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THE Thirtieth Annual Convention of the American Institute of Architects will meet in the rooms of the Engineering Association of the South, at Nashville, Tennessee, on Tuesday, October 20, at 10 o'clock A. M. The programme for the proceedings is a particularly interesting one, including the report of the Legislative Committee on Government Architecture, that of the Committee on a National Building for the Institute, and a discussion on the Influence of Steel Construction, and of Plate Glass, on the Development of Modern Style, which is to be introduced by the reading of papers on the subject, prepared by Professors Osborne and Ricker, and Messrs. Andrews, Yost, Adler and Newton. Mr. Aiken is also to read a paper on National Architecture, which is likely to be of special interest under present circumstances. The Engineering Association of the South has appointed a Committee to assist the Institute Committee of Arrangements in entertaining the members of the Convention, and similar Committees have been delegated for the same purpose by the City Council, the Chamber of Commerce, the Directors of the Centennial Exposition, and the local architects, so that the comfort and pleasure of persons attending the Convention seems to be assured. A special train will leave New York for Nashville at 5 P. M. on Sunday, October 18, by the Royal Blue Line, from the station of the Central Railroad of New Jersey, reaching Nashville at 6.25 A. M. on Tuesday. On the return trip, the train will leave Nashville at 9.15 A. M. on Friday, and reach Chattanooga at 2.40 P. M. The afternoon will be occupied in visiting Chattanooga and the Chickamauga battlefield, and the night will be spent on Lookout Mountain. The next morning, Saturday, the party will leave Chattanooga at 7.30 A. M., and arrive at New York at 12.50 P. M. on Sunday. The single fare from New York to Nashville is $25.65, and sleeping-car ticket $6 extra. It is hoped that arrangements can be made for securing return tickets at one-third the regular rate, which would make the total fare both ways, including sleeping-car tickets, $46.22. The trip can also be made from New York partly by the steamers of the Old Dominion Line, leaving New York at 3 P. M. on Friday, October 16, for Portsmouth, and thence by rail, via Atlanta, to Nashville. If fifteen or twenty persons should choose this route, the fare for the round trip would be $42.75.

THERE are some things which we do better than our English cousins, and one of these is certainly the management of fire-extinguishing appliances. One evening, a few weeks ago, fire broke out in a hardware store on the principal street of Ilfracombe, a fashionable watering-place in Devonshire. An attempt was made to ring in an alarm, but the electrical signal system was "out of order," and refused to respond. After some time had been spent in ineffectual struggles with the electrical apparatus, some one was sent to ring a big bell in the neighborhood. This called the attention of the citizens, and, incidentally, of the members of the fire-brigade, who got together and brought the engines to the spot. It was then discovered that there was no water in the hydrants, and it turned out that the town council, with the laudable purpose of reducing expenses, had, two days before, given orders that the water should be shut off from the hydrants at night. The town magnates were then hunted up, and an order obtained to have the water turned on for this special occasion. Meanwhile, the fire had spread across the street, and, notwithstanding the fact that it rains nearly every day in Devonshire, and that everything is saturated with moisture, was making excellent headway toward the entire destruction of the town. After the water was turned on to the hydrants, there was another disappointment, as no result followed the opening of the valves. Then some one recollected that repairs were to be made in the pipe system, and that the town engineer had directed that the water should be shut off that night at the waterworks, a mile and a half away. There was no telephone, telegraph or other means of signalling to the waterworks, so a messenger was sent to make personal application to the engineer. On his arrival, some time later, the engineer, after hearing his story, ordered the gate to be opened, and in due course the water reached the hydrants, and was conveyed by the engines to the fire; but not until half a million dollars' worth of property had been consumed.

AN extraordinary sort of fireproof lathing has been introduced into Germany, consisting, essentially, of little cross-shaped bits of terra-cotta, strung on wires, which pass through them in two directions, at right angles with each other. One would think that such a combination would be expensive, but it is claimed to be cheaper in use than ordinary wire lathing, inasmuch as the terra-cotta crosses take the place of a large part of the plastering mortar. The mortar is said to adhere very strongly to the terra-cotta, in addition to the excellent clinch afforded by the network, and, of course, the fireproof qualities of the material are nearly perfect. The crosses are stamped out of clay, and are, presumably, strung on the wires by machinery. It is sold, in rolls, one metre wide, and five metres long, containing thus nearly six square yards, at three marks and a half, or eighty-four cents. This is quite as cheap as plain wire lathing, to say nothing of the saving of mortar by its use, and the application of the new lathing seems to be even easier than that of ordinary wire lathing, as it gives a good clinch when nailed directly to boarding or timbers, without furring. The German manufacturers are Herren P. Stauss & H. Ruff, Cottbus, Germany. They advertise that their foreign patents are for sale, and it would certainly be desirable to have so promising a material put into the hands of a public so much interested in fireproof construction as that of the United States.

MR. J. D. LYMAN, of Exeter, N. H., is a practical grower of trees, who adds to his long experience a deep conviction of the importance of tree-cultivation as a branch of industry. In 1870, he bought a deserted farm, about forty miles from Exeter. On this farm was a little grove of pines, covering about two-thirds of an acre. Taken by itself, this grove, as he says, at the time of his purchase of the farm would not have sold for much, if any, over one dollar, and perhaps would not have brought more than fifty cents. He found a man living in the neighborhood, who was glad to thin out the trees according to his directions, receiving, as pay for his work, the thinnings, out of which he made stakes, kindling-wood, and some top-poles for fencing. Some six years later, the grove was thinned again in the same manner; and, since then, irregular thinnings have been made, and the trees have been unsystematically pruned. At present, there are one hundred and forty-six trees in the grove. Most of these were twenty-five or thirty years old when the lot was bought, so that they are now from fifty to fifty-five years old, and the cost of the entire grove now amounts to about one dollar, with twenty-six years' interest, and the cost of pruning, which has been, including interest, about two dollars more. Allowing something for the value of the land after clearing away the trees, the total cost of the grove, including interest and taxes, and expenses of cultivation, would probably be less than five dollars. To test the results of his experiment so far, Mr. Lyman had one of the largest and one of the smallest trees in the grove cut, and sawed into inch boards. These two, which he considered to represent a fair average for the whole grove, produced five hundred feet of boards, of a quality much superior to the box-boards commonly made out of second-growth pine. If the trees should be left to grow twenty-five years longer, they would increase in size, and the lumber would be clearer and more valuable, but if the grove should be cut down now, its product would be at least thirty-three thousand feet of lumber, worth probably, on the stump, not less than one hundred and fifty dollars, or more than thirty times the total cost of the grove, including interest and taxes. A revenue of one hundred and twenty per cent per annum on an investment which cannot be lost or depreciate is worth waiting for; and Mr. Lyman's figures are, probably, less favorable than the reality. For a rough estimate, he thinks that an acre of ordinary poor New England land may be depended upon to produce as many thousand feet of pine lumber to the acre as the average age of the trees in years; so that his grove, twenty-five years hence, would be worth two hundred and fifty dollars; or, as the quality of the timber improves with age, perhaps three hundred dollars, instead of one hundred and fifty; and, in the meantime, the pruning and thinning would have furnished kindling, fencing and other material to a very large amount. Poor as the New England farmer thinks himself, there is not a silver mine, or commercial enterprise, or banking business in the United States, which will yield such enormous returns on a small investment of capital as a piece of forest land intelligently treated; yet there are, in the State of New York alone, eight hundred and sixty thousand acres of "waste land," bringing to their owners nothing but taxes and loss of interest, which, if planted, and treated with even the small amount of care that Mr. Lyman bestowed on his grove, would, by the time that the great-grandsons of the present proprietors had attained their majority, be covered with timber worth at least two hundred and fifty million dollars, while the land, enriched by the decaying leaves, would be worth, after the timber was cut away, far more than it is now. This land, like many thousands of acres of better land in Massachusetts, already covered with forest, could probably be bought for something like twenty-five cents an acre, so that an investment of a thousand dollars now would grow to at least a million before the grandchildren of the investor had become too old to enjoy their wealth.

IN regard to the details of American steam-heating, the *Builder* presents, in a recent article, some queer ideas. It supposes, apparently, that American architects know little or nothing about hot-water heating, and says that steam is preferred here because "the architects rely upon the tradesmen for details, and these latter prefer steam because it is easier to plan and set up a steam-heating apparatus which will work than to do the same with a hot-water apparatus." "Add to this," it says, "that steam-boilers and fittings, in a country which is the paradise of machinery, can be readily obtained, that the plant for a steam-heating apparatus is cheaper than for a hot-water one, and that it is easier to 'scamp' work with steam than with hot water, and quite sufficient reasons exist for the tradesmen's preference." The idea that American architects leave it to the "tradesmen" to say whether their buildings shall be heated by steam or hot water will astound the profession in this country, while the notion that the "tradesmen," thus empowered to make the choice, choose steam because it is easier to "scamp" a steam apparatus than one for hot water, is not less complimentary to the heating contractors of the United States. The fact is, that hot-water is used for warming private houses in America to a very large extent, and the reason why American architects do not usually favor it for public buildings is not that they are unaware of its easier regulation, its economy of coal, or its other advantages, of which the *Builder* speaks, but that a sudden frost, in a building which is not continuously warmed, may do many thousand dollars' worth of damage by freezing and bursting the pipes and radiators. When such accidents, which occur frequently enough to put architects on their guard, are not to be feared, hot-water heating is used in America, in many instances, on a very large scale. We have in sight from where we are writing two office-buildings, each containing twelve stories of rentable space, both of which are warmed by hot water, and hot-water heating is used in perhaps most of the modern public libraries in the States, and in many school-houses and churches. It may be interesting to English architects to know that in some instances the hot water for warming these buildings is heated by exhaust steam from the engines. The *Builder* seems to have a rather cloudy idea of the use of exhaust steam for heating. The grease-trap, which is generally employed, where the exhaust steam is used for heating, and the condensed water returned to the boiler, to prevent corrosion of the boiler from the products of decomposition of the grease brought back in the return-pipes from the radiators, it imagines to be a device for preventing oil from being carried into the radiators, and says that if this accident should happen, the heating capacity of the radiating surfaces would be "materially interfered with." This idea will amuse the "tradesmen" in this country, of whose honesty the *Builder* has so low an opinion; for all pipes and fittings are liberally oiled in threading, and are put together with oil and lead, and, in general, shine with grease; so that, in point of fact, it is the oil which is brought back in the return-pipes which forms the most serious trouble in heating by exhaust steam. From this trouble the comparatively new method of heating by means of water, which is itself warmed by the exhaust steam, gives a means of escape. The water is heated in a tank, by a coil of pipe, through which the exhaust steam passes, either escaping from the end of the coil into the atmosphere, or being condensed and returned to the boiler, according to circumstances. As the coil in the heating-tank, surrounded by the water to be warmed, acts as a surface condenser, and the distance through which the exhaust steam must be forced is very small, there is practically no back-pressure on the engine, and, as the exhaust steam does not pass through the radiators, there is no trouble with grease from this source in the condensed water returned to the boiler; while the temperature of the water can be accurately, and even automatically, adjusted, by means of a by-pass valve allowing a larger or smaller proportion of the exhaust steam to escape without circulating through the heating coil.

MOST architects and engineers have either used or seen the instrument known as Amsler's planimeter, with which, by tracing on a map, at any scale, the outline of a pond, or a tract of land, of any shape, the number of square feet contained in the area can be read on an index dial attached to the instrument. This planimeter, which makes its calculations by means of gearing which combines the polar coördinates of each portion of the outline, is, naturally, an expensive affair, but a tolerable substitute has been invented for it, the simplicity and cheapness of which are only equalled by its ingenuity. The description of the new "Axe-Planimeter," which is the invention of Captain Prytz, of the General Staff of the Danish Army, is very brief. It consists of a stout iron wire, about a foot long, turned down at each end. One end is sharpened to a point, while the other is flattened, in the plane of the length of the rod, and sharpened to a curved edge, like that of an axe. In use, the instrument is held approximately in a vertical plane, with the pointed end on the map, and the axe end on a blank piece of paper. The outline of the tract to be measured is then traced by the point, the sharp edge of the axe moving at the same time over the record-paper. When the tracing is complete, the instrument is laid aside, and the distance between the beginning and the end of the scratch made on the record-paper by the axe edge is measured along the scratch. This distance, taken at the scale of the map, multiplied by the length of the instrument, will give the area of the tract measured. At first sight, the idea of obtaining even approximate planimetric measurements by such rude means seems preposterous; but it is not so much so as would appear. It is evident that the sharp edge of the axe can move only in a direction parallel with that of the instrument. Hence, the line described by the edge consists of zigzags, the length of which depends directly on the contour of the area to be traced, while the angles between the lines of the zigzag depend upon the relation of the length of the instrument to the contour to be traced. In this way all the elements of the contour, however complex this may be, enter into the final result, the simplicity of which is by no means due to the simplicity of the mathematical operations involved. As the zigzag lines of the scratch made by the axe are measured as straight lines, while they are really slightly curved at the ends, there is a small error in the result; but, with care to keep the map and the record-paper in the same plane, and not try to measure areas of a diameter greater than half the length of the instrument, except by subdividing them, the approximation to the true area is very close.

STABLES. — I.

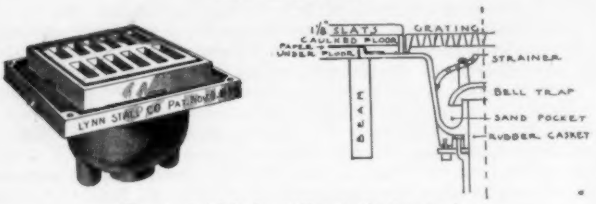


Fig. 1. Catch-basin and Trap for Carriage-wash.

THE problems involved in the construction of a stable are neither extended nor complicated and are more matters of detail than of general arrangement. In the large stables intended to accommodate one hundred horses or more, there are no complicated conditions whatever and the planning is of the simplest sort. In the smaller stables there are a few general considerations which have to be borne in mind, though these are usually modified by fixed relations to existing structures or to the locality.

The architect has but little control over the placing of a stable, as usually there is but one portion of a lot or estate where it can be placed to advantage. In general, however, it is best to have the exposure such that the stalls and the paddock will be on the side towards the sun and away from the residence, while the man's room and the harness-room should by preference be towards the main house and, if possible, the stable should be to leeward of the house, measured by the prevailing summer winds. Small stables ought never to be tolerated in a closely built-up section of a city, and where such do exist, the conditions are so unfavorable that they need hardly be studied as types. The ordinary private stable can generally be placed at sufficient distance from the house to be unobjectionable, and consequently the arrangement is substantially the same for stables either in the suburbs or in the country. Stables are usually built of wood, without a cellar, and are supported either upon brick piers or cedar posts. The only advantage of a cellar is that of making the superstructure a little dryer and less affected by extremes of cold; but unless the nature of the ground is such that it can be entered directly from the rear without going down steps, the building would be, on the whole, better without it, as a cellar produces complications of drainage and provides a place in which rubbish and filth are apt to accumulate, while it offers few tangible advantages.

It is a common mistake to build a stable too low. The main story should not be less than 11 feet in the clear height, and the front door, which should be hung on the inside rather than on the out, should extend to within 6 inches of the ceiling and be not less than 10 feet wide. As commonly arranged, a gable is built over the main entrance, with a door surmounted by a ring to permit of a snatch-block being suspended to hoist bags of grain and bales of hay into the loft from a loaded wagon which would be standing underneath in the doorway. A better arrangement is to leave a large trap in the loft floor and build a ring in the roof timbers immediately overhead, so the loaded wagon can drive wholly into the barn and rest on the level surface while the grain or hay is being hoisted to the loft.

A stable of the ordinary type comprises four distinct parts, namely: a carriage-room entered directly from out-of-doors, wherein the teams are harnessed or hitched and carriages washed and put away; a harness-room, where harnesses are hung and cleaned; a stall-room, where horses sleep, feed and are groomed; and a loft, for storing fodder, a portion of the loft usually being partitioned off as a man's room.

A statement of the various items to be considered in connection with each portion of the stable is as follows:

Carriage-room.

Strength of floor.	Sponge-rack.
Construction of floor.	Chamois-holder and wringer.
Area.	Overhead hitch.
Disposition.	Whip-tree.
Heat.	Blanket-bars.
Wheel-guards.	Carriage-pole hooks.
Carriage-wash.	Cupboard.
Trough.	Finish.
Hose-rack.	Hardware.
Hot water.	

Harness-room.

Disposition.	Saddle-hooks.
Cases.	Sink and hook and grip for cleaning harness.
Drawers and bit-case.	Stove.
Harness-hooks.	

Stall-room.

Disposition.	Light.
Floor.	Heat.
Sizes.	Windows.
Arrangement and sizes of stalls.	Hay feed.
Varieties of stalls.	Grain-chutes.
Box-stall.	Blanket-bars.
Mangers.	Sponge-rack.
Ironwork.	Implement-holder.
Hitchings.	Medicine-box.
Cribbing.	Finish.
Gutters.	Paddock.
Drains.	Drying bedding.
Ventilation.	Manure-box.

Loft.

Double floor.	Hoist.
Stairs.	Blanket-bars.
Dimensions.	Man's room.
Bins.	

All the foregoing have to be considered in the construction of even the simplest stable and they are all essential to a well-ordered arrangement.

Carriage-room. — The Boston building-laws prescribe a strength of 70 pounds per foot for stable floors. This is hardly sufficient to give the desired stiffness. 2" x 12" spruce beams spaced 12" on centres with bearings of about 16 feet would give a construction which would theoretically be in excess of the needed resistance, but the price of the extra lumber over what is strictly required by law would be so slight that the extra rigidity of the floor would more than compensate for the cost. In arranging a carriage-room, it is customary to allow for a space at least 10 feet wide across one side leading from the entrance doorway at the front to the carriage-wash at the rear, this space being left for driving in, hitching, etc., space for storage of carriages being provided at one side. 7' x 14' is enough to allow for each carriage; so that to accommodate four carriages the room should have an area of about 28' x 24'. This is a minimum; 12 feet for driving in and 16 to 18 feet for carriages is better, making the carriage-room 28' x 30'. This space should be entirely unobstructed by posts, the loft above being trussed in the roof through the centre. A moderate amount of heat should be supplied for a room of this size. Hot-water circulation from the heater in the harness-room is usually the most convenient source of supply, and if the required heat is no more than sufficient to prevent the water from freezing, a heating surface of 30 or 40 square feet would accomplish this purpose in our climate. It is, however, often desirable to keep the carriage-room comfortable in extreme weather, in which case there should be not less than 100 feet of surface. This is a matter of convenience and comfort, however, rather than necessity. For light, a single gas or electric bracket over the water-trough is sufficient.

A cast or wrought iron guard should be placed at each side of the front door. In its simplest form this consists of a piece of 2½" steam-pipe bent in a quadrant to a radius of 8 inches, with flanges at each end screwed to the door-sill and jamb. If the stable is at all likely to be entered by heavy teams it is well, also, to screw a 6-foot length of 3" x 3" x ⅜" angle-iron to the outer edges of the door-jambs. Wheel-guards consisting of a 2" x 4" strip, planed, should be nailed to the floor around the three sides of the storage-space at a distance of 8 inches from the wall to prevent the carriage hubs from scratching the sheathing.

The main floor of the stable is usually laid with an ordinary upper and under floor, the upper floor being matched and of hard pine where expense need not be considered, though a good spruce floor will answer every purpose.

If the framing of the floor is quite light, the timbers of the carriage-wash will have to be framed below the main timbers and then furred up so that the finished floor shall pitch 2 inches all around towards the centre. If 2" x 12" beams are used, however, they can be cut down 2 inches without materially impairing their stiffness. There are several methods of laying a floor for a carriage-wash. The simplest is to carry upper and under floor boards straight across the wash without any butt joints, springing the boards to fit the pitches of the wash, and putting a strainer and bell-trap at the centre connected with the drain from trough either to a cesspool or the drain to sewer. If there is a cellar under the stable, however, this floor would have to be made water-tight, in which case a ⅞" matched spruce floor is first laid, mitred at the corners to fit the slopes of the wash. This is then covered with two thicknesses of tarred paper, and mopped with hot tar, and a flooring of 1⅛" square-edged pine is laid with ⅜" open joints running towards the centre, caulked with oakum run in hot tar or mastic composition. On top of this is laid a wearing floor of 1⅛" x 5" hard-pine strips laid ⅛" open with joints pitching to the centre. At the centre an iron catch-basin is set-in flush with the floor. An iron box 12 inches square and 6 inches deep, covered with a movable iron grating and with the 3" outlet carried up in the centre like a stand-pipe waste to within 1 inch of the grating, is very commonly used for this purpose, the sand from the carriage washing into the bottom of the box, while the water overflows into the waste-pipe, which should be not less than 3 inches in diameter. An improvement on this is shown by Figure 1. A wooden carriage-wash floor seems generally to be preferred on account of the better footing it affords, but a wash is often constructed of asphalt laid with a corrugated surface either over the wooden floor-beams, or, better, upon brick arches carried by iron beams. The asphalt is often laid only one inch thick. This is not enough; it should be at least two. Only the best natural-rock asphalt is suitable for this purpose, as the coal-tar products speedily wear out and do not keep tight. The size of the carriage-wash should be not less than 10' x 14', and as much larger as the conditions will admit, up to 18 or 20 feet square.

Troughs are very commonly built of 1½" pine plank with white lead in the joints, but such are not altogether satisfactory. If the wood is lined with tinned copper it is several degrees better, but there are forms of enamelled cast-iron watering-troughs made especially for stables which are very satisfactory and cost from five dollars upward. A minimum size would be 22" x 18" and 12" deep.

The trough should be so located that as the carriage is driven into the stable the horse can go directly to the trough, being at the same time as near the carriage-wash as possible, and where practicable it is well to extend the wash so as to run entirely under the trough and catch the drippings therefrom. The trough should be enamelled inside and out, should set up on legs so as to be entirely open underneath, and should be supplied with both cold and hot water, the latter being taken from the circulation-pipe of the hot-water heating-coil. The sponge-rack and chamois-holder should be immediately above the trough, and on one side there should be a space for a cupboard arranged to receive a 50′ length of hose. There should also be close at hand a cupboard of sufficient size to receive odds and ends with a number of heavy hooks, and possibly in this same closet should be placed the racks in which the whips are to hang. There are several forms of holders arranged for one, two or three blanket-bars. These should be attached to the wall convenient to the space where the horse is to be unhitched and should be as long as possible, but not less than 6 feet, so that the blankets can be spread out without folding. On one of the side walls there should be two heavy hooks to support a carriage-pole.

In the cheapest stables the wall studding and the beams are left unfinished.* If any finish is to be used, it should be of North Carolina or Georgia hard pine with three coats throughout of best spar varnish. All the hardware of every description used about the stable, rings, bolts, latches, etc., should be of bronze metal. The cost is considerably more than iron, though not a great deal more in proportion to the expense of the whole stable, and iron speedily rusts and does not give good satisfaction.

Harness-room. — A very common arrangement in stables is to have the main front door built with a wicket in it, which can be opened when the main door is closed, the harness-room in that case being entered directly from the carriage-room. A better plan is to build the main front door solid, with the harness-room so placed that it can be entered directly from out of doors. A wicket in a large door is apt to get out of order and give trouble, and there are many cases where it is desirable to enter the harness-room without necessarily going into the stable, so that on cold days the harness-room, which is always more or less warm, can be accessible without dissipating the slight amount of heat in the carriage-room. The harness-room must be entirely separated from the stall-room, otherwise the ammonia fumes from the stalls are apt to make havoc with the harness and trimmings. The size of the harness-room depends entirely on the accommodation required for harnesses, but a good minimum size would be, say, 7′ x 11′. Harness-cases should have sliding glass fronts, should be 18 inches deep inside and provided with rows of hooks not less than 8 inches apart and placed 7 feet above the bottom, which should be set up 4 inches above the floor. If saddles are to be taken care of, the cases therefor should be not less than 24 inches deep. In some portion of the harness-room there should be a chest of four drawers, each about 6 inches deep, over which there can be a bit-case about 2′ x 4′ on the face and 9 inches deep, with glass doors. Inside there should be a dozen small brass hooks.

Ordinarily the watering-trough in the carriage-room is the only source of water-supply in a stable, but where strict economy is not required it is very advisable to install in the harness-room a sink about 30″ x 48″ and, say, 12″ deep. This should be set up on legs 30″ from the floor and should have a wide drip-tray all around, being supplied with both hot and cold water. It is a very good idea to have a wooden slat cover hinged to the wall to fold down over this sink, to be used as a table when the sink is not in use. Over the sink should be a hook and grip to hold the harness while it is being cleaned, arranged so it can be raised or lowered to get at any portion of the work desired. In case such a sink is installed in the harness-room it is desirable to have, close at hand, a sponge and soap rack. In some of the more recent stables, the harness sink, etc., is placed in a separate room about 8′ x 10′, immediately adjoining the harness-room proper, which in such case is simply fitted with harness-hooks on the walls, the cases not being required. It is hardly necessary to add that the harness-room should be abundantly lighted and the walls and ceiling should be sheathed throughout, even if the sheathing is omitted everywhere else in the stable. A single drop-light in the centre serves best for artificial illumination.

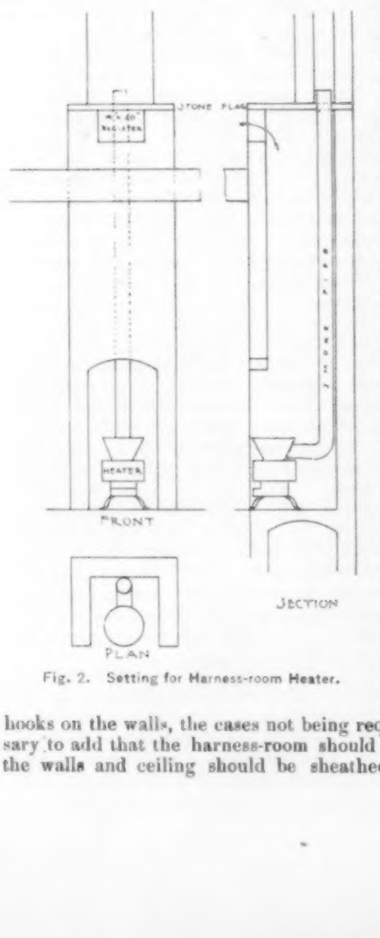


Fig. 2. Setting for Harness-room Heater.

The heater for the entire stable, unless it is a very extended structure, can be best located in the harness-room. Figure 2 shows an arrangement of heater, etc., which has been found very satisfactory in practice. The stove, or heater, is set in a recess 30 inches square, formed by 8″ brick walls on the sides and back, and open in front, the hearth also being of brick, though this need not be carried out beyond the line of the brick walls. At a height of 5 feet above the floor, the front of the recess is closed-in by an arch and the 8″ brick wall carried up on all four sides to a height of about 2 feet above the loft floor, where the space is topped off by a horizontal stone flag with a hole cut in the centre. Just below this in one side of the brickwork can be set a register. The smoke-pipe from the heater is carried up inside of the brickwork and through the stone flag above to second floor, where it terminates, the brickwork above this point being narrowed down to the dimensions of an ordinary flue and carried out through the roof. The radiation from the heater is amply sufficient to heat the harness-room and enough surplus heat goes up in the brick recess and from the smoke-pipe to supply heat for the man's room in the loft, the heat escaping through the register in the brickwork just above the floor. This arrangement is absolutely safe from any danger of conflagration, as the heater is entirely enclosed by brick and by no possibility of carelessness or accident could it set fire to the building. For an ordinary stable covering, say, 1,000 square feet, the equivalent of a No. 1 Walker-Pratt heater would be sufficient to take the chill off the carriage-room and keep the water in the trough from freezing. If desired to raise temperature up to 60 or 70 degrees in zero weather, a much larger heater would be required. The cost of a No. 1 heater installed with the necessary piping, including the branch outlets to the trough in the carriage-room and a washing-sink in harness-room would be about $125. C. H. BLACKALL.

[To be continued.]

CONSTRUCTION IN EARTHQUAKE COUNTRIES.[1]

SINCE time immemorial, buildings have been tied together with iron or with wooden rods; but some time previous to 1868, when San Francisco was shaken, a patent known as the "Foye patent" was taken out to improve the construction of sea-walls. This was made to apply to land structures. The City-hall and other buildings in San Francisco are built upon this plan, which consists in tying together the walls at each floor by transverse and fore-and-aft rods of steel or iron. A plan similar to this is that of M. J. Lescasse.[2] It has been applied to several buildings in Tokio and Yokohama.

For such earthquakes as these buildings have experienced, excepting on one occasion, when the chimneys of the German Hospital in Yokohama were more or less injured, they have stood well. This system, however, requires to be thoroughly executed; for if the rods be too few, or if the bearing-surfaces be too small, rather than support a building they accelerate its destruction, especially at the points of contact. Such buildings, partly for this reason and partly on account of their expense, are not looked upon with favor in Italy. The Ischian law specifies that if iron bands or chains are used, they must act upon a large surface.

The Tokio disturbance of June 20, 1894, which produced disastrous results amongst very many ordinary European buildings, does not appear to have produced any visible effects upon several buildings in which the Lescasse system had been adopted.

Instead of tying a building together until it may have a rigidity which may be likened to a steel box, the builder may go to the opposite extreme, giving all his connections so much freedom that each part of the structure may be capable of yielding in the same manner as a wicker basket. That temple roofs in Japan probably stand in consequence of the freedom existing between them and the supporting walls has already been pointed out, and there is no doubt that Japanese dwellings owe much of their security to the freedom with which they yield. Their weakness chiefly resides in their heavy roofs, and the reckless manner in which main supports are cut away at joints with other timbers.

After the earthquake of 1893, the visitor to the provinces of Mino and Owara saw illustrations of destructions due to the failure of vertical supports in the apparently triangularly-formed thatched roofs of the farmers' houses, which dotted the country in all directions, looking like so many huge saddles. With lighter superstructures and iron straps or sockets to take the place of many mortises and tenons, there is but little doubt but that the destruction of life and property would be mitigated.

An excellent example of a large and handsome building put up on these principles is seen in the Imperial Hotel in Tokio, which, amongst its other attractions, is advertised as being earthquake-proof. Although it would be exceedingly difficult to demolish such a structure by shaking, its easy yielding results in so much internal disfigurement by the cracks in plaster and the falling of portions of ceilings and the like, that its advantages are somewhat marred; guests may be needlessly alarmed, and the building lose its reputation.

When building to obtain rigidity, much may be done by paying

[1] Extract from a paper in the *Engineer* by John Milne, F. R. S.
[2] "*Mémoires de la Société des Ingénieurs Civils*," 1887, page 212.

attention to the floors. The beams supporting one floor should be placed at right angles to those on the floors above and below, and all should extend nearly, if not completely, through the supporting wall. Floor joists should similarly be well supported at their extremities, and, if possible, cross each other at right angles, while the flooring should be laid diagonally. Experience has shown how much destruction has been occasioned by the withdrawals of beams and joists from their supports, and both in the Ischian and Nortian edicts relating to these matters the construction of floors receives special attention.

An ordinary arch is undoubtedly stable for vertically applied forces, but for horizontal stresses it is one of the most unstable structures that could be erected; and because it has so often been the cause of ruin when shaken by an earthquake, in Italy and Manila special rules have been drawn up respecting such structures. Thus, in Manila intersecting vaults are not allowed and ordinary vaults are only permissible when strengthened in a particular manner by iron. In Liguria vaults can only be used in cellars, and even there the rise must be at least one-third of the span. The law of Norcia, also, only permits the use of arches in cellars, and their thickness and the method of construction are defined. In Ischia, archwork with a rise of one-third of the span, and with a thickness of .26 metre at the crown, may be used, but only in cellars. Speaking generally, the use of archwork above ground has been prohibited, and if it has existed after an earthquake, all Governments who have paid attention to building have ordered its removal. Underground its use is permitted, providing that the arches are not too flat. This, however, only tells us that the motion beneath the surface is too small to destroy even a bad form of structure, and, therefore, such a form of structure, providing it is underground, is allowable.

If it is a necessity that arches must exist, they should not be too flat; they should have a specified thickness, be protected by an iron or wooden beam above, and curve into their abutments. Arches which meet their abutments at an angle often show cracks at their junction, and these may have been formed by very slight shakings. Light arches connecting heavy walls, or arches for porticos, supported on one side by a building and on the other by a column, often give way. Wing walls, such as support an embankment and form an entrance to a subway beneath a railway, as usually constructed, seem to be especially weak.

In 1891, in Mino and Owari, the writer does not remember having seen a single wing wall which had not separated along a vertical line from the abutments of the bridge.

In the building regulations for Norcia and Ischia it is stated that openings should be placed vertically above each other. It appears to the writer that if we have a series of openings like doors and windows in a wall, placed vertically above each other, it is very much the same as if we had here and there built our wall with the joints of a line of bricks or stone continuously above each other — that is to say, we have destroyed the uniformity of the wall by lines of weakness which will readily give way to horizontally applied stresses.

Although the subject may not be one of great importance for ordinary dwellings, the writer inclines to the opinion that the doors and windows in successive tiers of openings ought *not* to be above each other, but so far as possible arranged that any line of openings, when regarded vertically, is as much broken as possible.

After an earthquake it certainly happens that we often meet with buildings which have been disfigured by lines of cracks running vertically downwards from window to window, these openings having performed a similar function to the perforations in a sheet of postage stamps. To arrange doors and windows so that they may form ready means of escape is certainly a matter worthy of attention. An important point mentioned in the Ischian law is the position of doors and windows relatively to the freely vibrating end of a building, the limiting distance being 1.50 metres. Similar regulations are found in the regulations for Norcia and Liguria. This distance should, if possible, be made to depend upon the materials of which a wall may be constructed, its dimensions, and the size of the openings.

A terrible destruction of life has often happened in consequence of the openings on one side of a row of houses, as, for example, in shop fronts facing a street, having been much greater than those in the opposite side. This is particularly marked in Japan, where, no matter from which side the shaking may approach, the tendency of the buildings is to yield on their weakest side and fall inwards upon the streets. If these are narrow, the débris from the two sides forms an embankment down the middle, beneath which the inhabitants seeking refuge from their houses are entombed.

In Ischia it was suggested that balconies should not project more than .60 metre beyond the wall, and should be so constructed that they formed a part of the wall. The regulations provide that cornices should not project more than .30 metre beyond a wall. From the Ligurian regulations we learn that cornices shall not project beyond the thickness of the wall to which they are attached, while roofs may not rest upon them. Stone consoles must run through the wall to which they are attached. In Manila the regulations require that the balconies rest on the prolongation of timbers of the upper floor. Otherwise a special form of construction is required. From what I saw of the balconies or upper verandas when in Manila, it appeared that many of them were without support on their outer sides. In such instances they act as loaded cantilevers, which, either for horizontal or vertical motions of the building, must cause considerable stress at their points of junction with the supporting wall. A careful examination of several hundreds of brick houses in Tokio showed that the walls were usually cracked at the points where they were entered by the beams supporting a balcony, notwithstanding the fact that the same balconies were supported along their outer face by vertical pillars rising from the ground. My own opinion is that balconies in any form are objectionable features in a building constructed to withstand earthquakes.

Walls which are run upwards beyond the height of those carrying the main roof to form gables, especially when they support a heavy coping, although not referred to in regulations, are, from the author's own observations, exceedingly objectionable features in a building, usually falling outwards to destroy and bury porticos, or whatever may be beneath them.

Staircases are also overlooked in regulations; if heavy and supported from the walls these may have the same destructive cantilever action that is found in balconies. Ceilings, we learn, should be constructed in the ordinary manner with laths and plaster. The author's own observations suggest that this is by no means sufficient. The latter should be well secured, and the plaster be especially adhesive. Heavy ornamentation should be avoided. Although persons are not likely to be killed by the coming down of a few pieces of plaster, the cracking and falling of it creates so much disfigurement and alarm, that even a building which has been constructed to be earthquake-proof may receive a bad name, and those who have a choice in the matter decline to live in the same. For a large hotel the falling of plaster may mean financial ruin.

This section, relating to the quality of materials which ought to be employed when building in earthquake countries, is one which cannot be too greatly emphasized.

All regulations relating to this matter insist that materials of good quality shall be used.

The Ischian regulations specify that for the principal framework of buildings, chestnut must be used. In all cases squared stones are to be employed. The lime must be good, and be properly slaked with fresh water. Below ground, hydraulic mortar must be used, and the sand for the mortar must be clean. These matters are treated upon in all regulations. In the regulations for Manila there are special remarks condemning the use of liquid lime, and recommending that stone walls shall be kept wet while the mortar is setting, also that there shall be a good bonding, etc.

After the disaster of 1891, the author had occasion to test the tensile strength of very many samples of masonry collected from the ruins throughout the earthquake district. In some instances the brickwork used in certain buildings was held together by a material which, although it looked like mortar, was so non-adhesive that the bricks could be easily separated by hand. The tensile strength of this material was too low to be measurable. In Tokio the writer saw a tall chimney and a wall built with what appeared to be a similar material, which were overturned by a high wind. The strength of other samples varied between three pounds and fifteen pounds per square inch. When a brickwork structure is shattered, it will be noticed that either the cementing material has yielded, that it is separated at its junction with the bricks, or the bricks themselves have fractured, from which it follows that there has been a want in uniformity of strength throughout the building.

To obtain economically the uniformity which is desirable, it would seem that the strength and adhesiveness of a cementing material should be approximately equal to the strength of the material it is intended to hold together, or, especially for the higher parts of a building, it should at least have a resistance equal to the effects of the tensile strain it is expected it may have to resist. To economize the use of cement in Japan, bricks which lock into each other have been made, while hollow bricks have been employed to avoid effects due to inertia. In the preceding sections reference has been made to the use of adhesive materials in embankments, the use of iron sockets and straps to avoid excessive cutting in timber joints, the untrustworthiness of cast-iron in columnar structures, and the effects of heavy materials for roofs. In choosing materials to resist earthquake effects, one rule is to take those which give a maximum strength with a minimum weight, and this especially for superstructures. For example, it would seem that a wall made of pumiceous scoriæ and cement would be lighter than one where the cemented basis was ordinary gravel.

The type of building most suitable for earthquake countries was discussed at considerable length by the Commission summoned after the disaster in Ischia.

The objections to iron buildings chiefly rested in their cost, the difficulty of keeping them cool, and the fact that as they were a novelty it might be difficult to get them generally accepted. The Commission, however, considered them durable and secure, and recommended that experimental buildings should be erected.

Timber buildings, although sufficiently strong and elastic to resist earthquake motion, and at the same time fairly impervious to heat, have the objection that they are not durable, and are subject to fire. These objections may to some extent be overcome by the proper application of paints, chemical preservatives, and the so-called earthquake lamps, which are put out if overturned. Mixed constructions of iron and timber were not considered to present great advantages over those wholly made of timber. Buildings may be made of iron or masonry either by covering an iron framework with stone or brick, by building an iron framework inside the masonry walls, or by filling up the spaces between a double metallic framework with hollow bricks or other materials. Such buildings, although exceedingly good from many points-of-view, have the drawback that they are exceedingly expensive.

Having considered these types, from which it will be observed ordinary buildings of brick and masonry have been excluded, the committee describe a "barrack system" of building, which is the system they particularly recommend for Ischia. Briefly, such a building consists of a timber framework well braced together, the spaces between the timbers being filled up with hollow bricks or some light material like scoriæ. The timbering is hidden by rough-cast. After the disaster in 1755 such a system was made compulsory in Portugal. A building of this type, which may be made ornamental with an outside covering of tiles, which the author, however, does not think is to be recommended, is cheap, impervious to heat, and safe against earthquakes and fires. This suggestion respecting the system of construction was adopted in the regulations issued by the Italian Government.

In the building regulations for Norcia the barrack system is the one to which preference is given. In the Manila regulations considerable latitude is allowed as to the system of construction. Stone walls are considered best, but concrete or brick are also considered good. Although timber offers great resistance to earthquakes, its destructibility by fire, white ants, ordinary rot, and its inability to exclude heat prevent its recommendation. An iron framework filled-in with concrete is spoken of with favor. In the recommendations of a committee appointed to consider building in Manila, we find that stone is recommended for the basement and for the walls of the ground floor. This, with an upper story of timber, is the type of building which is common in Manila.

The military committee which was summoned in connection with the destruction in Manila, in 1863, pointed out that destruction had occurred in all classes of buildings, but buildings with masonry supports had suffered more than others. This led them to suggest that only one kind of material should be used in constructions, and masonry supports should be avoided. Private buildings should be of wood. In all cases the limiting spans of roofs were specified, and the roofs must be light. Lieut.-Colonel Cortés, who wrote at some length on structures in earthquake countries, shows that buildings must be light as well as strong, and this may be obtained by building their parts together much in the same manner that the timbers of a ship are bound together. Foundations and walls should be continuous. Timberwork and masonry should not come in contact, otherwise they may be mutually destructive.

After criticising the system of building in Manila, and showing how it may be improved, especially with regard to balconies and roofs, Colonel Cortés proposes as a foundation a timber platform almost on the surface of the ground, from which rises a building with iron or timber framing footed on a plinth of masonry, surmounted by a light roof. The wall-framing may be filled with brick or plaster. Colonel Cortés's descriptions are accompanied by an elaborate series of illustrations.

The Californian system of construction, for which a patent has been granted, as we have said, appears to be very similar to that proposed by M. Lescasse, the essential feature in which is to tie a masonry construction together at each story by a set of iron or steel rods, which run from end to end, and from back to front in the interior of the walls of a building. There are also rods running vertically.

From South America but little information has been obtained. In Columbia the smaller houses have been built of thick adobe bricks, while the Spanish have used stone.

In Equador (Quito) occasionally a special earthquake-proof room is built, the walls of which are a wooden framework filled-in with adobe. Many houses which have adobe walls three feet thick have only one story, and there are few houses with more than one upper story.

In Venezuela, also, the houses are low. In Mexico and Bolivia the houses are solidly built; while in Lima certain buildings are constructed lightly so that they may yield.

From Guatemala (San Salvador) I received from Messrs. Clark & Co., contractors, the drawing of a house supposed to be earthquake-proof. It is of timber, well framed together, and very similar to the bungalows in Japan. These latter descriptions are particularly meagre, and for a full description of the system to which they refer it is better to refer to Vol. XIV of the "*Transactions Seis. Society of Japan.*"

If we wish to mitigate the effects of earthquakes, one general conclusion that may be drawn from what has been written is, that it is essential to select a site where we know from experience and experiment that the ground suffers but slight motion. This will generally be the hard ground, which is usually the high ground. Soft ground, slopes and scarps should be avoided. Having obtained our site, we can follow one of two general systems of construction — either to give so much rigidity to a structure that it may be likened to a steel box, or to erect a building which is light, but which has so much flexibility that it may be compared to a wicker basket — in either of these structures we ought to have lightness, especially in their upper parts.

Amongst the former class of buildings, which, from the materials of which they are constructed, are unquestionably heavy, we have ordinary structures of a stone or brick (by preference we might use hollow bricks). These should rise from a deep foundation, have a free basement, walls of unusual thickness, and be well bonded and tied together. The roofs should be light, and the precautions respecting the position and form of openings, the arrangement of floors, roof-trusses and top weight referred to in the preceding epitome carefully attended to. In this case we have a building where its strength more than outweighs the ill effects due to its weight. Such buildings are durable, relatively safe against fire; they are suitable for all climates, but they are relatively to all other buildings very expensive.

For this latter reason this type of structure can only be employed for buildings of importance.

Amongst the light buildings, which have sufficient strength and flexibility to overcome the effects due to their own inertia when shaken by an earthquake, are nearly all well-constructed structures of wood or iron. The former of these, however, is neither durable, safe against fire, nor impervious to heat and cold. These objections may, however, be practically overcome, and wooden buildings are cheap. Iron buildings are relatively expensive, and without special arrangements they are too hot in summer, and too cold in winter.

A type of building which offers the same advantages as a brick or stone structure does in relation to the danger of fire, and in being suitable for changes in temperature, but which is very much cheaper, and at the same time safe against all ordinary earthquakes, is a building constructed on the barrack system, so strongly recommended in Italy. The framing may be of wood or iron, while the filling-in material which forms the walls, which ought to be as light as possible, may consist of hollow bricks or a concrete of light material. For this latter purpose in Japan experiments might be made with a concrete made of the pumiceous light scoriæ, of which in Japan there is such an abundance. I would also call attention to the possible employment of cylindrically-formed or drain-pipe-shaped bricks, such forms being stronger than bricks of the ordinary rectangular section.

In all these buildings, whether they be of masonry, iron, wood, or built according to the barrack system, the roofs must be light, openings must be in proper positions, walls must be of moderate height, while floors, trusses, balconies and the like must be constructed in accordance with the suggestions contained in the previous epitome. Ordinary structures in bricks or stone are usually bad, while timber structures with a masonry front are worse. To resist earthquake motion we require lightness, strength, and, if possible, a certain elasticity. Weight, unless it is accompanied by great strength, should be avoided.

For buildings of importance I suggest the use of masonry. Let the buildings be placed in good situations, the brick or stonework well bonded and unusually thick, and let it rise from deep foundations. Roofs should be light. For ordinary buildings, unless the barrack system be adopted, I suggest that for a country like Japan, ordinary frame buildings continue to be used. To improve them they require more diagonal bracing, less cutting at the joints, lighter roofs and some protecting covering against fire. In carrying out these suggestions, the conclusions respecting general principles and details of construction arrived at in the preceding epitome must not be overlooked.

A type of structure, several examples of which are springing up in Tokio, and which embody several principles promising to render them less liable to destruction than ordinary dwellings, has been recently designed and patented by Mr. Inouyé, a private architect. The main feature is that of a roof, the principal rafters of which are carried downwards to a sole-plate on the ground. Rather than weakening timber by mortises and other joints, cast-iron sockets and a variety of iron straps are employed. A veranda gives the appearance of walls, and the roof, which is of wood, is covered with paint and sand. When completed these buildings have a villa-like and pleasing appearance, and in the writer's opinion will stand whilst ordinary buildings will fall.

BOOKS AND PAPERS.

We do not, in these days of complex and specialized construction, particularly favor the use of model specifications, at least for anything but ordinary dwelling-houses; but, while it is no longer prudent to use a stock form of specification, with a few interlineations to adapt it to different buildings, it has become more desirable than ever for the architect to have at hand something in the shape of a reminder, by reference to which he can fill the gaps in his first draught of a specification, and carry into more detail stipulations which are not sufficiently full. In this book,[1] the latest of any importance which has come under our observation, Mr. Bower has appreciated the conditions which his work should fulfil, and has performed a valuable service to the profession by the pains which he has taken to collect from various sources the collateral information which the modern specification-writer most needs. In fact, the collateral information is in some respects the best part, as

[1] "*Specifications: A Practical System for Writing Specifications for Buildings.*" W. Frank Bower. New York: Edward A. McLean, 14 Lafayette Place, 1896. Price, $5.

it was probably intended to be. For example, the specification for Hot-water Heating consists of twenty-two lines, exclusive of the contractor's guaranty and the references to the Steam-Heating specification; but with it is given a much larger amount of useful suggestions, which might with advantage have been still further expanded. In the same way, the Plumber's specification, which is good, though too short, is mixed with what should be the Gas-fitter's specification, in a way which is, we think, peculiar to New York, and is not particularly worthy of imitation; but some tables of weights of pipe, and suggestions of various sorts, are added on the alternate pages, which will be found very useful. As an *excursus* to the Electrical specification, which is full and good, the Standard Rules of the National Electric Light Association, adopted in 1894, are printed complete; and many quotations from the New York Building Law, and tables of weights, snow and wind-loads, strength of cement, and so on, are given in appropriate places. Mr. Bower has in these tables and elsewhere, perhaps necessarily, referred to one or two selected types of the materials mentioned, and architects of experience would, perhaps, be glad to see a more comprehensive presentation of the subject; but it would have increased materially the size of the book to give anything like a comparative description of the various available cements, varnishes, steam and hot-water boilers, etc., and the necessary information for such comparisons is easily obtained elsewhere.

MOST old architects and builders probably retain a grateful remembrance of the works of Peter Nicholson, Batty Langley, Gwilt and others, who, in the days when architects were little employed, endeavored to put into the hands of persons interested in building, some rational information in regard to the principles of design and construction. The first book of the kind that came into our own hands had, in a modest way, a rather interesting history. One of our uncles, who flourished in the middle portion of the present century, was treasurer, if we recollect rightly, of the first cotton-manufacturing corporation formed in Massachusetts. It fell to his lot to arrange for the construction of a mill for the corporation, at Lowell, and, with characteristic conscientiousness, wishing to have everything about the new building as perfect as science could make it, he sent to England for a copy of Peter Nicholson's "*Dictionary of Architecture*," in two bulky volumes, from which he sought to imbibe the information necessary for planning and supervising the work intelligently. These two volumes came, many years afterwards, into our youthful hands, and for a long time formed the basis of our professional knowledge. Now, although the modern architect laughs at Nicholson's careful copper-plate engravings of the roof-trusses of Drury Lane Theatre, and his elevations of a house in the Grecian style, it is by no means certain that his theories of proportion in panelling and fenestration, and his suggestions, borrowed from Evelyn, on the use and seasoning of timber, have not still some value; and, if modern builders would condescend to read hand-books, it is very possible that one might still be written which would tell them something that they do not already know.

Such a hand-book Herr Lothar Abel has endeavored to prepare for German builders. As he modestly says in his preface, the present is, above all, the practical age. Nevertheless, it is possible for even a practical builder to exercise a certain discrimination in the planning of his houses, and in the choice of a style for their design, and some suggestions which may aid in exercising this discrimination wisely are not amiss in a book which is devoted more particularly to details of construction.

With this idea, in connection with chapters on Foundations, Building Materials and Building Operations, Static Calculations, and Estimates, he gives an essay on House-Planning, including dwellings of different sorts, from the workingman's cottage to the nobleman's palace, including farm-houses, parsonages, country mansions and city apartment-houses; and, a little farther on, is a chapter on architectural form and proportion, as applied to the designing of openings, the arrangement of heights of stories, and decoration in general, followed by an abstract of the principal architectural styles, from the Egyptian to the modern Renaissance, which occupies sixty pages, and is illustrated by fifty-eight admirably chosen wood-cuts.

Although the whole book is characterized by the skilful condensation which only a thorough master of his subject can apply to such matters, it is in the chapters on æsthetic matters that professional readers will find this quality most striking. The chapter on Architectural Design and Proportion, for instance, is filled with rules, given, as they should be for such a purpose, without discussing their origin or propriety, some of which will, we imagine, be new, even to architects, although the author speaks of them merely as "simple and natural principles, which assist in giving a harmonious appearance to the outside of buildings, or, at least, in avoiding an air of unskilful vulgarity." Among these rules, which, by the way, are illustrated almost exclusively by French examples, we find the familiar maxim that horizontal bands make a surface look low and long, while vertical members make it appear narrow and high; followed by a rule that, in a building standing alone, no vertical wall-surface should extend in length more than three times its height, without being broken by recesses or projections. This rule, which is a novelty to us, would certainly admit of exceptions, which every architect will call to mind; but, for such structures as are designed by ordinary builders, it is likely to be of value. Speaking of fenestration, the familiar principle is given, that the openings should increase upward in size or number; but we find also an excellent suggestion, that where large openings in the first or second story are necessary, apparent solidity should be given to the lower walls in another way, by showing as deep reveals as possible.

In the chapter on Architectural History we find the same condensation. Speaking of the Romanesque style, we are told that it consists in general in semicircular groined vaults, with ribs, round-arched windows, round-arched frieze-arcades, picturesque grouping of parts, and the characteristic ornamentation, which is elsewhere described. With three or four illustrations, this gives an excellent definition of at least the German Romanesque, and there is a little further explanation of the progressive stages of the style. The Renaissance part is equally excellent, covering the field well and concisely, and architects who read German, as well as builders, will find the book, in general, interesting and valuable.

1 "*Die Praxis des Baumeisters*": Ein Hilfsbuch bei allen Bauführungen von Wohnhäusern: von Lothar Abel, Architekt: Mit 106 Abbildungen. Wein, Pest, Leipzig: A. Hartleben's Verlag, 1896. 4 marks.

SOCIETIES

MINNESOTA CHAPTER OF THE AMERICAN INSTITUTE OF ARCHITECTS.

THE annual election of officers resulted as follows: *President*, Harry W. Jones, Minneapolis; *Vice-President*, Clarence H. Johnston, St. Paul; *Secretary* and *Treasurer*, Walter S. Pardee, Minneapolis; *Director*, one year, F. A. Clarke, Minneapolis; *Director*, two years, Cass Gilbert, St. Paul.

AMERICAN INSTITUTE OF ARCHITECTS.

THE Thirtieth Annual Convention will be held in the rooms of the Engineering Association of the South, at Nashville, Tenn., on Tuesday, Wednesday and Thursday, October 20, 21 and 22, 1896.

ORDER OF PROCEEDINGS. — TUESDAY, OCTOBER 20TH.

The members of the Institute will assemble promptly at 10 o'clock, A. M., will register their names, and at 10.30 the President of the Institute, Mr. George B. Post, of New York, will call the Convention to order, and an Address of Welcome, in behalf of the citizens of Nashville, will be given, which will be responded to by the President, in behalf of the Institute, followed by his Annual Address. Mr. William C. Smith, the Chairman of the Committee of Arrangements, will make an announcement of local arrangements, and the Convention will be declared open for business, in this order:

1. Report of the Board of Directors.
2. Report of the Treasurer and appointment of the Auditing Committee.
3. Reports of Chapters, a synopsis of which will be read by the Secretary.
4. Reports of Standing Committees:
   - Committee on Foreign Correspondence, W. L. B. Jenney, *Chairman*.
   - Committee on Education, Henry Van Brunt, *Chairman*.
   - Committee on Publication and Library, Frank Miles Day, *Chairman*.
   - Committee on Conservation of Public Buildings, R. M. Upjohn, *Chairman*.
   - Committee on Building-laws, T. M. Clark, *Chairman*.
5. Consideration of the Annual Address of the President, of the Report of the Board of Directors, and of the Reports of the Chapters and Standing Committees, followed by the appointment of the Special Committees to which recommendations contained therein shall be referred.
6. Reports of Special Committees:
   - Legislative Committee on Government Architecture, George B. Post, *Chairman*.
   - Committee on National Building for the Institute, Daniel H. Burnham, *Chairman*.
   - Committee on Papers read by Messrs. Patton and Cook at the St. Louis Convention, W. W. Clay, *Chairman*.
7. Consideration of Reports of Special Committees and action thereon.
8. Consideration of proposed amendment to the By-laws.

It is proposed that the morning and afternoon sessions shall be continuous, with the exception of a recess for luncheon from 12.30 to 2 P. M. The Committee of Arrangements will make announcements before recess.

There will be a Reception complimentary to the American Institute of Architects, at 8.30 P. M., at a place to be announced by the Chairman of the Committee of Arrangements.

WEDNESDAY, OCTOBER 21ST.

1. Deferred Reports of Special Committees.
2. The Committee on Education has arranged for a series of

papers by Robert D. Andrews, F. A. I. A., Boston, Mass.; C. Francis Osborne, F. A. I. A., Ithaca, N. Y.; J. W. Yost, F. A. I. A., Columbus, Ohio; Dankmar Adler, F. A. I. A., Chicago, Ill.; N. C. Ricker, F. A. I. A., Urbana, Ill., and G. F. Newton, Boston, Mass., on "The Influence of Steel Construction and of Plate Glass on the Development of Modern Style."

It is intended that these papers shall be merely introductory to a general debate, in which it is hoped that Fellows will come prepared to participate.

3. Paper: "National Architecture," William Martin Aiken, F. A. I. A., *Supervising Architect of the United States Treasury Department.*

4. Appointing of Committees to nominate officers of the Institute for the ensuing year, and to suggest a place in which to hold the next annual convention.

5. Announcements by the Committee of Arrangements.

The morning and afternoon sessions, like those of Tuesday, will be continuous with the exception of a recess for luncheon from 12.30 to 2 P. M.

The evening is set apart for social intercourse between the visiting members of the Institute and the citizens of Nashville, the details of which will be made known by the Chairman of the Committee of Arrangements, on Wednesday, October 21st.

THURSDAY, OCTOBER 22D.

1. Reports of Committees and their consideration.
2. Mr. James B. Cook will propose to the Convention the feasibility of creating a Standing Committee on "Applied Arts and Sciences."
3. Unfinished business.
4. Election of officers, and selection of a place for the next annual convention.
5. Miscellaneous business.
6. Adjournment.

The afternoon will be reserved for a visit to the Tennessee Centennial and International Exposition Grounds, and such other places of interest as may be determined upon by the General Committee on Entertainment.

A banquet will be served at the Maxwell House, at 9 P. M., in honor of the American Institute of Architects.

ALFRED STONE, *Secretary, A. I. A.*

ILLUSTRATIONS

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

THE POSTAL-TELEGRAPH-CABLE CO.'S BUILDING, BROADWAY, NEW YORK, N. Y. MESSRS. GEO. EDW. HARDING & GOOCH, ARCHITECTS, NEW YORK, N. Y.

[Gelatine Print, issued with the International and Imperial Editions only.]

"THE CAPSTAN," FOR MESSRS. B. P. & C. P. CHENEY, MIDDLE BREWSTER'S ISLAND, BOSTON HARBOR. MR. J. A. FOX, ARCHITECT.

SKETCHES IN ECONOMY, O., BY MR. E. ELDON DEANE, NEW YORK, N. Y.

HOUSE AT CONCORD, MASS. MR. EUGENE L. CLARK, ARCHITECT, BOSTON, MASS.

HOUSE FOR MR. F. C. LIBBEY, MALDEN, MASS. MR. A. C. FERNALD, ARCHITECT, BOSTON, MASS.

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

HOUSE, NO. 4 VICOLO DEL CAMPANILE, ROME.

DETAILS OF SGRAFFITO WORK, NO. 4 VICOLO DEL CAMPANILE, ROME.

DETAILS OF SGRAFFITO WORK, NO. 4 VICOLO DEL CAMPANILE, ROME.

[**Additional Illustrations in the International Edition.**]

ENTRANCE TO THE POSTAL-TELEGRAPH-CABLE CO.'S BUILDING, BROADWAY, NEW YORK, N. Y. MESSRS. GEO. EDW. HARDING & GOOCH, ARCHITECTS, NEW YORK, N. Y.

[Gelatine Print.]

GROUP OF DWELLING-HOUSES, DRESDEN, SAXONY. HERR ERNST BECHER, ARCHITECT.

THIS illustration is copied from *Architektonische Rundschau.*

E. U. CHURCH, BATHGATE, SCOTLAND. MR. J. GRAHAM FAIRLEY, ARCHITECT.

COMPETITIVE DESIGNS FOR THE PETIT PALAIS IN THE CHAMPS ELYSÉES, PARIS, FRANCE: FIRST PRIZE, M. GIRAULT; SECOND PRIZE, MM. CASSIEN-BERNARD & COUSIN.

THESE illustrations are copied from *La Construction Moderne.*

NOS. 66 AND 65 NEW BOND STREET, LONDON, ENG. MR. . A. KEEN, ARCHITECT.

CHURCH OF ST. DAVID, EXETER, ENG.

THIS illustration is copied from the *Builder.*

COMMUNICATIONS

[*The editors cannot pay attention to demands of correspondents who forget to give their names and addresses as guaranty of good faith; nor do they hold themselves responsible for opinions expressed by their correspondents.*]

A QUESTION OF COMMISSION.

ALTOONA, PA., September 25, 1896.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs, — Kindly express an opinion on the following matter of commissions:

A firm of architects entered into contracts with the county commissioners to furnish plans, etc., and superintend the erection of the County Almshouse.

The regular charges of 5 per cent were to be paid and all matters were to be decided according to the usual custom of architects, as interpreted by the American Institute of Architects. The architects were instructed to provide for 450 inmates. The plans were completed *in detail*, the commissioners inspecting them during their progress; the plans were accepted and bids asked for; but just at this time it was discovered that a building accommodating but 200 inmates was all that was required. The architects were instructed to prepare an entirely different set of plans, which they did, the building being erected in accordance therewith and was entirely satisfa ory to all concerned.

The architects were paid 5 per cent on the building, and claim 2½ per cent on the first set of plans which were worked-out in detail, they paying their own expenses while carrying on the work.

The commissioners do not object to the bill, but only wish to know what is just and proper. It is proper to state that the first building would have cost twice as much as the second, but was about the same ratio per inmate. The contention of the architects is this, that if the operation had been abandoned at the time the second set of plans were ordered, the charge would have been 3½ per cent and that the second set of plans was entirely a different operation.

Yours truly, C. M. ROBINSON, *Architect.*

[WE should say that the charge of 2½ per cent for the first set of plans was entirely fair and reasonable. — EDS. AMERICAN ARCHITECT.]

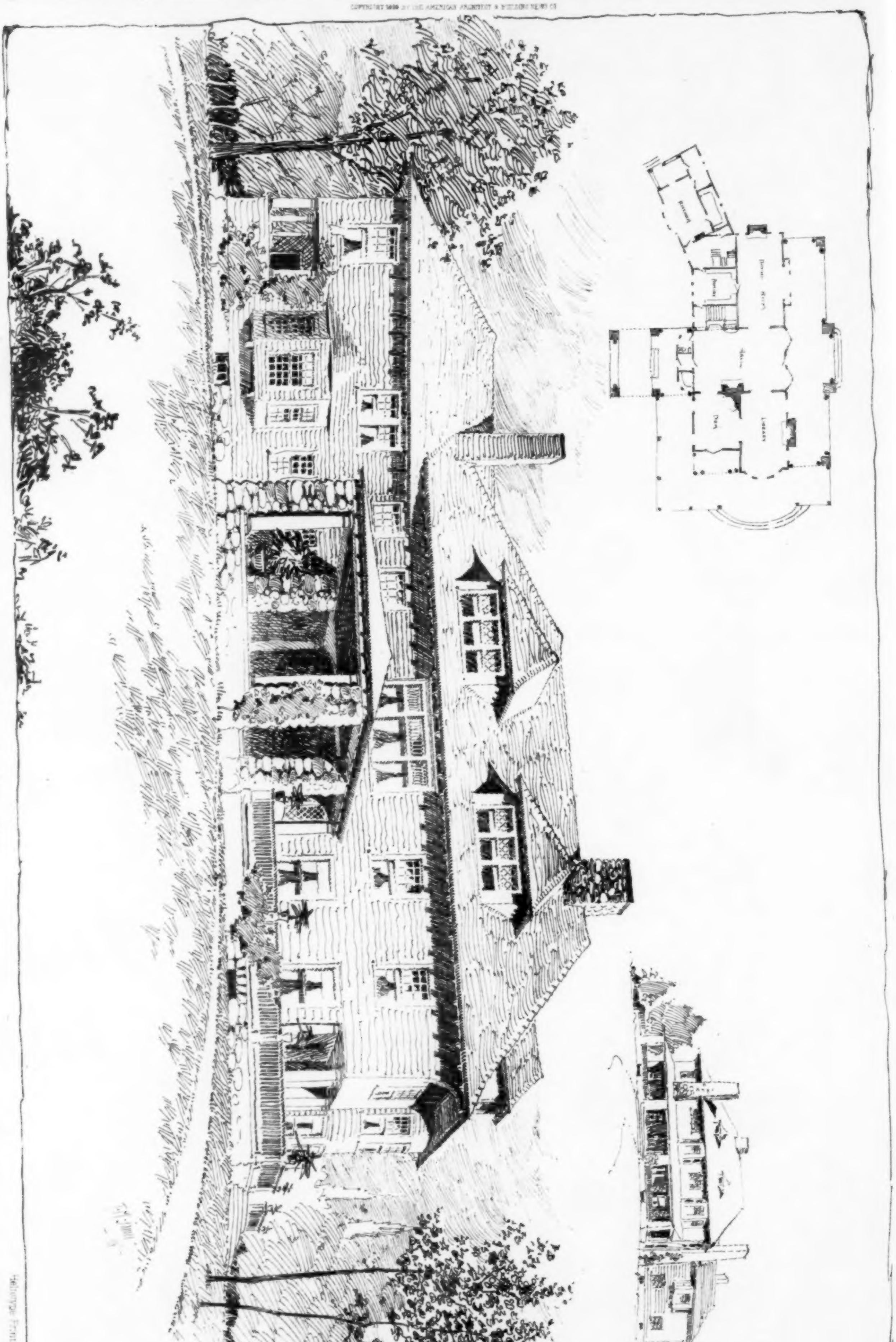
NOTES AND CLIPPINGS

ARCHÆOLOGICAL SURVEY IN MADRAS. — During 1897-1898 it is proposed that the Archæological Survey operations in Madras should embrace the most important monuments in the Tinnevelly district, many of which are of great interest. The number of places which it would be possible to visit is contingent to a great extent on the amount of work; to be ascertained after inspection. Among the chief remains of interest are those at Sattur, Sankaranayanakovil, Virasakamani, Kalugumalai, Kuttalam, Tenkasi, Korkai, Maramangalam, Srivaikuntam and the Valavanad Hill, consisting of temples, ancient city sites, rock-cut caves, monolithic temples, Jain sculptures and inscriptions, cairns, Siva and Vishnu temples, sepulchral and other remains. The most extensive work will be in the great Siva Temple in Tinnevelly town. Government has approved of the programme. — *Indian Engineering.*

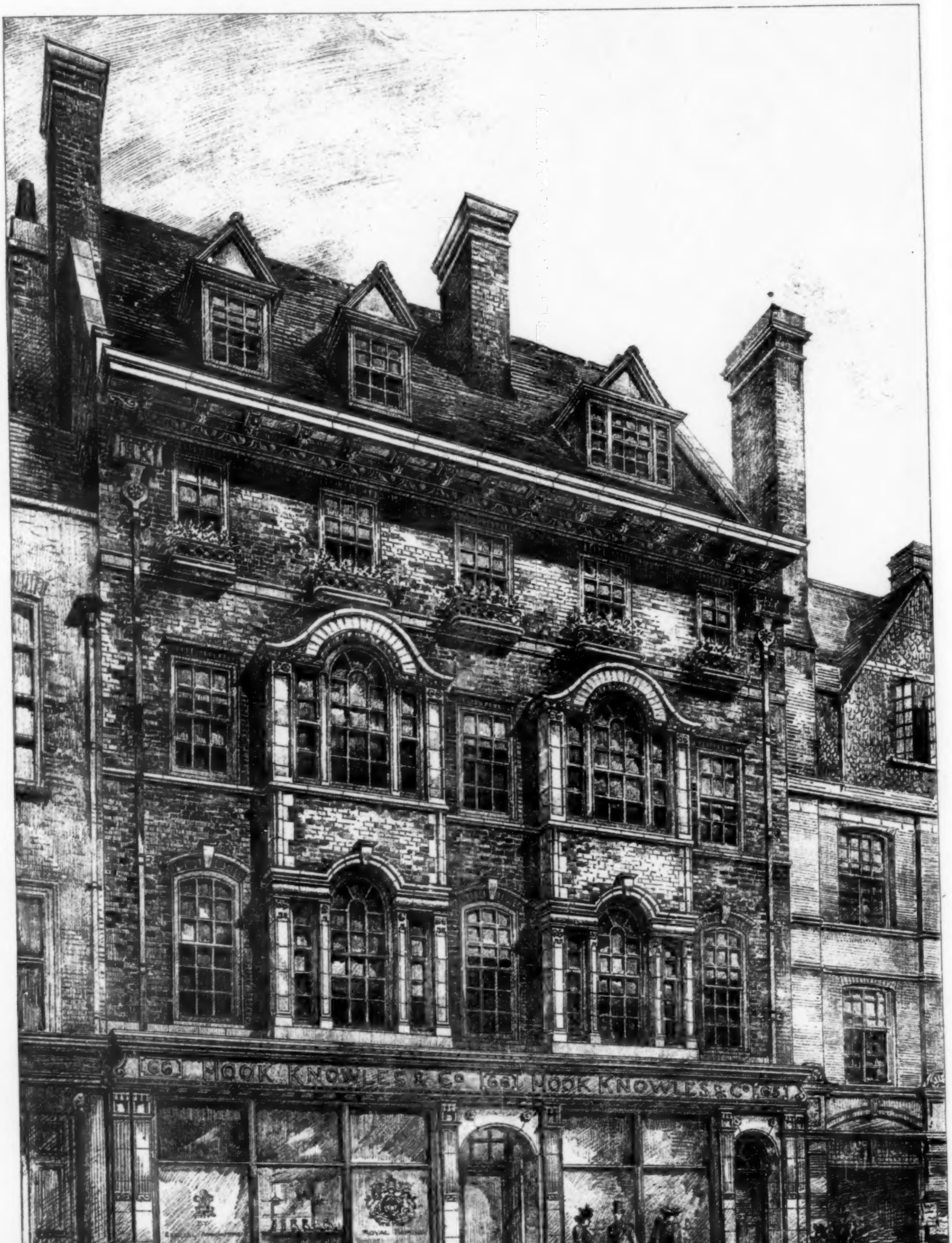
THE WALL OF ANTONINUS. — The preservation of the remains of the famous wall of Antoninus between the Firths of Clyde and Forth, built in 140 A. D., has been occupying the attention of the National Trust for Places of Historic Interest or Natural Beauty. Communications have passed on the subject between the Trust and Lord Balfour of Burleigh, Secretary of State for Scotland, who has displayed considerable interest in the matter, and has visited the neighborhood of Falkirk in order to examine personally what remains of the wall. There is reason to believe that the landlords along the line of the wall will coöperate in the work of preservation. — *Invention.*

NEW MONUMENTS AT PERE LACHAISE. — Besides the great work by M. Bartholomé, the "Monument aux Morts," the cemetery of Père Lachaise is also to receive shortly another important work, the monument to be erected by the Paris Municipality to the memory of artisans who have been killed by accidents in the course of their work. This monument is to be carried out from the general designs of M. Dupré, the architect, but it will also include important sculptural work. — *The Builder.*

S. J. PARKHILL & Co., Printers, Boston, U. S. A.



PROPOSED HOUSE, CONCORD, MASS.
EUGENE L. CLARK, Architect.



From the Building News

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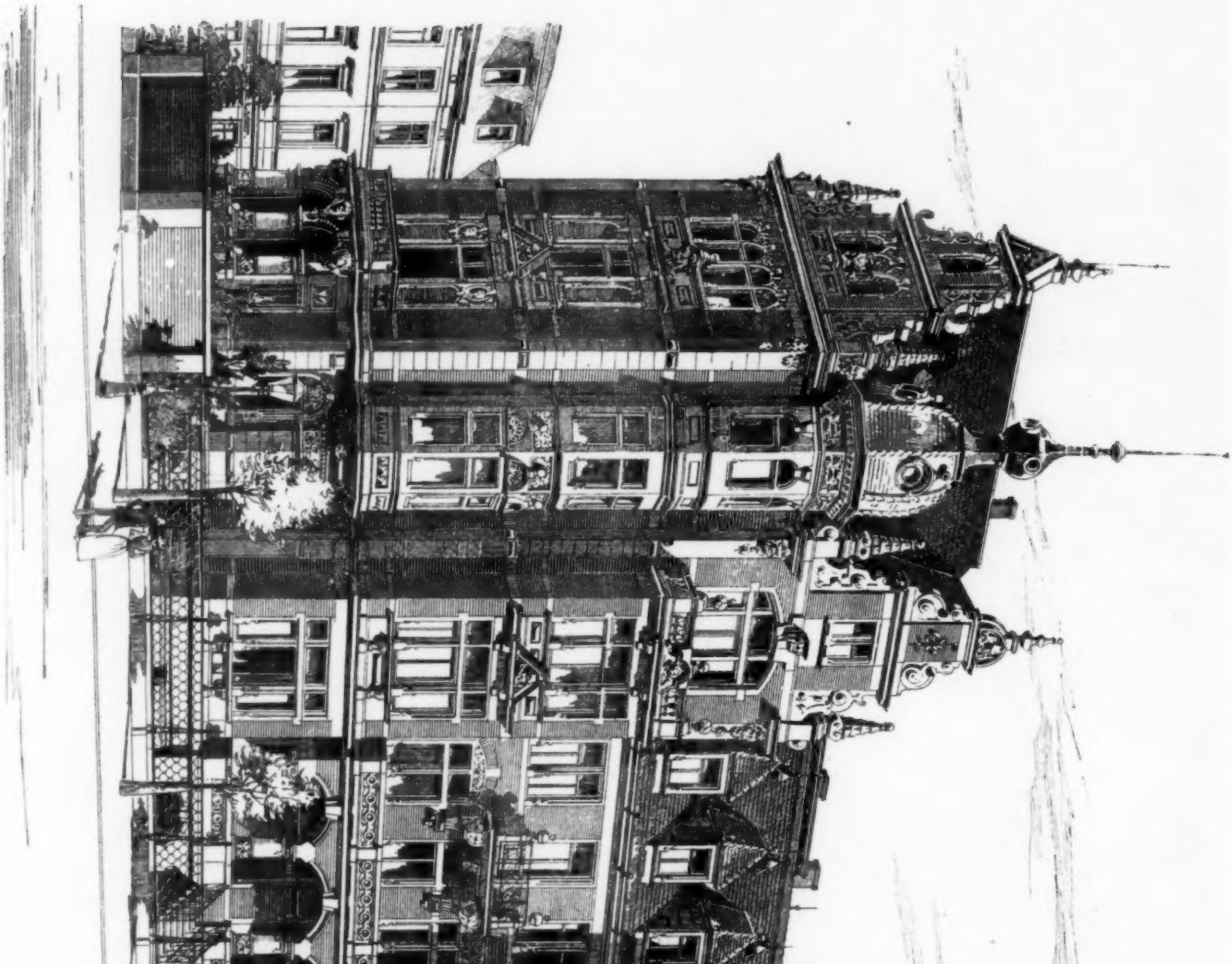

From Architektonische Rundschau

Wohnhausgruppe „Fürstenhaus", Ecke der Fürsten- und Blasewitzerstrasse in Dresden; erbaut von Architekt Ernst Becher daselbst.

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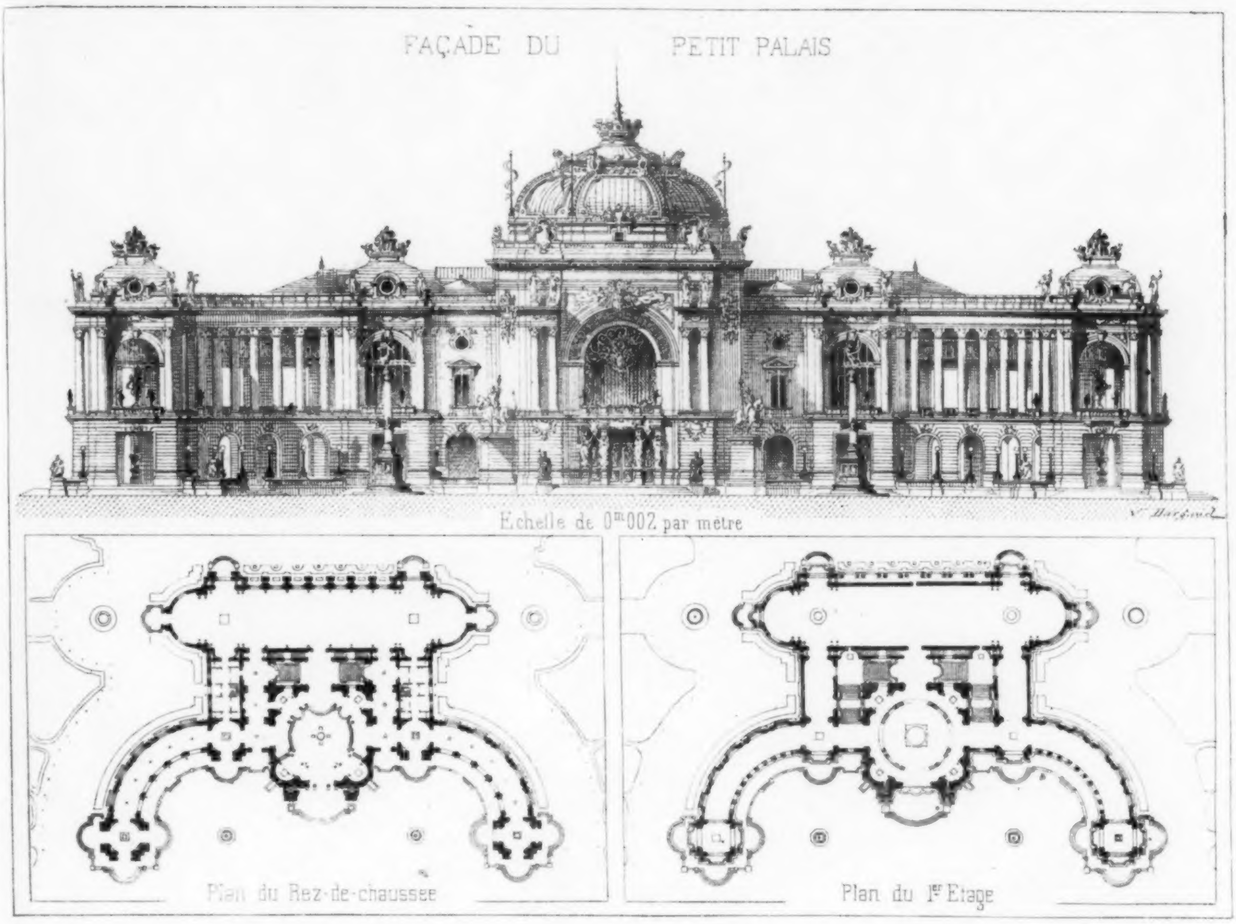
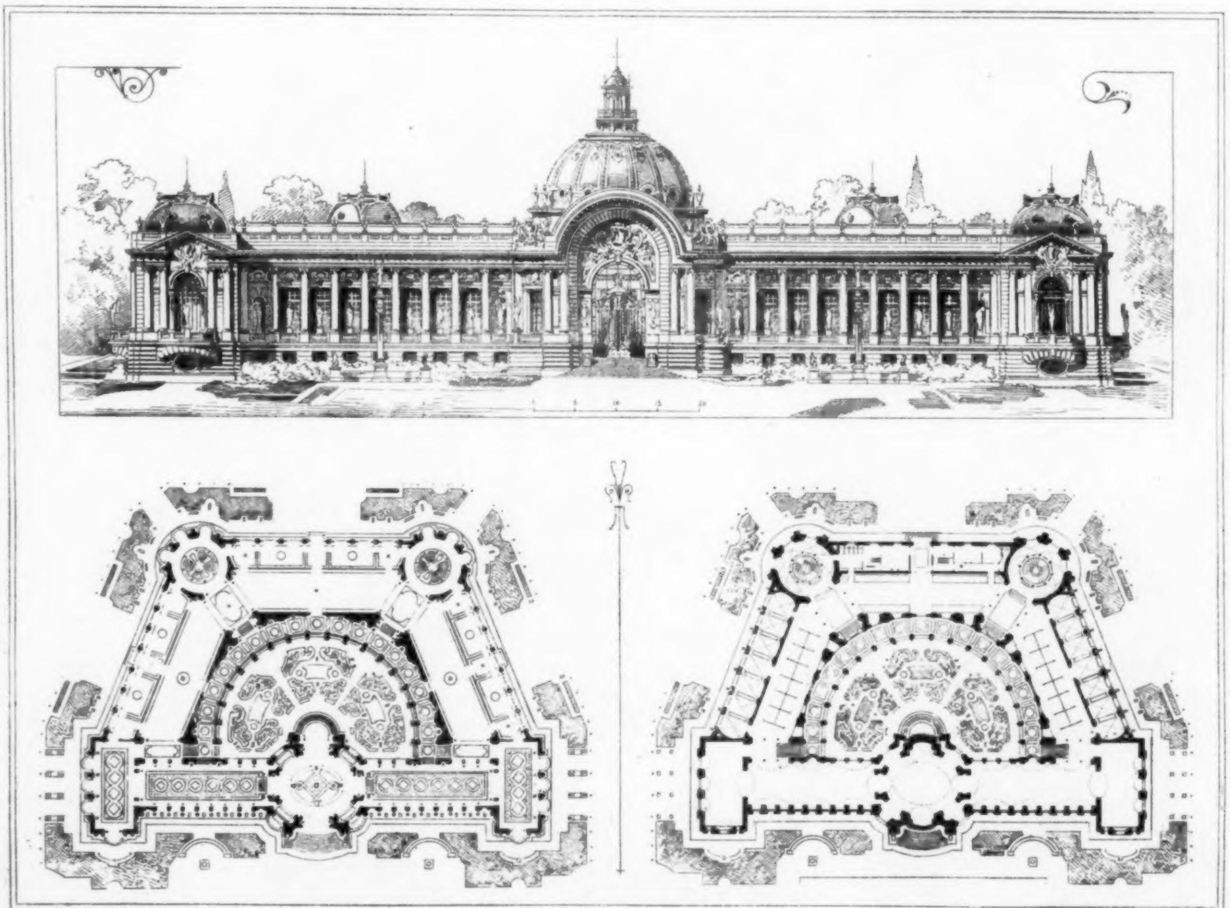


PETIT PALAIS DES CHAMPS-ELYSÉES _ PROJET DE MM. CASSIEN-BERNARD ET COUSIN
2ème Prime



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PETIT PALAIS DES CHAMPS-ELYSÉES _ PROJET DE MR GIRAULT
1ère Prime

AMERICAN ARCHITECT AND BUILDING NEWS, OCT. 10 1896. No. 1085.

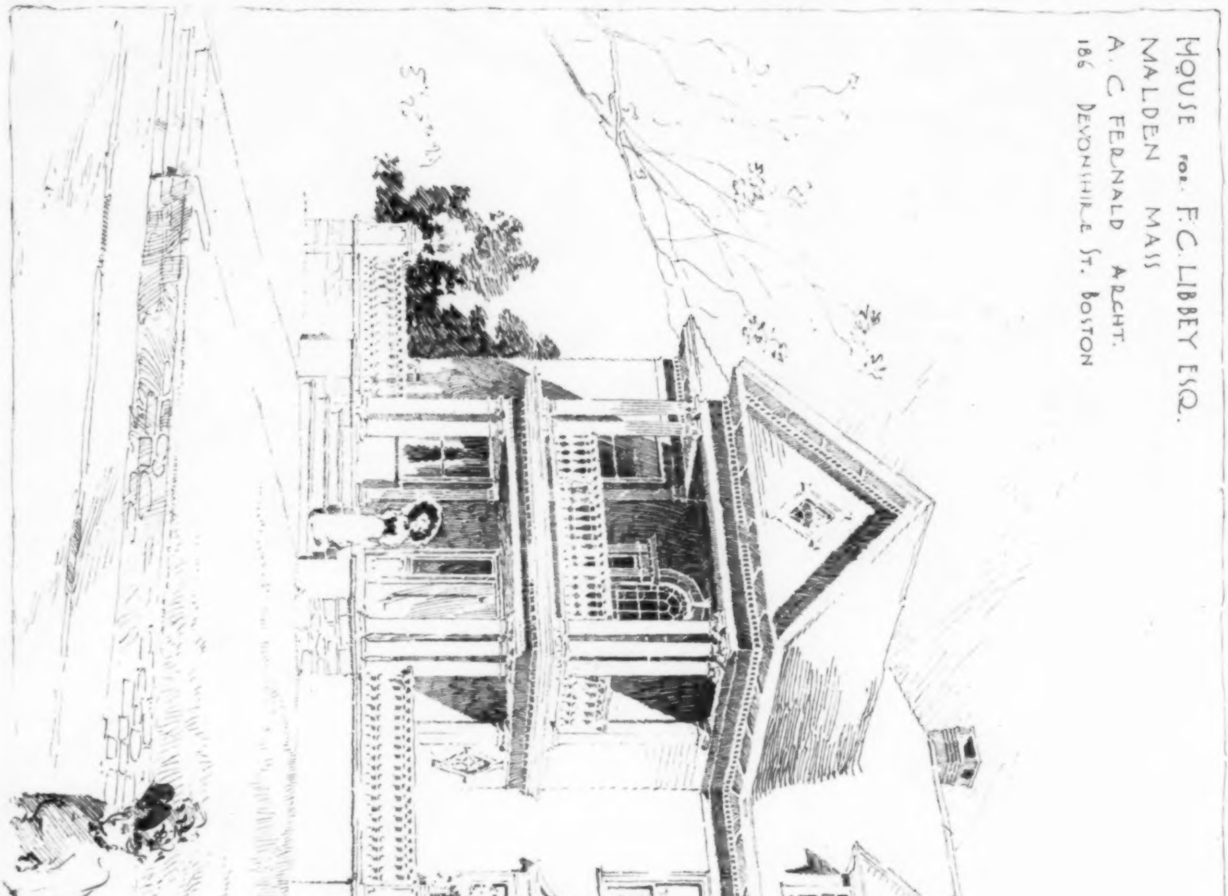
From the Builder.

Heliotype Printing Co. Boston

CHURCH OF ST. DAVID, EXETER: EXTERIOR FROM THE NORTHEAST.

W. D. CARÖE, M. A., Architect.

AMERICAN ARCHITECT AND BUILDING NEWS, OCT. 10 1896. No. 1085.



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THE HELIOTYPE PRINTING CO., BOSTON

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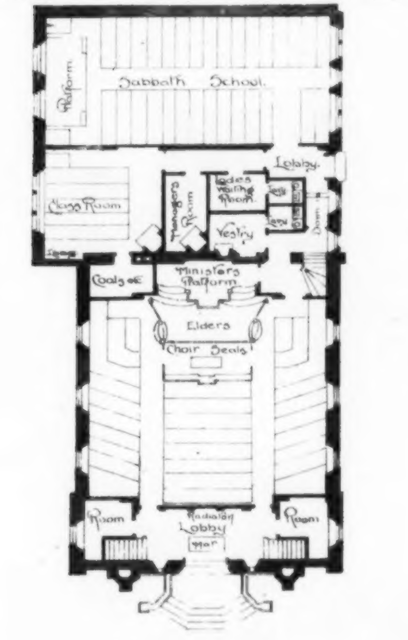
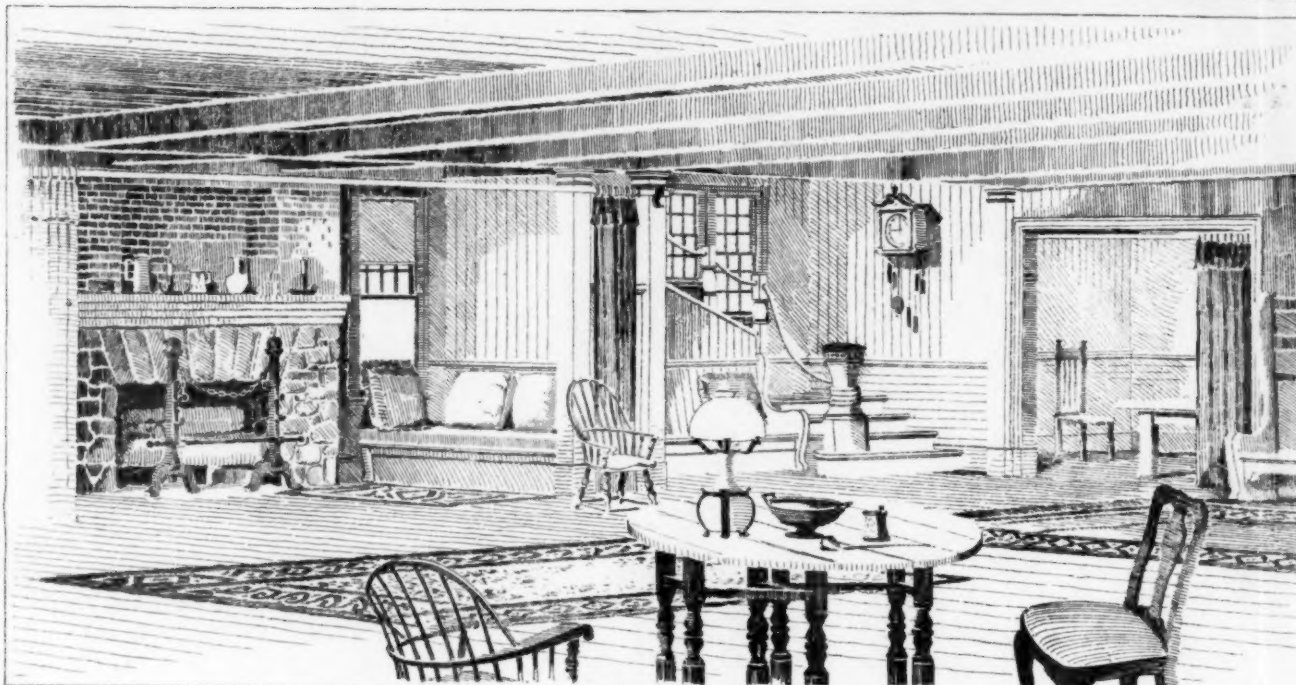
GEO. EDW. HARDING & GOOCH, Architects.

E·U·CHURCH·BATHGATE.

J. Graham Fairley. Architect.



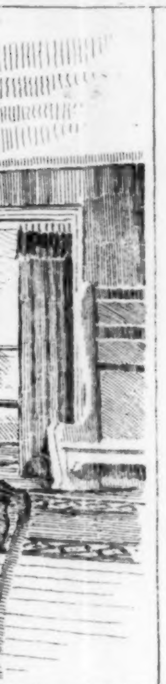
Ground Plan



-|-MAIN SALOON-|-

THE "CAPSTAN" FOR B·P· & C·P·CHENEY

MIDDLE BREWSTER



·NORTHERLY·VIEW

JOHN·A·FOX·ARCHITECT

·SOUTHERLY·VIEW·

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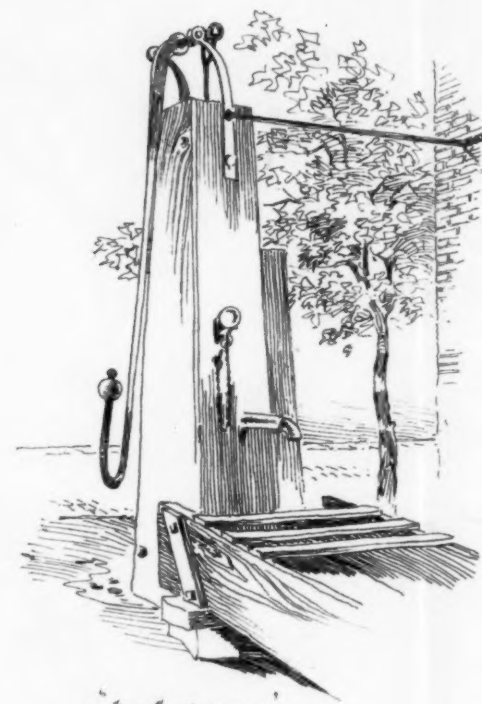
Sketches in Economy. O:

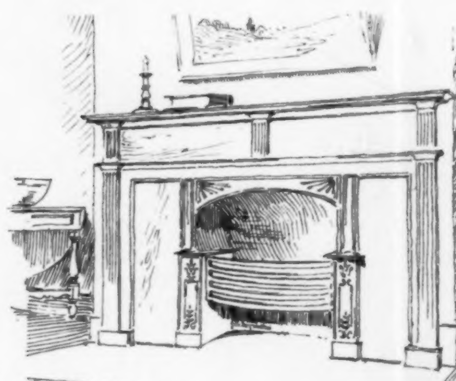
the town of the Economites on the banks of the Ohio River. built about 100 years ago.

Church Tower.



a "town pump"

"a peep from Church Tower"

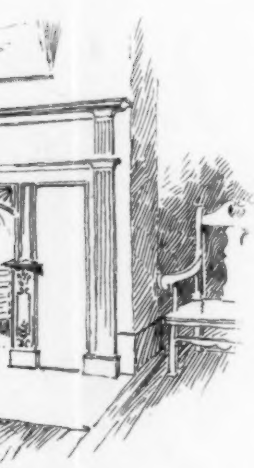


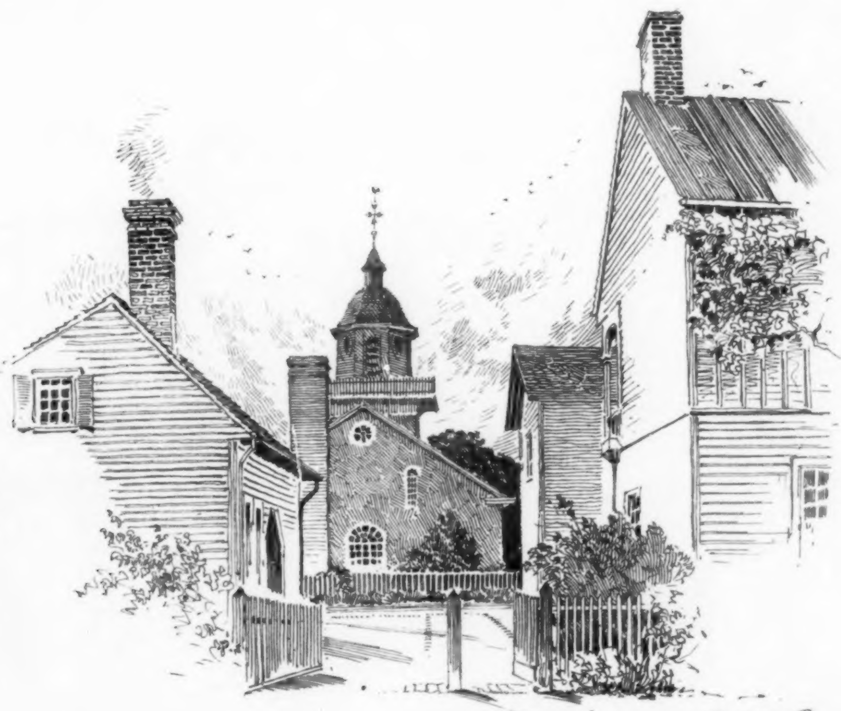
Mantel in Hotel.

O:

River.
s ago.

Courtyard of Hotel





an evening silhouette

E. Eldon Deane

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