed at right angles to one another. The stones which form the outer facing are in no case more than three feet long by one and one-half feet in depth, and are not very closely fitted to one another. These pyramids have never been explored. What varied treasures may they not contain! What priceless inscriptions may adorn the walls of their sepulchral chambers! The temple which we first approached on leaving the pyramids is hewn out of the solid rock. It contains three chambers, the central one being the largest, with the two smaller ones on each side of it. In each case the walls are richly decorated with hieroglyphics, and in some places the original coloring remains. It is, however, extremely difficult to trace the details of the carvings, for the wild bees have found them convenient projections on which to build their little nests."

Color-blind Painters. — To speak of a color-blind artist sounds like joking, said a noted oculist; but, strange as it seems, there are several persons so affected who can nevertheless paint extremely well. Numbers of color-blind people there are, of course, who draw perfectly in pencil, ink and crayons, but I myself know a scene-painter attached to a provincial theatre who, though "color-blind," paints all its scenery, and has quite a local name, not only for his "interiors" and oak chambers but even for landscapes. I can tell you also of two London ladies who consulted me for color-blindness who paint really beautiful pictures. One is the daughter of a late famous artist, and was taught painting by her father. She is quite unable to distinguish red from green, but her colors are labelled with the names, and she has been taught which to use for certain effects. Possibly her painting may seem to her eyes, as it were, drawing with a brush and "shading" with the colors. The other is a lady artist of some celebrity, who has for years exhibited annually in London. The public are not aware that she is color-blind. She painted the "Wedding Group" for a certain noble bridegroom a year or two ago, and also several public men's portraits, and one of an eminent physician fetched 500 guineas. There is a gentleman residing at Kensington who, having years ago left the navy through finding his advancement hopelessly barred by his color-blindness, is at present making several hundred a year by his brush as an artist, designing most artistic and brightly colored picture "posters" for advertisement hoardings. — *London "Tit-Bits."*

The Growth of Electrical Industries. — The last report of the Commissioner of Patents gives some historical notes on the influence of patented inventions in the creation of electrical industries. The manufacture of electrical apparatus and supplies began to be of importance shortly before 1880. In that year 1,271 people were employed in 76 establishments, producing an output valued at $2,665,036. In ten years the output, which had risen to $19,114,714, engaged the labor of 9,485 persons in 189 establishments. Since 1890 the increase in the industry has been proportionately large. The exports of "instruments and apparatus for scientific purposes, including telegraph, telephone and other electrical appliances," amounted in value in 1897 to $3,083,900, having increased to this amount from $88,383 in 1880 and $1,429,785 in 1890. In 1880 there were but three electric-light and power establishments in the United States, employing 229 persons and producing an output value of $458,400. The investment in electric-lighting stations and plants in the United States to-day is estimated at over $600,000,000. The year 1880 also marks the commercial advent of telephony. At the close of 1896 there were in this country 967 telephone exchanges and 832 branch offices, using 536,845 miles of wire and employing 14,425 people. The amount then invested in telephone property was estimated at nearly $100,000,000. — *Boston Transcript.*

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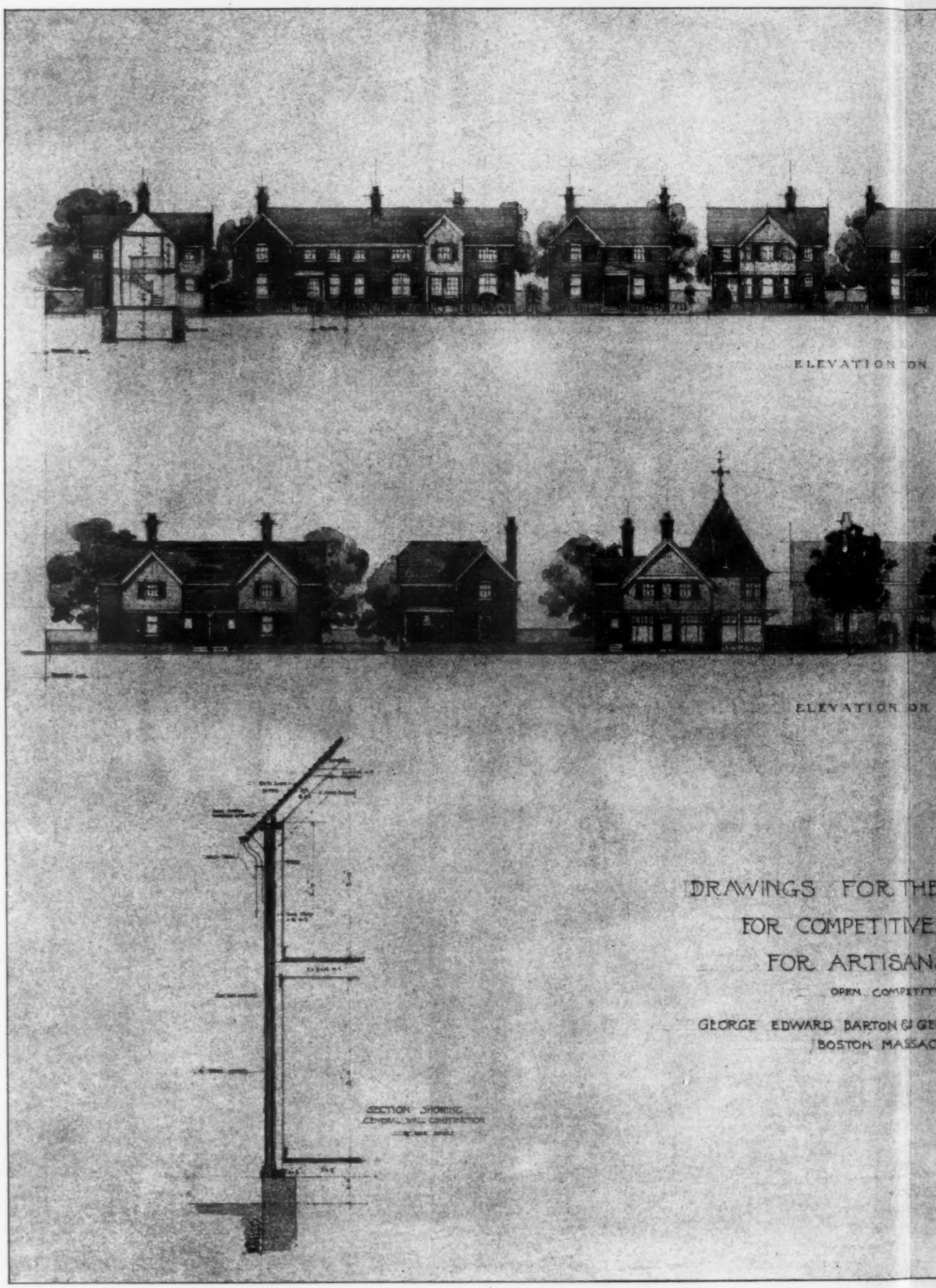

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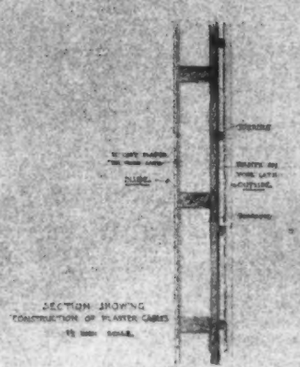

SECTION SHOWING CONSTRUCTION OF PLASTER CASES

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G. WILL, ARCHITECTS, 19 EXCHANGE PLACE, BOSTON, MASS.

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SHATTUCK PRIZE FOR COMPETITIVE DESIGNS FOR

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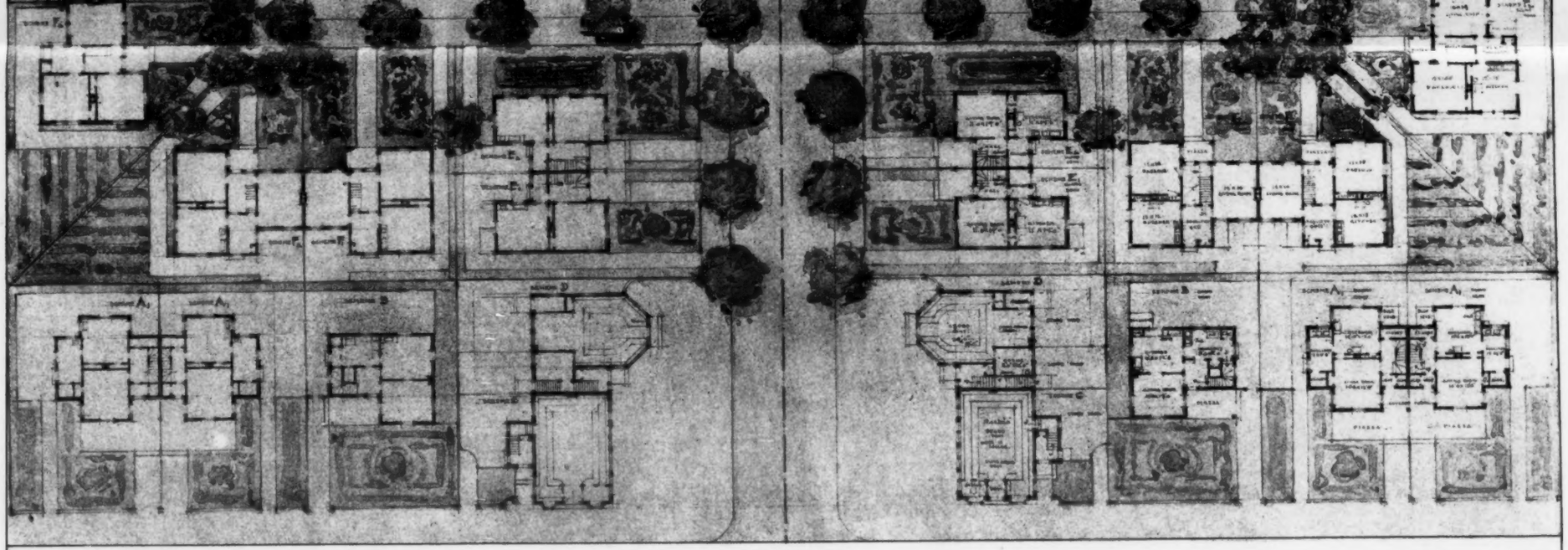
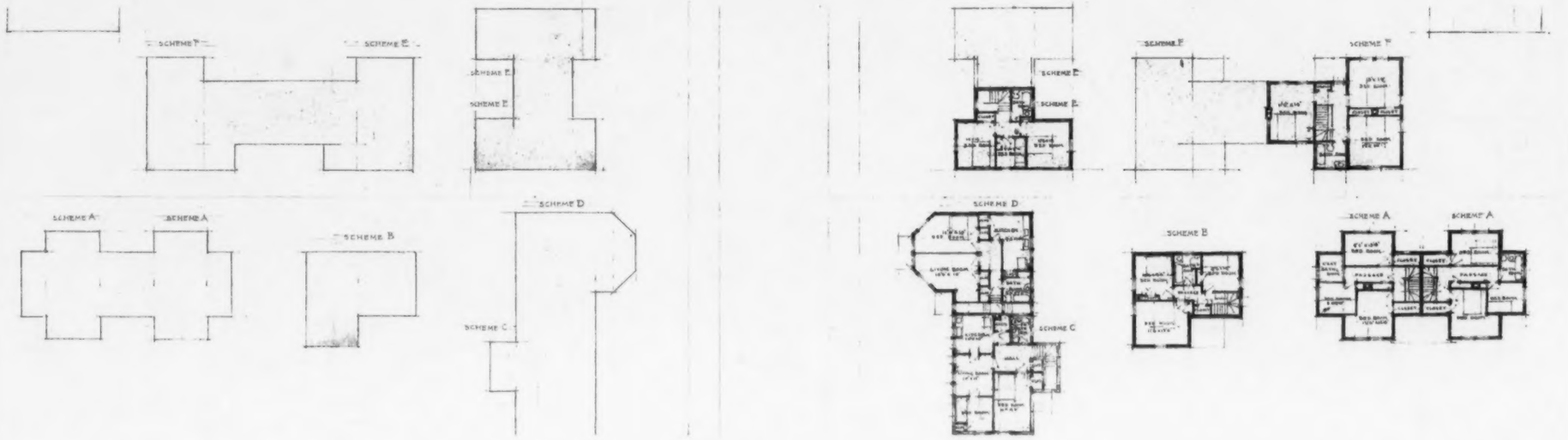


FIRST FLOOR PLANS.



SECOND FLOOR PLANS
SCALE 1/16 IN. = 1 FT.

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SHATTUCK PRIZE FOR COMPETITIVE DESIGNS FOR ARTISANS' HOMES (OPEN COMPETITION).

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[PRIZE-WINNING DESIGN.]