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NUMBER 1807

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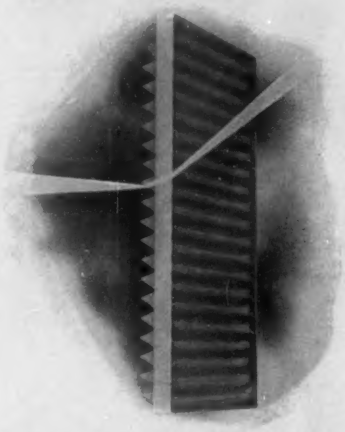

PLATE I. This illustration shows how light rays are bent by means of prism angles.

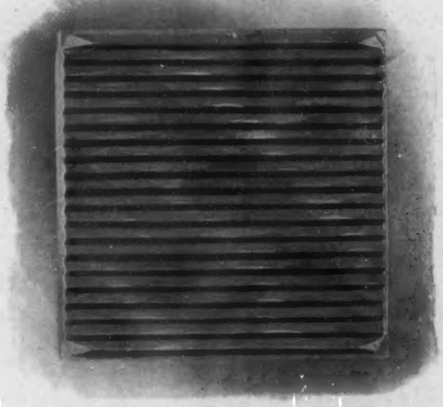

PLATE II. This illustration shows appearance of simple prism square. Note angles on surface.

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THE AMERICAN ARCHITECT

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ARCHITECTURAL ACOUSTICS*

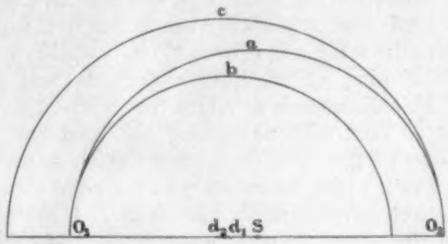
BY PROFESSOR WALLACE C. SABINE

ORDINARILY there is not a close connection between the flow of air in a room and its acoustical properties, although it has been frequently suggested that thus the sound may be carried effectively to different parts. On the other hand, while the motion of the air is of minor importance, the distribution of temperature is of more importance, and it is on reliable record that serious acoustical difficulty has arisen from abrupt differences of temperature in an auditorium. Finally, transmission of disturbing noises through the ventilation ducts, perhaps theoretically a side issue, is practically a legitimate and necessary part of the subject. The discussion will be under these three heads.

The first of the above three topics, the possible effect of the motion of the air on the acoustical property of a room, is the immediate subject.

Ventilation.—It was suggested during the planning of the Boston Symphony Hall that its acoustical properties would be greatly benefited by introducing the air for ventilation at the front and exhausting at the back, thus carrying the sound by the motion of the air the length of the room. The same suggestion has been made to the writer by others in regard to other buildings, but this case will serve as sufficient example. The suggestion was unofficial and the gentleman proposing it accompanied it by a section of a very different hall from the hall designed by Mr. McKim, but as this section was only a sketch and without dimensions the following calculation will be made as if the idea were to be applied to the present hall. It will be shown that the result thus to be secured, while in the right direction, is of a magnitude too small to be appreciable. To make this the more decisive we shall assume throughout the argument the most favorable conditions possible.

If a sound is produced in still air in open space it spreads in a spherical wave diminishing in intensity as it covers a greater area. The area of the surface of a sphere being proportioned to the square of its radius, the law obtains that the intensity of sound in still air is inversely proportional to the square of the distance from the source. If in a steady wind the air is moving uniformly at all altitudes, the sound still spreads spherically, but with a moving center, the whole sphere being carried along. If the air is moving toward the observer, the sound reaches him in less time than it otherwise would, therefore spread over a less spherical surface and louder. If, on the other hand, the observer is to windward, the sound has had to come against the wind, has taken a longer time to reach him, is distributed over a greater surface, and is less loud.



The three cases are represented in the accompanying diagram. The stationary source of sound being at *S*, *a* is the wave in still air arriving at both observers at the same time and with the same intensity. If the air is moving to the left, the center of the wave will be shifted by an amount *d* to the left while the wave has spread to o_1. On arrival it will have the size *b*, less than *a*, and will be louder. On the other hand, while the wave is reaching o_2, the observer to windward, the center will have been shifted to the left by an even greater amount d_2. In this case the size of the waves will be *c*, larger than *a*, and the sound will be less. The loudness of the sound in the three cases is inversely as the three surfaces *a*, *b* and *c*. If the distance of the observer from *S* is denoted by *r*, the loudness of the sound in the three cases will be as

$$\frac{1}{r},\ \frac{1}{(r-d_1)^2} \text{ and } \frac{1}{(r+d_2)^2}.$$

The above result may be expressed in the following more simple and practical form. If, in the diagram, *a* is the wave in still air, its corresponding position when of the same size and, therefore, of the same intensity in moving air will be *a'*, the movement of the air having been sufficient to carry the wave a distance *d* while it has expanded with the velocity of sound to a sphere of radius *r*. The distance *d* and the radius *r* are to each other as the velocity of wind and the velocity of sound. If the observers o_1 and o_2 move, the one away from the source and the other toward it, by a distance *d*, the sound will be of the same intensity to both as in their first positions in still air.

In order to make application of this to the particular problem in hand, we shall assume a normal air supply

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to the room for ventilation purposes of one-seventieth of a cubic meter per person per second. This, if introduced all at one end and exhausted all at the other, in a room 17.9 m high, 22.8 m broad and seating about 2,600 persons, would produce a velocity of the air of 0.09 m per second, assuming the velocity to be the same at every point of a transverse section. Leaving out of account the questionable merits of this arrangement from the ventilation standpoint, its acoustical value can be calculated readily.

The velocity of sound under normal conditions being about 340 m per second, the time required to transverse a hall 40 m long is only about one-ninth of a second. In this short interval of time the motion of the air in the room, due to the ventilation, would be sufficient to advance the sound wave only 0.01 m, or 1 cm. It would thus arrive at the back of the room as a sphere with its center 1 cm nearer than the source. That is to say, the beneficial effect of this proposed system of ventilation, greatest for the auditor on the rear seat, would to him be equivalent at the very maximum to bringing the stage into the room 1 cm further, or it would be equivalent to bringing the auditor on the rear seat forward 1 cm. This distance is so slight that without moving in his seat, in fact, without moving his shoulders, a slight inclination of the head would accomplish an equivalent gain. Thus, while the effect is in the right direction, it is of entirely imperceptible magnitude. If we take into account the sound reflected from walls and ceiling, the gain is even less.

But the suggestion which is the text of the present paper was not made by one, but by several gentlemen, and is based on the well-recognized fact that one can hear better, often very much better, with the wind than against it, and better than in still air. Therefore, the suggestion is not groundless and cannot be disposed of thus summarily, certainly not without submitting to the same calculation the out-of-door experience that gave rise to the thought.

In the nomenclature of the United States Weather Bureau a wind of from "1 to 5 miles an hour is called light, 6 to 14 miles fresh, 15 to 24 miles brisk, 25 to 37 miles high, and a wind of from 40 to 50 miles is called a gale." Taking the case of a "high wind" as a liberal example, its average velocity is about 14 m per second, or about one-twenty-fifth the velocity of sound. In such a wind the sound 1,000 m to leeward would be louder than in still air only by an amount which would be equivalent to an approach of 40 m, or 8 per cent. Similarly, to windward the sound would be less loud by an amount equivalent to increasing the distance from 1,000 to 1,040 m. This is not at all commensurate with general experience. The difference in audibility, everyone will agree, is generally greater and very much greater than this. The discrepancy, however, can be explained. The discrepancy is not between observation and theory, but between observation and a very incomplete analysis of the conditions in the out-of-door experience. Thus, the ordinary view is that one is merely hearing with or against the wind and this wind is thought of as steady and uniform. As a matter of fact, the wind is rarely steady, and particularly is it of different intensity at different altitudes. Fortunately, the out-of-door phenomenon, which in reality is very complex, has been carefully studied in connection with fog signals.

The first adequate explanation of the variation in loudness of a sound with and against the wind was by the late Sir George G. Stokes in an article "On the Effect of Wind on the Intensity of Sound" in the Report of the British Association for the Advancement of Science for 1857. The complete paper is as follows:

"The remarkable diminution in the intensity of sound, which is produced when a strong wind blows in a direction from the observer toward the source of sound, is familiar to everybody, but has not hitherto been explained, so far as the author is aware. At first sight we might be disposed to attribute it merely to the increase in the radius of the sound-wave which reaches the observer. The whole mass of air being supposed to be carried uniformly along the time which the sound would take to reach the observer, and consequently the radius of the sound-wave would be increased by the wind in the ratio of the velocity of sound to the sum of the velocities of sound and of the wind, and the intensity would be diminished in the inverse duplicate ratio. But the effect is much too great to be attributable to this cause. It would be a strong wind whose velocity was a twenty-fourth part of that of sound; yet even in this case the intensity would be diminished by only about a twelfth part.

"The first volume of the 'Annales de Chemie' (1816) contains a paper by M. Delaroche, giving the results of some experiments made on this subject. It appeared from the experiments, first, that at small distances the wind has hardly any perceptible effect, the sound being propagated almost equally well in a direction contrary to the wind and in the direction of the wind; second, that the disparity between the intensity propagated in these two directions becomes proportionally greater and greater as the distance increases; third, that sound is propagated rather better in a direction perpendicular to the wind than even in the direction of the wind. The explanation offered by the author of the present communication is as follows:

"If we imagine the whole mass of air in the neighborhood of the source of disturbance divided into horizontal strata, these strata do not move with the same velocity. The lower strata are retarded by friction against the earth and by the various obstacles they meet with; the upper by friction against the lower, and so on. Hence, the velocity increases from the ground upward, conformably with observation. This distance of velocity disturbs the spherical form of the sound-wave, tending to make it somewhat of the form of an ellipsoid, the section of which by a vertical diametral plane parallel to the direction of the wind is an ellipse meeting the ground at an obtuse angle on the side towards which the wind is blowing, and an acute angle on the opposite side.

"Now, sound tends to propagate itself in a direction perpendicular to the sound-wave; and if a portion of the wave is intercepted by an obstacle of larger size the space behind is left in a sort of sound-shadow, and the only sound there heard is what diverges from the general wave after passing the obstacle. Hence, near the earth, in a direction contrary to the wind, the sound continually tends to be propagated upwards, and consequently there is a continual tendency for an observer in that direction to be left in a sort of sound-shadow. Hence, at a sufficient distance, the sound ought to be very much enfeebled; but near the source of disturbance this cause has not yet had time to operate, and, therefore, the wind produced no sensible effect, except what arises from the augmentation in the radius of the sound-wave, and this is too small to be perceptible.

"In the contrary direction, that is, in the direction towards which the wind is blowing, the sound tends to propagate itself downwards, and to be reflected from the surface of the earth; and both the direct and reflected waves contribute to the effect perceived. The two waves assist each other so much the better, as the angle between them is less, and this angle vanishes in a direction perpendicular to the wind. Hence, in the latter direction the sound ought to be propagated a little better than even in the direction of the wind, which agrees with the experiments of M. Delaroche. Thus, the effect is referred to two known causes—the increased velocity of the air in ascending, and the diffraction of sound."

As a matter of fact, the phenomenon is much more complicated when one takes into consideration the fact that a wind is almost always of very irregular intensities at different altitudes. The phenomenon, in its most complicated form, has been investigated in connection with the subject of fog signals by Professor Osborn Reynolds and Professor Joseph Henry, but with this we are not at present concerned, for the above discussion by Professor Stokes is entirely sufficient for the problem in hand.

The essence of the above explanation is, therefore, this, that the great difference in loudness of sound with and against the wind is not due to the fact that the sound has been simply carried forward or opposed by the wind, but rather to the fact that its direction has been changed and its wave front distorted. The application of this consideration in the present architectural problem leads to the conclusion that the greatest benefit will come not from an attempt to carry the sound by the ventilating movement of the air, but by using the motion of the air to incline the wave front forward and thus direct the sound down upon the audience.

This can be done in either one of two ways, by causing the air to flow through the room from front to back, more strongly at the ceiling than at the floor, or by causing the air to flow from the back to the front, more strongly at the floor than at the ceiling. The one process carrying the upper part of the wave forward, the other retarding the lower part of the wave, will tip the wave in the same way and by an equal amount.

Again, taking an extreme case, the assumption will be made that the motion of the air is such that it is not moving at or near the floor, that it is moving with its maximum velocity at the ceiling, and that the increase in velocity is gradual from floor to ceiling. Keeping the same amount of air moving as in the preceding calculation, the velocity of the air under this arrangement would be twice as great as the average velocity at the ceiling, in the preceding case the wave was advanced one centimeter by the motion of the air while traveling the whole length of the hall. In this case, obviously, the upper part of the wave would be carried twice as far, two centimeters, and the lower part not advanced at all. This would, therefore, measure the total forward tip of the wave.

Fortunately, the acoustical value of this can be expressed in a very simple and practical manner. An inclination of the sound wave is equivalent acoustically to an equal angular inclination of the floor in the opposite direction. The height of the hall being 17.9 meters, the inclination forward of the sound wave would be 2 in 1790. The length of the hall being 40 meters, an equal inclination, and thus an equal acoustical effect would be produced by raising the rear of the floor about 5 centimeters. This considers only the sound which has come directly from the stage. It is obvious that if the reflection of the sound from the ceiling and the side walls is taken into account, the gain is even less.

It, therefore, appears that, using the motion of the air in the most advantageous way possible, the resulting improvement in the acoustical property of the hall is of an amount absolutely negligible. A negative result of this sort is perhaps not so interesting as if a positive advantage has been shown; but the problem of properly heating and ventilating a room is sufficiently difficult in itself, and the above considerations are worth while if only to free it from this additional complication.

Temperature.—The effect of raising the temperature of a room, involving as it does the contained air and all the reflecting walls and objects, is two-fold. It is not difficult to show that, whether we consider the rise in temperature of the air or the rise in temperature of the walls and other reflecting surfaces, the effect of a change of temperature between the limits which an audience can tolerate is negligible, provided the rise in temperature is uniform throughout the room.

The effect of uniformly raising the temperature of the air is to increase the velocity of propagation of sound in all directions. It is, therefore, essentially unlike the effect produced by motion of the air. In the case of a uniform motion of the air, the sound spreads spherically but with unchanged velocity, moving its center in the direction and with the velocity of the wind. Thus, when blown toward the observer, it reaches him as if coming from a nearer source. Blown away from the observer, it arrives as from a more distant source. An increasing temperature of the air increases the velocity, but does not shift the center. The sound reaches the observer coming from a source at an unchanged distance. A rise in temperature, therefore, provided it be uniform, neither increases nor decreases the apparent intensity of the sound. The intensity at all points remains wholly unaltered.

The above is on the assumption that the temperature of the air at all points is the same. If the temperature of the air is irregular, the effect of such irregularity may be pronounced; for example, let us assume a room in which the temperature of the air at the upper levels is greater than at lower levels. In order to make the case as simple as possible, let us assume that the temperature increases uniformly from the floor to the ceiling. To make the case concrete, let us assume that the hall is the same as that described above, practically rectangular, 40 x 22.8 x 17.9 meters. The velocity of the sound at the ceiling, the air being uniform, is greater than it is at the floor. In traversing the room the sound wave will thus be tipped forward. The effect is practically equivalent as before to an increased pitch of the floor or to an increased elevation of the platform. Without going into the details of this very obvious calculation, it is sufficient to say that in the case of the hall here taken as an example a difference of temperature top and bottom of 10 degrees C. would be equivalent to an increase in pitch of the floor sufficient to produce an increased elevation of the very back of 10 centimeters. A difference in temperature of 10 degrees C. is not excessive, and it is obvious that this has a greater effect than has that of the motion of the air.

In the above discussion of the effects of motion and of temperature on the acoustical quality of a room, it has been assumed that we are dealing solely with the sound which has come directly from the platform. The argument holds to a less degree for the sound reflected from the ceiling and from the walls. The above estimates, therefore, are outside estimates. The effect is on the whole certainly less. It is safe to say that the total attainable result is not worth the effort that would be involved in altering the architectural features or in compromising the engineering plans.

But, while uniform variation in the motion or in the temperature of the air in the room are on the whole negligible factors in its acoustical character, this is by no means true of irregularities in the temperature of the air, such as would be produced by a column of warm air rising from a floor inlet. That this is a practical point is shown by the testimony of Dr. David B. Reid before the Committee of the Houses of Parliament published in its Report of 1835. This committee was appointed to look into the matter of the heating, ventilation and acoustics of the houses which were being designed to replace those burned in 1832. Of the gentlemen called before the committee, Dr. Reid gave by far the best testimony, part of which was as follows:

Speaking of the hall temporarily occupied by the House of Commons, he said: "Another source of interruption which might be guarded against is the great body of air which I presume arises whenever the heating apparatus is in action below. In different buildings I have had occasion to remark that whenever the atmosphere was preserved in a state of unity as much as possible, equal in every respect, the sound was most distinctly audible; it occurred to me that when the current of hot air rises from that large apparatus in the middle of the House of Commons it would very likely interfere with the communication of sound. On inquiry, one of the gentlemen now present told me he had frequently observed it was impossible to hear individuals who were on the opposite side of this current, although those at a distance were heard distinctly where the current did not intervene." Elsewhere Dr. Reid said, "A current of hot air, rising in a broad sheet along the center of the House, reflected the sound passing from side to side and rendered the intonation indistinct. One of the members of the committee, when I explained this circumstance, stated that he had often noticed that he could not hear a member opposite him distinctly at particular times unless he shifted his seat along the bench, and on examining the place referred to, it was found that he had moved to a position where the hot air current no longer passed between him and the member speaking."

A more recent instance of this sort of difficulty was mentioned to the writer by the late Mr. W. L. B. Jenney, of Chicago, as occurring in his practice, and later was described in detail in a letter from which the following is quoted:

"The building I referred to in my conversation was a court house at Lockport. No plans exist as far as I am aware. Note the sketch I made from remembrance.

"Note the passage across the room with stove in center. As the courts were held only during winter there was invariably a fire in that stove. When I examined the room the attendant that was with me informed me that the remarks made by the judge, lawyers and witness could not be heard by the audience on the opposite side of the passageway containing the stove.

"At that time, the court room not being occupied, there was no fire in the stove and the doors were closed. I experimented; put the attendant in the judge's stand and took position at 'A'. I could hear perfectly well. I spoke to him and he replied 'Why, I can hear you perfectly well.' I reached this conclusion: That the heated air from the stove and the air supplied by the doors that were constantly fanning at each end of the passageway produced a stratum of air of different density from that of the other parts of the room, which acted like a curtain hanging between the speakers and the hearers. I made my report verbally to the committee that I left below and brought them with me to the room. The experiments were renewed and they accepted my theory. I recommended that the stove be removed and that the warm air should be let into the room from steam coils below at the end 'A' and taken out by exhaust ventilators at the end 'B'. This was done, and I was informed by the chairman of the committee that the result was very satisfactory. The other conditions of the room were quite usual—plastering on wooden lath, wooden floors, reasonable height of ceiling."

The above incidents seem to demonstrate fairly clearly that under certain circumstances abrupt irregularities in temperature may result in marked and, in general, unfavorable acoustical effects. The explanation of these effects in both cases is somewhat as follows:

Whenever sound passes from one medium to another of different density or elasticity a portion of the sound is reflected. The sound which enters the second medium is refracted. The effects observed above were due to these two phenomena, acting jointly.

The first of the two cases was under simpler conditions, and is, therefore, the easier to discuss. Essentially, it consisted of a large room with speaker and auditor facing each other at a comparatively short distance apart, but with a cylindrical column of hot air rising from a register immediately between. The voice of the speaker, striking this column of air, lost a part by reflection; a part of the sound passed on, entered the column of warm air, and came to the second surface, where a part was again reflected and the remainder went on to the auditor. Thus, the sound in traversing the column of hot air lost by reflection at two surfaces and reached the auditor diminished in intensity. It reached the auditor with diminished intensity for another reason.

The column of warm air acted like a lens. The effect of the column of air was not like that of the ordinary convex lens, which would bring the sound to a focus, but rather as a diverging lens. The effect of a convex lens would have been obtained had the column of air been colder than that of the surrounding room. Because the air was warmer, and therefore the velocity of sound through it greater, the effect was to cause the sound in passing through the cylindrical column to diverge even more rapidly and to reach the auditor very considerably diminished in intensity. Which of these two effects was the more potent in diminishing the sound, whether the loss by reflection or the loss by lens-like dispersion was the greater, could only be determined if one knew the temperature of the air in the room, in the column, and the diameter of the column. It is sufficient, perhaps, to point out on the authority of such eminent men as Dr. Reid and Mr. Jenney that the phenomenon is a real one and one to be avoided, and that the explanation is ready at hand and comparatively simple.

It is, perhaps, worth while pointing out that in both of the above cases there was a good deal of reverberation in the room, so that any considerable diminution in the intensity of the sound coming directly from the speaker to the auditor resulted in its being lost in the general reverberation. Had the same conditions as to location of speaker, auditor, column of warm air and temperature occurred out of doors or in a room of very slight reverberation the effect would have been very much less noticeable. Nevertheless, great irregularity of temperature is to be avoided, as the testimony shows.

The above also suggests another line of thought. If, instead of having a single screen of great temperature difference between speaker and auditor, there were many such differences in temperature, though slight in amount, the total effect might be great. This corresponds, in the effect produced, to what Tyndall calls a "flocculent condition of the atmosphere" in his discussion of the transmission of fog signals. Tyndall points out that if the atmosphere is in layers alternately warm and cold sound is transmitted with much more rapid diminution in intensity than when the atmosphere is of very uniform temperature. This phenomenon is, of course, much more important with such temperature differences as occur out of doors than in a room, but it suggests that, in so far as it is a perceptible effect, the temperature of a room should be homogeneous. This condition of homogeneity is best secured by that system of ventilation known as "distributed floor outlets." It has the additional merit of being, perhaps, the most efficient system of ventilation.

THE CURRENT ARCHITECTURAL PRESS

The Architectural Review, January.—It was with a feeling of incredulity that we opened the package containing the long-deferred issue of the *Review.* It seemed as though it must have been mislaid, an impression that persists when one inspects the contents, chronicling events that were timely last winter, the Philadelphia A. I. A. Banquet, the New Theater in New York, which by the way, has a reason for appearing now—that its exterior is published here for the first time since the addition of the crowning balustrade which, in a measure, overcomes the awkward roof intersections formerly in evidence from the corners of the main façade. A number of small photographic exterior views showing dwellings in Minneapolis is of no particular architectural interest, since there appears to be no reason for the selection. A Memorial Chapel at Hudson, N. H., by Herbert A. Ripley, is well presented by photographs, scale and detail drawings; a description of its construction and the materials used together with some explanatory remarks by the architect lends interest to the illustrations. The leading article on Civic Centers in America, though well illustrated by diagrams, presents nothing new, being a résumé of accomplishments in civic improvement in this country, with a list of references where more detailed discussions are to be found on the individual subjects. A house at Pitsford, Northamptonshire, England, is not unlike some of the recent American work of this class and might readily be mistaken therefor.

House built of terra cotta hollow tile blocks, with plaster finish at Orange, N. J. Dillon, McLellan & Beadle, Architects
(From *The Brickbuilder.*)

House in Radnor Township, Delaware County, Pa. Geo. Bispham, Architect
(From *The Brickbuilder.*)

Residence at Lenox, Mass. Wilson Eyre, Architect
(From *The Western Architect.*)

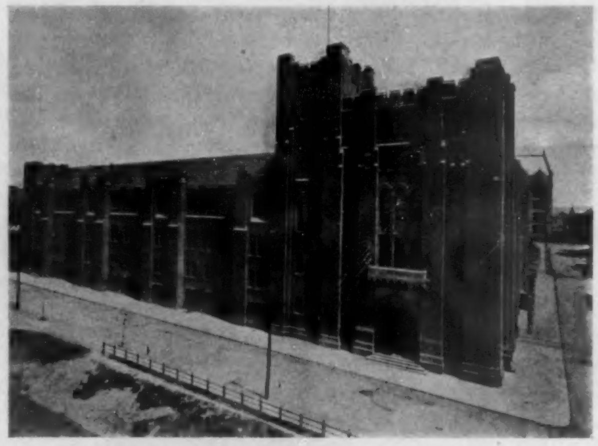
The New York Architect, June.—The prize designs of the recent Fulton Memorial Watergate Competition are shown in this issue. A number of bank and office buildings by D. H. Burnham & Co. occupying the bulk of the illustrations have, for the most part, been published elsewhere in a more comprehensive and useful manner for architectural reference. On the whole, the issue lacks interest and fails to carry conviction as to its serious purpose.

The Brickbuilder, June—Instructive and valuable to the profession is the leading article in this issue on Co-Partnership Agreements Between Architects by Judge Charles N. Goodnow, who discusses the whole matter of the business association of architects in a comprehensive technical yet not uninteresting manner, laying out a working basis for the proper formation of a partnership which architects will find of value in forming new associations or as a guidance in their conduct under an existing agreement.

A miscellaneous collection of city and country residences, some of which are familiar from previous publication, occupy the illustration pages, while a well-designed suburban house in Orange, New Jersey, illustrates, with a number of isometric constructive detail drawings, an article on the application of hollow terra cotta tile to house construction, bringing forth arguments to prove its insulating qualities and strength as compared with the cheaper frame constructions finished on the exterior with shingles, boards or stucco on metal lath.

The Western Architect, July.—There is little of interest in this issue besides an article on Workingmen's Houses in Hungary, by Robert Fleischl, one of the successful competitors in the recent competition conducted by the Hungarian Government for a model village in the suburbs of Budapest, of almost one thousand houses of various sizes to accommodate about twenty-five thousand individuals. It appears, from a comparative study of census figures of the largest European cities, from 1875 to 1900, that Budapest has grown in population faster than any of the other large centers, having multiplied itself by more than two and one-half times. Its closest competitor is St. Petersburg, which almost doubled in population during that quarter of a century. Judging from the deplorable conditions in a few of the largest American cities which have grown fast but not nearly so fast as Budapest, it is not difficult to believe that the housing conditions in the Hungarian twin-city must long since have become unspeakably bad, occasioning famine and disease with which only the government could effectively cope. What the conditions must be in St. Petersburg can only be conjectured, but they cannot be much better than the worst visual picture that could be painted of them. Perhaps the Russian Government will soon take notice, or has already done so, of what its Hungarian neighbors are doing for better housing conditions.

Residence of E. Drexel Godfrey, Esq., Oceanic, N. J. Bosworth & Holden, Architects
(From *The Architectural Record.*)



Armory, Second Battery, New York. C. C. Haight, Architect
(From *Architecture.*)

The finished houses of the model Hungarian village and their floor plans published in this article are interesting in comparison with recent English and German achievements in that field. The examples illustrated are one-story structures covering an unusual area (some of the rooms 32′ 6″ square) and are planned with few and large rooms. It is impossible to judge of the disposition of the houses or of their surroundings in the absence of a general layout of the village streets, but the cost of land and of labor and materials is low enough to permit giving the workingman a great deal in the way of a roomy home for a nominal yearly rental. The houses are built for two, three and some for four families; the two-family houses allow four rooms to each family: living room, bedroom, kitchen and storeroom, besides a small built-in porch, while those for four families provide but two rooms each with pantry

(*Continued on page 48*)

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AN article in a current issue of *The Building News* (London) on "Seaside Architecture" in England is full of meaning for American conditions. The comments on the shoddiness of construction and the lack of consistent development of the English seaside towns is equally true of our own ocean retreats on the coasts of Massachusetts, Long Island, New Jersey and California, or of the developments along the Great Lakes—notably Michigan and Erie. The first consistent effort, by any municipality, looking towards architectural comity at the seashore, is, so far as we are aware, that of the Metropolitan Parks Commission, of Boston, Mass. We cannot recall to mind an instance in which private interests in a seaside community have coöperated to achieve a coherent scheme for the general good. We can, however, record instances in which seaside resorts have been rebuilt in a more attractive, safer and more durable manner, and others, profiting by the example of conflagrations, that have built better in the first place.

The seaside continues to attract to its borders an increasing number of the wealthy and they have steadily built more permanent houses from which architectural talent has not been debarred. Most of these are, however, remote from the seaside towns and are more properly called independent estates. Probably the best, architecturally, that we have to show in the way of seaside towns are the few remaining New England fishing villages in Maine, Massachusetts, Rhode Island and Connecticut, and these owe their existence to escape from the invasion of the modern real estate speculator. The newer seaside towns that have grown up by the aid of the railroads exhibit the same somnambulistic tendencies as to general improvement as are to be found in the inland towns. While the former contain all the elements of town life these are disposed and constructed without any coherent plan. The railroad may, if business warrants it, build an attractive station and have its surroundings cleaned up, but the general appearance of the business streets of most of these towns almost discourages any attempt at improvement and the residential quarters seem to take largely after the business districts. In isolated instances model business blocks have been erected and found to be good investments in the same way that the small number of more permanent seashore hotels erected during the past five years have proved profitable. More substantial and fire-resisting construction, by the sea, for our vacation homes, hotels and the like will be followed by a greater need for architectural services.

THE wide circulation by the government of information on building matters, such as is contained in a pamphlet published recently by the Department of Agriculture, is a public benefit as well as of the greatest value for the building trades and for the campaign for a higher grade of building construction. The matter in question is a bulletin to farmers instructing them in the application of cement to making concrete fence posts. The matter is clearly presented and in terms to be understood by anyone who has a business to build. The composition of concrete is discussed and the properties of its ingredients are briefly though thoroughly explained. Instruction is given also in the handling of the material in the molds of which cuts are shown of several different kinds as required by the particular job. Statistics show that the American farmer is beginning to be a factor in the development of more than one industry. In fact, the increased use of cement during periods of normal building activity have been traced to its application on the farm in minor works such as silos, water basins, floors, fences, walls and the like. If the farmer is disposed to use permanent material in his constructions the government is exerting a wholesome influence by advising him in its use. Perhaps, when the occasion arises for him to build a new residence and farm buildings, he may desire to see the application of the new material either by itself or in combination with one of the other fire-resisting materials, allowing the architect to show him the way.

THE *Manufacturers' Record*, in a recent issue, prints letters from correspondents in fourteen Southern States, recording a large number of building operations. The present building activity in the South, it appears from these letters, is not confined to the larger cities but is well distributed through the smaller towns as well, indicating a general response to the stimulating influence imparted to that section within the last ten years.

In the new constructions the Government is, of course, largely represented, as revived business in the South has meant for its states and municipalities more business and, therefore, larger and more modern buildings in which to transact it. Under the efficient direction of the supervising architect these buildings are setting a standard of taste which is materially assisting the educational campaign of the local architects.

Chapel at Hudson, N. Y. Hubert G. Ripley, Architect
(From *The Architectural Review.*)

(*Continued from page 46*)

or store-room. The construction is of brick, finished in stucco with low overhanging, picturesque roofs covered with tile. Special attention is paid to cemented sanitary toilets in the yards and the sanitary disposal of garbage; bath-tubs do not appear on the plans.

A number of current buildings are shown in the illustration form, among which the most worthy of note are a country house at Lenox, Mass., by Wilson Eyre; one by Jas. Gamble Rogers in Cincinnati, of good proportions but possessing little apparent fitness to its surroundings or charm of handling, and several semi-commercial brick buildings and an Elks' building in San Francisco, in which the forms of the local mission work are forced into the company of the Roman orders with not too pleasing a result.

The Architectural Record, August—This, the mid-summer issue of the *Record,* consisting of a collection of country houses, is entitled Seaside Number, and appears under a specially designed cover. The contents fail to live up to the expectations raised by its title and its external appearance. The selection of its illustrations is disappointing, a number of the houses being familiar both by reason of previous publication elsewhere and by republication in its own pages. The reader cannot, of course, reasonably find fault with the republication of a subject in an architectural journal or even of the identical view or views, but when there seems no better reason for "twice telling a tale" than the mere necessity of saying *something* objection, by the reader, would seem valid.

The new houses illustrated, several of which are of considerable architectural interest, suffer in presentation by reason of uninteresting points of view and because of the absence of floor plans.

The text, which purports to be an exposition of "Present-Day Conditions and Influences Illustrated with Representative Examples of the Type" of American Seaside Homes, says little that has not already been better presented in the architectural journals.

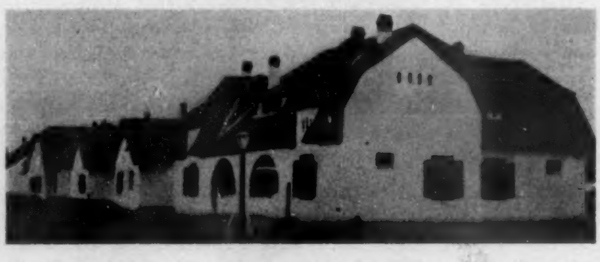
Architecture, July.—A varied and not uninteresting collection of current work is presented in this number. The most important works from the architect's stand-point, the Post Headquarters and the Gymnasium of the New West Point layout and the new armory of the Second Battery, Field Artillery, N. G. N. Y., are, unfortunately, inadequately illustrated, there being neither floor plans nor sufficient photographic views to convey a fair idea of the buildings to one who has not seen them. The technical publisher who makes a special effort to be timely in illustrating important buildings often has serious obstacles to overcome, which results in an inferior presentation, but, of course, he must pocket the profits of timeliness and bear the consequences of indifference often accompanying his efforts.

The open-stair tenements, by Henry Atterbury Smith, in New York, that is, tenements in which the public stairs communicate directly with the open air on the court, appear again in this issue with a later plan in which the stair runs are differently placed, but not as advantageously, it would seem, as in the earlier plan now being executed for Mrs. W. K. Vanderbilt, Sr., and published in THE AMERICAN ARCHITECT some months ago. It appears from a close inspection of this later plan that an economy of space has been effected, but four tiers of bath rooms would depend for their ventilation entirely on the vent shaft, as required by law, and against which the architect is conducting his campaign; while in the earlier plan above referred to the area given to the shaft could be thrown into the apartments in the event of a modification of the building law eliminating the shaft, without radical change of structural walls, in the later plan little useful space would be gained in the apartments by sacrificing the shaft. These new tenements are to be built on the upper east side of Manhattan and present an exterior treatment much more in keeping with their purpose than Mr. Smith's former designs for tenements and are, undoubtedly, a step in the right direction. The campaign for better tenements being carried on by a number of public-spirited architects will gain in popularity and force by the most careful consideration of economy and attractiveness of exterior treatment.

The Pilgrim Monument

The Pilgrim Monument, erected at Provincetown, Mass., to commemorate the landing of the *Mayflower,* was dedicated on August 8.

The shaft springs from a crest of a mound 95 feet high, and is 254 feet in height. It is said to be the second largest shaft of solid construction in the United States.



Two and Three-Room Houses, Employees' Residence District, Kispesti, Hungary. Robert Fleischl, Architect
(From *The Western Architect.*)

The construction of this house is of stucco on wire lath, with a shingled roof. The interior trim is of white wood, enameled white and tinted. Floors are of oak. The bathrooms and vestibules have tiled floors. It is heated by a direct hot-water heater, and is piped and wired for gas and electricity.

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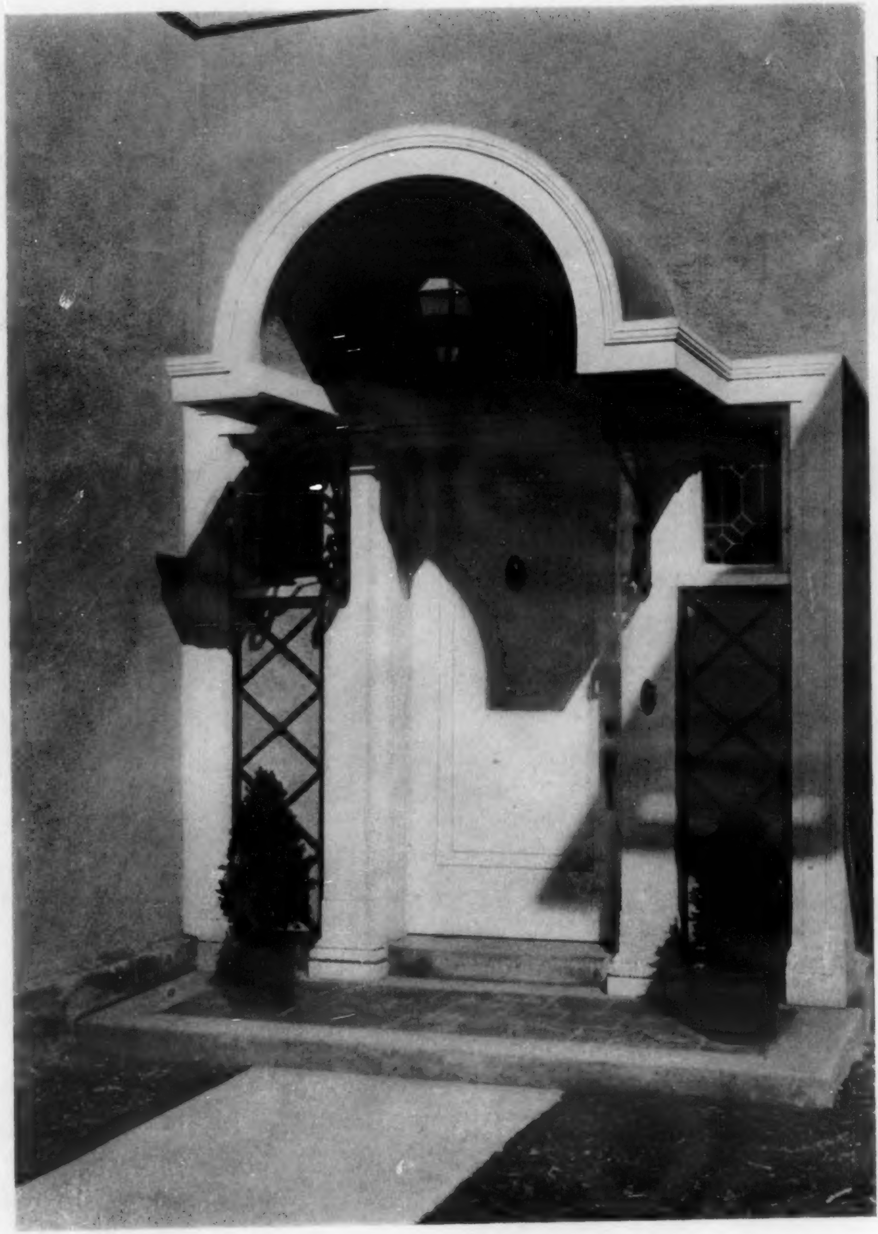
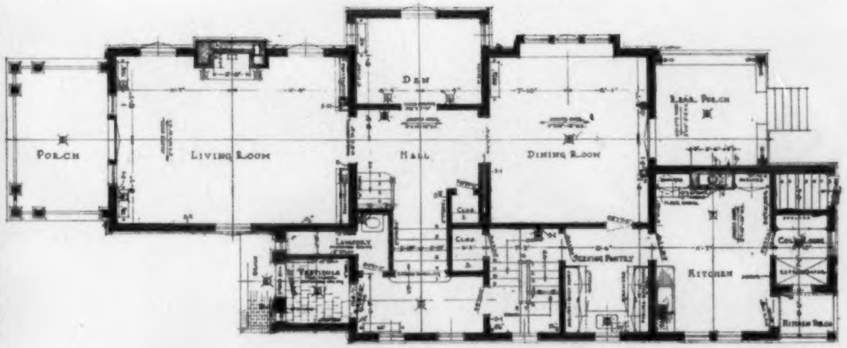
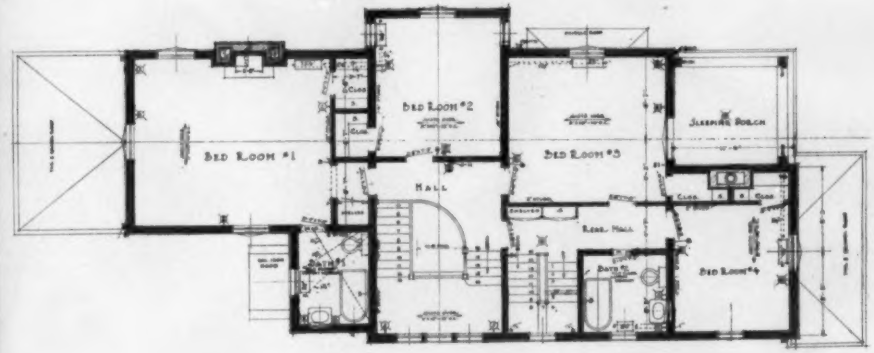
HOUSE OF C. E. MICKLER, ESQ.
BUFFALO, N. Y.

GREEN & WICKS
ARCHITECTS







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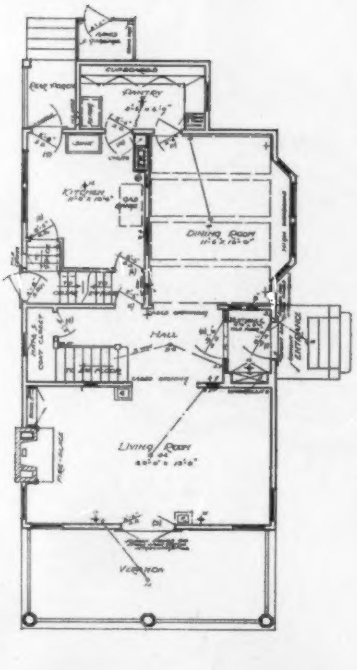

RESIDENCE OF MR. S. B. SOLOMON
CALUMET STREET, ROCHESTER, N. Y.

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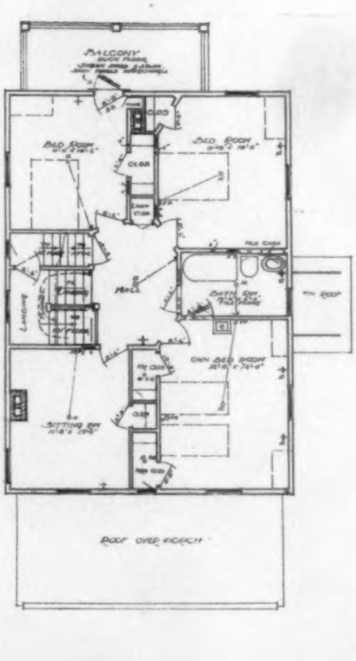

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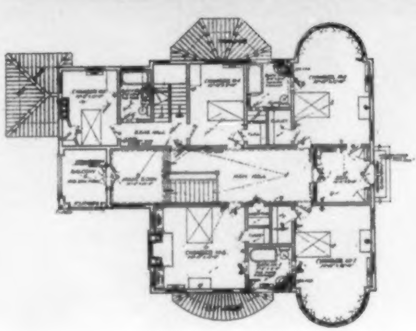

RESIDENCE OF MR. CHARLES STERN
ROCHESTER, N. Y.

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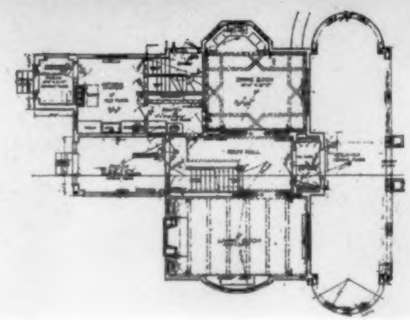

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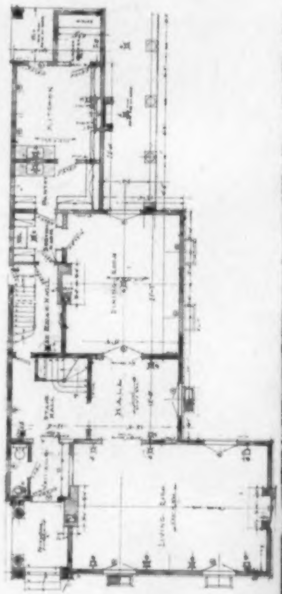
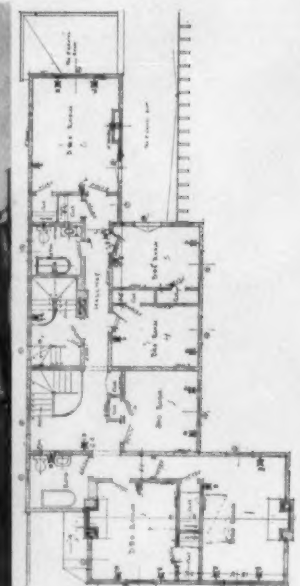


HOUSE OF

E. B. GREEN, ESQ.

BUFFALO, N. Y.

The exterior of this house is white marble rough-cast, with white cement. The roof is of purple slate. The interior trim is white wood, enameled a flat white. The halls and staircases are of white wood, with mahogany rails. The floors are of oak. House is heated by a hot-air furnace, and is wired and piped for electricity and gas.



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GREEN & WICKS
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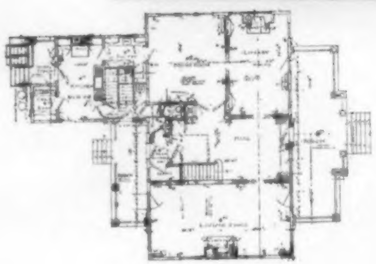
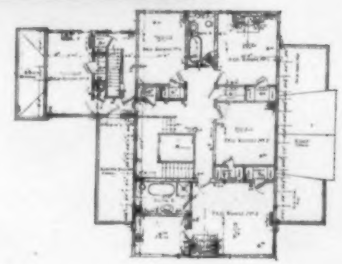


This house is of non-fireproof construction, shingled. The shingles are stained a dark green, and the trim a flat white. The interior trim is birch, redwood, oak and yellow pine. The floors are 13/16 x 2" white oak. It is heated by a one-pipe, gravity steam heater, has electric light installation and is also piped for future installation of a vacuum cleaner. The cost per square foot, complete, was $8.66.

HOUSE OF MR. JOHN T. SHANAHAN
BUFFALO, N. Y.

McCREARY, WOOD & BRADNEY
ARCHITECTS



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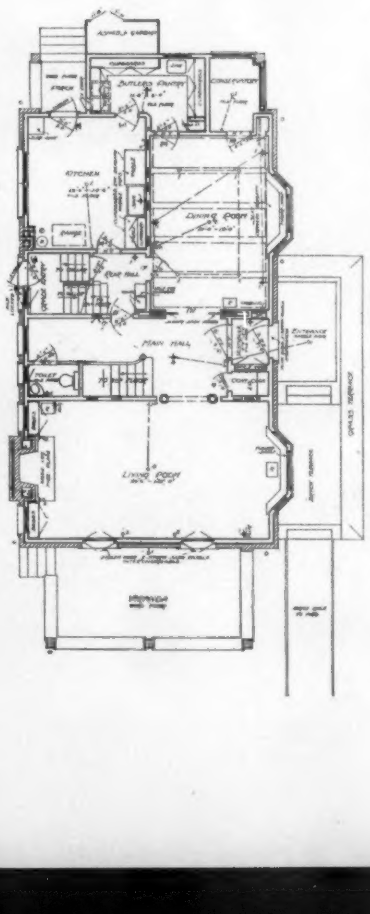
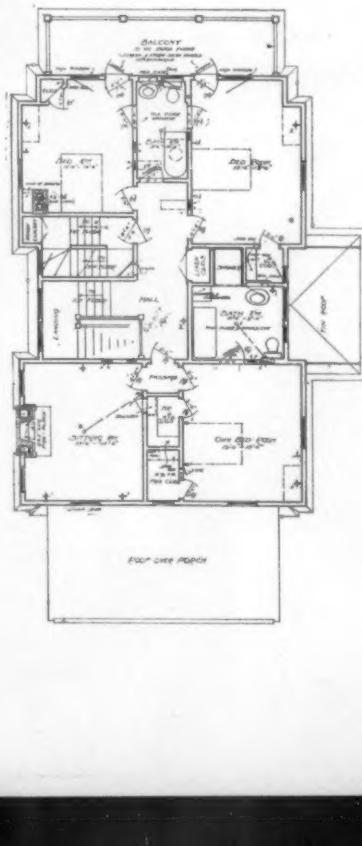


The exterior of this house is of red brick veneer and stucco on metal lath. The trim is of St. Lawrence marble, and the roof of Bangor slate. The interior trim is of specially selected woods. The dining room has a paneled wainscot with a beam ceiling. The porch has a tiled floor, and the vestibule, kitchen, pantry and bath room floors are of ceramic tile. House is heated by a hot air furnace, and has combination gas and electric fixtures.

RESIDENCE OF MR. LOUIS BLACK
CULVER ROAD, ROCHESTER, N. Y.

FOOTE & HEADLEY
ARCHITECTS



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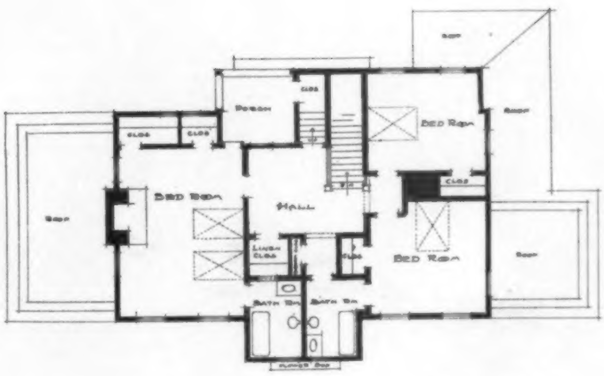

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WESTOVER ROAD, VERONA, N. J.

DUDLEY S. VAN ANTWERP, ARCHITECT
HILDA FENN VAN ANTWERP, ASSOCIATE