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CONTENTS.

WE have two apologies to make this week; one to Mr. Olin L. Warner, whose name, copying from the Boston *Advertiser*, we printed "Olive" in a paragraph regarding the purchase by the Boston Art Museum of the most meritorious works in the late exhibition of contemporary art. Mr. Warner may be assured that we were in no danger of mistaking his identity, but relying on our information we imagined that some other member of what the newspapers would call his "gifted family" had won distinction. While we are sorry to find that there are not two of them, as we supposed, we are glad to take the opportunity to restore to the proper person the credit to which he is entitled. The other correction for which we have to express our thanks is made by the Cincinnati *Commercial*, which informs us that the French invasion of Mexico, so far from having been viewed with complacency by the United States, was regarded at Washington with serious disapproval, and that an emphatic suggestion from the State Department immediately preceded the withdrawal of Marshal Bazaine and the French army from the neighboring republic.

THE industrial schools established in New York by the Metropolitan Museum of Art are meeting with great and deserved success, the attendance of pupils since the opening of the season having averaged eighty per day. Since our last mention of these schools a new department has been added for instruction in plumbing, which opened a few days ago with lectures by Professor C. F. Chandler and Mr. C. F. Wingate, till lately the editor of the *Sanitary Engineer*. No course is likely to be more useful than this, as regards the benefit which the public will indirectly derive from it, and it is only fair to say that no class of mechanics is more likely to seek and profit by instruction than the plumbers. Unlike the members of some trades, such, for instance, as the plasterers, who have, at least in certain localities, a bad reputation for ignorance and indifference, plumbers as a rule take pleasure in discussing new theorie and criticising new apparatus, and if they do not always show the skill or the conscientiousness that we should like, the intelligence necessary for comprehending their duty is seldom wanting; while the best of them display an unselfishness in carrying out what they believe to be the best mode of executing their work, often at considerable expense to themselves, which might well be imitated by others. A journeyman plumber once, when we condoled with him on the difficult and often repulsive character of his business, answered that "they" (the plumbers) "thought of the health and convenience which their work would give, and did not mind the disagreeable things about it." If there is any trade or profession which takes a higher view of its duties than this, we should be glad to know what it is.

IT is gratifying to observe the readiness which Congress has shown to comprehend the requirements of a wise and far-sighted economy in providing for the construction of the public buildings which have incontestably become necessary. Our readers will recollect the report of the Committee on the Library in regard to the new building which they agreed to be immediately required; the majority recommending the selection of Judiciary Square for its site, on the ground of economy, as the land there was already public property, while Senator Morrill alone maintained the wisdom of purchasing territory east of the Capitol, arguing with great force that since this position was acknowledged by all to be pre-eminently suitable for the Library building, it would be far more judicious to secure it at a proper price, leaving Judiciary Square for the future purposes to which it might be adapted, than to occupy this at a confessed disadvantage with the Library, and thereby necessitate at a later day the purchase of other land to replace it. These sensible suggestions seem to have prevailed, for the Senate has already passed a bill providing for the purchase of the site east of the Capitol, and the erection of the Library building thereon. The country is to be congratulated upon this determination, which we earnestly hope will be seconded by the House. Not only is a noble and stately Library the fittest of all structures to stand side by side with the Capitol of the Republic, but this situation will give it the ready accessibility upon which the members of Congress have so much and so justly insisted; while the friends of art will rejoice to see the effect of the beautiful eastern front of the Capitol, now so lonely in its grandeur, heightened by the juxtaposition of a worthy rival. Besides the Library, the Senate has provided for a much-needed building to be used for the safe-keeping of the Government records. This structure is to be situated near the War Department, and will be made as secure as possible against fire.

IT is said that a large manufacturing jeweller of New York, employing from four to six hundred hands, and occupying extensive buildings at Rutherford Park, New Jersey, has been driven by the malarious character of that locality to abandon his property, and is about to erect new works at Sag Harbor, Long Island, at a cost of over one hundred thousand dollars. This is perhaps the strongest evidence we have yet seen of the gravity which the question of malaria is rapidly assuming in the Eastern and Middle States. A generation ago malaria was as little dreaded about New York as it would be in London; now some of the most beautiful suburbs of the city are becoming depopulated on account of it, and town after town is attacked by the ague, which never again releases its hold. The nature of the infection has hardly yet been satisfactorily explained. By experience, a few maxims for avoiding it have become current in the malarious localities, but nothing approaching to a scientific explanation of its cause and cure has yet been offered. The investigation could not but be a profitable one, and in these days of microscopic science we hope to see it before long seriously attempted.

A REMARKABLE scheme has been set on foot for reclaiming the vast swamp which occupies one-third of the State of Florida, and is known as the Everglades. The preliminary surveys indicate that two canals of no great length will drain the whole territory, which is of an almost tropical fertility, and enjoys by its situation complete immunity from frost. The territory is to be "capitalized" at ten million dollars, and the shares put upon the market at once. As with most speculations which are intended to depend upon the smaller and perhaps less cautious capitalists for support, the shares are put at ten dollars each, and each share carries with it the right to an acre of land. We wish the new company all possible success, but have some doubt whether the most skilful financial management will ever float stock based upon such a valuation. It is not long since immense tracts of land in Virginia, one of the most progressive States in the Union, were sold for less than one cent per acre, and the notion that Florida swamps were worth a thousand times as much per acre as Blue Ridge timber-lands would hardly find much acceptance at the South.

A CHEAP way of making, if not a marine park, at least a very good substitute for one, is now awaiting official sanction in Boston. The lower basin of Charles River, forming a wide estuary dividing Boston from Cambridge, is bordered on the city side by private estates, whose boundaries touch the water's edge. For a short distance, a narrow and ill-paved private street occupies the margin, giving access to the stables and kitchen doors of the riparian proprietors, but no promenade worthy of the name exists along the shore, and it is proposed to furnish one by building a plank walk, fifteen feet wide and three miles long, from the Cambridge bridge to the pleasant shores of Longwood. A more charming resort than this would be can hardly be imagined. Far quieter and more removed from the bustle of ferry, railroad and other traffic than the famous New York Battery, it would be also much more extensive, and although no landscape gardening or rural decoration would be possible in such a place, the owners of the neighboring houses, which are among the finest in the city, would be likely to find pleasure in adorning that portion of their land which bordered the new promenade in such manner as good taste might suggest. The maritime predilections of the Bostonians have clung to them longer than has been the case in New York and other cities, and the streets bordering the water, where not actually needed for the purposes of commerce, are still considered to be very desirable for residences. We hope this may long remain so, and that generations hence the descendants of those who inhabit the Boston of to-day will find the seaward slopes of Dorchester Heights, Milton and Quincy Hill as attractive as is now the "water side of Beacon Street."

The use of "water-gas," as manufactured by the decomposition of water over heated coal, although rapidly extending, is now seriously opposed on account of its poisonous qualities. As is well known, this gas, as delivered by the companies, contains thirty or forty per cent of carbonic oxide, a most dangerous substance, which, unlike most gaseous poisons, cannot be eliminated from the system, when once inhaled, by exposure to fresh air, but is said to combine chemically with the red corpuscles of the blood, rendering its subsequent aeration impossible. There is therefore much reason in the demand made by several of the daily papers, that the introduction of this sort of gas into houses should not be allowed until after it had been impregnated with some admixture more powerful in odor than the carbonic oxide, by which persons would be warned of its presence in a room in time to escape injury. The matter is an important one, and while we do not remember any instance of fatal accident resulting from the use of the gas as supplied by the Municipal Company in New York and other cities, there are many cases where death has followed the inhalation of carbonic oxide in laboratories, and no precaution should be omitted to protect innocent or ignorant consumers of the commercial product from such casualties. A kind of burner is now extensively used which cannot be turned entirely out, but maintains a tiny flame in its sheltered interior, so that on opening the key the full flame appears at once, without using matches or other apparatus for lighting. This would be particularly useful with the new gas, by preventing the escape of unburned portions which ordinarily takes place in the act of lighting.

The Emperor of Germany has, it is said, announced his intention of encouraging co-operative associations among workingmen, elevating them socially and morally, and providing for the formation of workingmen's accident insurance companies; and the Boston *Herald* comments upon the movement as a strange illustration of the way in which the imperial government practically fosters communistic tendencies; forgetting that tyranny and socialism have played into each other's hands since political organization was first attempted. We recollect seeing once in New York a procession of tailors on strike, who displayed the motto, "Government Protection and Assistance from the Cradle to the Grave," and have often subsequently heard the same expression from professed labor reformers. A more concise description of the *régime* which German despotism wishes to impose upon its subjects it would be hard to find, and it is not strange that souls too abject to help themselves should find the price of servitude, which tyrants impose upon their "protection," a trifling one to pay. It is not long since the very ideal of this "enlightened communism" existed in the southern portion of this country; the "protection and assistance" of the working people and their families by the governing class was carried to its utmost limit, and the dreams of the German political economists might have been realized if the slaves, more spirited or less philosophical than their white brethren, had not suddenly chosen to revert to the barbarian plan of shifting for themselves.

A passenger railway has been recently constructed in Switzerland, employing the principle found so useful in some coal mines, of drawing empty cars up an incline by means of the superior weight of loaded cars descending. The Swiss line, which is intended to transport passengers from the landing place at Brienz to the top of the plateau from which the cascade of the Giessbach falls into the lake, forms a steep incline, on which two wagons ply, attached to an endless cable of steel. No engine or other machinery is used to drive the cable, but in place of this a large tank is attached to each wagon, which is alternately filled with water at the upper station and emptied when the force of gravitation has brought it to the bottom of the slope; the same force which carries down the full one serving also to pull up the other. To save the expense of a double track, an automatic turnout is put in the middle of the road, the remainder of the line being used alternately by both cars, and as these cannot shift their relative positions on the rope, there is no danger of their coming into collision.

The Brush electric light has been tried with a view to its use in the British House of Commons. Six globes were suspended a few feet below the ceiling, but the illumination proved too strong, and another experiment is to be made, with the lamps placed above the glass roof. The room is not a large one, having been purposely restricted in all its dimensions, so that the members might hear and see each other with the utmost possible facility. It is even said that provision was only made for about three-fourths of the proper number of members, on the supposition that at least a fourth would always be absent, and that the space they would occupy might as well be saved, to increase the comfort of the rest. Six electric lamps might therefore readily be supposed to furnish more light than would be necessary or desirable. It is time, we think, to invent a different sort of globe for such lamps. The ground glass ordinarily used is painful to the eyes, even over a gas flame, and infinitely more so when it shades an electric arc, while a large part of the light is wasted. A ribbed glass, which would disperse without intercepting the rays, or perhaps a double shade, filled with water, might answer. Both of these are used with gas, and are found pleasant.

The singular blot in the perspective of Broadway at the corner of Houston Street, so long known as Murderers' Row, from the frightful crimes repeated year after year in the foul saloons which occupied its cluster of rickety shanties, is to exist no longer. The property has been rented for sixty-three years, on the pernicious system of ground-leases, and two iron stores are to be erected on the spot. Nearly opposite, another large building will soon be constructed, while on the corner of Prince Street and Broadway a third is already in progress. It is a long time since such extensive improvements have been undertaken on lower Broadway; most of the mercantile building having for a few years past been on the cross streets, particularly those adjoining the stations of the elevated railroads; but those who visit the city only on rare occasions will be glad to miss the shock which the sight of the squalor and crime of Murderers' Row, obtruded in the middle of the greatness and brightness of Broadway, never fails to give the stranger.

An ingenious system of police alarms is now on trial in Chicago, and the results have thus far been so satisfactory that it is intended to establish it permanently in certain sections of the city. At frequent intervals, on the street-corners where practicable, "public alarm-houses" are erected, built of wood, and resembling a small sentry-box in shape and size. Keys to the houses are furnished to responsible citizens who apply for them, and when occasion arises it is only necessary to unlock the door, when by moving a lever attached to a signal-box inside the structure an alarm is given at the nearest station, which is answered in from one to three minutes by the appearance of three policemen and a horse and wagon, which serves either as an ambulance or a conveyance for prisoners, and is furnished with stretcher, blankets, handcuffs, and other apparatus for both purposes. In addition, a telephone from each house communicates with the station, so that help may be summoned, or descriptions of fugitive criminals given, with the least possible delay. To check the transmission of false alarms, the lock of the house is so arranged as to hold the key fast after opening, until released by another key, in the custody of the district patrol, which is applied on the reverse side of the lock. As each key is numbered, and a register is kept of the person to whom it is issued, the originator of any alarm, whether false or not, can be easily traced. Private police and fire alarms, resembling those so common under the "District Telegraph" system, will also soon be placed in the dwellings of those who desire them, on payment of their cost, thus giving a security which the inhabitants of other cities will regard with envy.

BUILDING SUPERINTENDENCE.—III.

Disposal of Excavated Material.

WHILE the workmen are cutting the sod in long strips and rolling it up, which may be desirable if it can be used for improving portions of the lot, it is necessary to choose places where the loam from the surface and the gravel from beneath may be piled up separately in "spoil-banks," out of the way of building operations, but near at hand for use in the subsequent grading. Nothing is more common than to see the earth from a cellar thrown out at one edge of the excavation, to be soon after shovelled over again in order to dig a place for some pier or post; then, perhaps, the middle of the heap turned over a third time, to cut a trench for drain or other pipes, and finally the greater part of the mass shovelled again into wheelbarrows, and transported halfway around the building, to be used for grading up in some place on the other side, where it might just as well have been thrown in the first place.

Let the young superintendent think, therefore, where the gravel is likely to be used for grading or road-building, and how the heaps can be most conveniently arranged, in reference both to its future use, and to the least laborious mode of bringing it from the cellar. The amount of material which the cellar will furnish can be approximately estimated with very little trouble, as well as the quantity which will be needed for the grading about the building, so that if there proves to be a surplus which must be provided for, places may be arranged for disposing of it, either in filling up hollows about the lot, grading the approaches, forming terraces, or other improvements; and the earth may then be excavated from the cellar, hauled to the place designated, and dumped in immediately, without having to be twice handled. Wherever grass is intended to cover the new surface, loam must be piled near, or brought from other parts of the excavation.

The location of the avenues and paths, with the drainage works necessary, should be determined at the outset, and marked upon the plan which the superintendent must have always at hand to refer to.

Space to be Reserved for Materials.

A large space on the most level part of the ground, and not far from the principal entrance, should be reserved for unloading and piling up timber, and for framing. Room must also be left for delivering stone at various points around the building, and for other materials. Especially should the area about the main entrance be kept free of obstruction. These cares properly belong to the contractor, since the extra expense and delay caused by re-handling and improper disposal of material must be paid by him, but the efficient and intelligent conduct of such works is indirectly advantageous to all parties, and the superintendent, by his greater familiarity with the plans, as well, perhaps, as his superior skill in interpreting their indications, is able to foresee future contingencies more clearly even than those who will suffer most by want of due precaution.

Grading.

Applying these observations to our present building, we notice the conditions to be as follows: The street runs along the south side of the lot; and the ground sloping gently toward the east, the best place for the entrance roadway will be near the western end of the building, arranging it, if no other considerations oppose, so that the grade will ascend slightly from the street. This will be of advantage in securing an outlet for water into the street-gutters during heavy rains. The building is not on the crest of the hill, the ground rising continuously westward. It will therefore be necessary, in order to prevent the water running down the hill from reaching the walls, which it would soon saturate, to grade up at the west front of the church sufficiently to turn it back by a slight slope in the reverse direction; and it will improve the appearance of the structure to have this graded surface somewhat extensive, so as to form a plateau in front of the building, nearly level, and spacious enough to turn a carriage easily. This level will be continued along the south wall of the church as far as the porch opening into the south transept, forming a terrace, wide enough for a foot-path, and regaining the natural surface southward and eastward by easy slopes.

The avenue crosses a small natural basin before reaching the plateau, and beyond it continues along the north side of the building to the sheds, which are situated at some distance to the north-east. A separate foot-path from the street leads to the entrances of the robing-room and the society-room in the basement.

The gravel from the excavation will therefore be principally needed for the plateau and terrace on the west and south sides, and for the paths and avenues; and the loam will nearly all be used on the south side, where a deep soil is desirable to insure a good growth of grass. It should therefore, as it is stripped from the surface of the excavation, be piled in a heap south of the south transept.

Avenue Building.

It will be very advantageous for the avenue to have it hardened by the traffic of heavy teams bringing materials, and equally an advantage for the teams to have a practicable road for wet weather, instead of being obliged to go over the grass-land, which is soon cut into a mass of mud. Hence while the turf and loam is being stripped off the site of the church, the driveway should be staked out, together with the plateau in front of the church, and the terrace, and in order that the new material may unite with the subsoil beneath, the surface should be ploughed, the loam taken off, and added to the main "spoil-bank."

As fast as this is done, a gang of laborers should dig a trench eighteen inches wide and two feet deep on each side of the roadway, throwing the gravel into the middle. Then fill these trenches half full of stones, put six inches of hay or straw over the stones, and throw back gravel enough to fill the trenches.

The French drain, or trench filled with stones, should be continued around the side of the plateau next the hill, and made considerably deeper in that place — three to six feet, according to the springiness of the soil. The object of it is to prevent water from working in at the sides and softening the gravel of the road just below the surface, breaking this up, however hard it may have become. If stones cannot be had, agricultural drain-tile may be laid in the trench, and the joints covered over with a piece of paper before filling up with gravel. The road thus defended against the undermining influence of water from the sides will soon be dry and hard, though below the general surface, and ready for the gravel-carts which will by this time be ready to bring their loads from the cellar excavation, coming to the surface by a runway at the eastern end, where the height is least, and passing along the rudimentary avenue at the north side of the building to deposit them, first on the plateau, until that is brought up to the height required, and then upon the avenue, a sufficient quantity being dumped in the hollow near the end to bring up the grade to a uniform slope with the rest.

Besides the deep intercepting drain around the upper edge of the plateau, it is best in all but the most porous soils to make another French drain under the plateau itself, in the shape of a V, the vertex of which points up the hill, while the extremities of the legs end in the road drains, one to the north and the other to the south of the western end of the church. This will prevent the water which falls upon or gets in beneath the fresh surface of the plateau from running along the comparatively hard, sloping stratum of natural soil beneath toward the foundation walls of the building, which will soon be penetrated by its persistent flow. It will be best to leave the avenues at a grade about six inches below the final level. If well drained they will soon become hard under the heavy traffic, and a final coating of six inches of screened gravel at the completion of the building, brought to a neat surface, will give a good and durable finish to the work.

The terracing along the south side may be provided for most economically, if the ground is firm, by directing the excavated material on that side to be thrown out on the bank without loading into carts; but if the soil is soft or sandy, the edge of the excavation must not be weighted with material until the cellar walls are built, or it is liable to cave in.

The contractor for the building is not obliged to do all these works, unless they are mentioned in the specification or contract. In general, if there is no agreement otherwise, the builder is expected to take off and reserve the sods, transport and pile the loam and gravel separately wherever directed within the bounds of a reasonably large lot, but he would not be expected to spread and level the material, except about the building, unless such levelling were mentioned specifically. The other works mentioned, although they are best carried on at the same time, would be included in a separate contract in connection with the subsequent terracing, planting, sodding, or gardener's work which might be determined upon for the general adornment of the lot.

Recapitulation.

To recapitulate the most important things to be remembered, and precautions to be observed in first laying out the building and starting the work:—

Examine the figures on the plans, to see if they are correct.

See that the steel or other tapes used are divided into feet and *inches*, not into feet and tenths of a foot.

Stake out provisionally the actual ashlar lines of the building.

Measure the diagonals of the principal rectangles.

Transfer the lines given by the stakes to batter-boards, permanently fixed. If the ground is not level, or nearly so, the horizontal dimensions must be measured level, and transferred to the stakes by a plumb-line. After determining the ashlar lines, the foundation walls should be marked on the batter-boards, and the lines of the excavation given about eight inches outside the face of the foundations.

Set some permanent mark representing either the top of the floor-beams, the water-table, or any other convenient level, providing carefully for the change in the surface of the ground which will be made by the subsequent grading. Write distinctly on this stake or "bench mark" the level which it is intended to represent, and also the depth of the cellar bottom below it, allowing three inches for concrete.

Consider and decide about the laying-out of the lot, and if any of the avenues can be used in the building operations have them immediately staked out, cleared of loam, and drained.

Confer with the contractor in regard to the most convenient place for delivering the materials and dumping gravel. Explain to him the future plan of grading, and interest him in your provisions for avoiding unnecessary handling of the earth, so that your directions may not seem arbitrary. Remember to leave spaces as follows:—

Not less than 2,500 square feet for piles of lumber.
Two or three plots of 500 square feet each for brick and rubble.
About 500 square feet for other materials.

These to be near the building, but leaving space for heavy teams to drive up, unload, turn, and go out. Space may also be needed near the street as follows:—

1,000 square feet for stone-cutting sheds.
1,000 " " rough blocks of stone.

Determine the position of the main provisional entrance, and keep the approach to it clear. This entrance need not necessarily be one of the regular church doors. In this instance, the main access to the church, through the tower, is somewhat tortuous for the introduction of long timbers or other bulky materials, so that it will be best to provide a temporary one, which can be done by leaving the arch of the large west window open down to the ground. When the necessity for so large an entrance is over, the wall can easily be built up as high as the sill.

SECOND VISIT.

We will suppose that the matters treated of in the foregoing notes have been satisfactorily disposed of, and the laborers have been some days at work. By this time it will be necessary to appear again upon the ground. The second visit finds the loam removed, and the excavations completed down to the cellar bottom at the western end. Teams are hauling rubble-stone for cellar walls, and a car-load of staging lumber has arrived on the ground.

Let the superintendent begin by going all around the outside of the building, comparing the excavated lines with the marks on the batter-boards. Any mistakes should be pointed out at once, before they are driven out of the mind by other matters. Next, let him make the tour of the inside of the excavation, examining the bank carefully. He finds the ground at the lower, or eastern end to be a fine gravel mixed with stones. The bank at the upper end, for five or six feet below the surface, is composed of a similar gravel, but below this appears a stratum of greenish clay, hard at the upper part, but softening into mud below. The clay continues along the bank to the site of the tower, where it ends in a large mass of loose slaty rock, from which water trickles rapidly. The south side of the tower excavation shows only gravel.

Tour of Inspection.

Appearance of the Excavation.

These appearances demand careful consideration, for they indicate a state of affairs involving both serious dangers to be overcome, and costly extra works to be planned, and the payment for them satisfactorily arranged.

The operations which will be necessary in the present case will be best understood by going through a process of reasoning similar to that which should occupy the superintendent's mind on viewing the circumstances.

The appearance of the hard clay stratum a short distance below the gravel at the upper side of the excavation warns us that it is first of all necessary to cut off the water, which in rainy weather will soak through the gravel, and collecting on top of the clay will follow it down hill in a wide, shallow sheet, so that the foundation wall, at the line where the clay stratum comes against it, would soon be soaked. We have had the trenches cut eight inches wider than the wall, expressly for the purpose of allowing this to be built up smooth and independent on the outside, and protecting it by filling the vacant space with gravel, which will intercept a part of the descending sheet, but this is not enough; a trench must be dug a few feet in front of the west wall of the church, deep enough to cut into the clay stratum the whole length. If the clay bed slopes northward or southward, as well as eastward, the trench may follow it downward, discharging into one of the road drains. (Fig. 26.) If its section in that direction is horizontal, the trench may take the form of a shallow V, with an outlet at each end. These trenches are to be half filled with loose stones, covered with straw or hay, and filled up with gravel.

Clay Stratum.

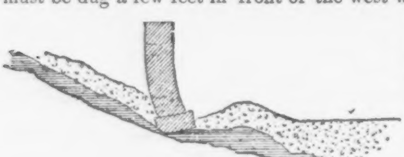


Fig. 26.

The water descending the hill on the surface of the clay stratum is thus completely intercepted, and if it were not for the ledge of rocks, which as we have ascertained extends beneath the clay bed, there would be no need of any further precautions, unless to give a little extra depth to the trenches in the clay, to insure against the effects of frost, which will penetrate a foot deeper in a clay soil, than in dry gravel.

But by closer attention we shall find that the clay bed is uniformly hardest at the top, and grows softer downward, being softest just above the ledge. This means that the rain falling on the hill above, filtering down through the gravel and clay strata till it reaches the rock, is there arrested and compelled to descend along its surface, working its way between the stone and the overlying clay, which it reduces to a mud so thin, after protracted wet weather, that the superincumbent material will slide along the top of the ledge thus lubricated, if any way is open for it to escape. The indications are that the ledge extends along the whole western line of the building, and by excavating the church cellar, a space will be open into which the clay, pressed upon by the weight of the walls which come over that portion of the foundation, will be able to force its way, the cellar floor rising and the wall settling, as the soft mud beneath is squeezed out under the load. (Fig. 27.) This is no imaginary danger, but is the certain consequence of the operations proposed. How can the programme be changed to meet the difficulty?

Clay over Sloping Rocks.

It might be possible to cut an intercepting trench in the ledge, similar to that by which we propose to cut off the water descending on the surface of the clay; but this would be expensive, and there might be seams of loose rock, like that found under the tower, through which the streams would run in the interior of the ledge, and coming again to its surface below the trench, would render this useless.

Might not the foundation be carried through the clay to the rock itself?

This would be effectual in preventing settlement, but from the inclination of the surface of the ledge exposed under the tower at the north-west corner, we can roughly estimate that the rock under the north-west angle would be at least ten feet below the cellar bottom, and to carry the foundation to this depth would add materially to the cost of the building. Besides, it would be hardly wise to dam up the descending water by a continuous wall, which would be in danger of being gradually undermined by the flow. Rather let us bring up piers from the rock, with arches below the cellar floor level, and the wall can then rest on these arches without danger of settlement, while the water will find its way between them and continue its course, far enough below the cellar floor to do no harm. For these piers we will use concrete, which will be much cheaper than brick or stone masonry, and will resist better the undermining action of the subterranean water.

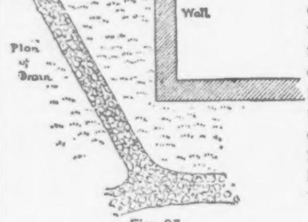


Fig. 27.

A short deliberation is needed to convince us that this is the best mode of overcoming the difficulty, and the arches are marked out on the foundation plan, through the whole extent of the west front, leaving the largest opening in the middle of the wall, under the great west window. Whether similar arches shall be continued under the north and south walls is next to be considered; but these are so much lighter than the west gable wall that their effect on the clay bed would be far less; moreover, this bed is here at a much greater distance from the surface, and, most important of all, the effect of a vertical pressure would be to press it outward, instead of inward toward the excavation, so that the weight and inertia of the whole depth of gravel above it will operate to keep it in place. There is some danger of unequal settlement at the junction of these walls, which stand on slightly compressible gravel, with the west wall, which by its piers extends to the incompressible rock; so we will enlarge the footings of these walls near the junction, thereby spreading the weight over a large surface, and reducing the land on each square foot of gravel so far that it will be borne without any yielding. An additional six inches on each side, obtained by adding one course of footings, will suffice, if the stones are reasonably flat, and making a memorandum of this we proceed to consider the foundation of the tower.

Here there is no doubt as to the support, the rock being everywhere above or near the level of the footings. The point requiring most attention is the spring of water flowing from the seam of loose rock. There is only one thing to be thought of; that is, to collect this water in a covered receptacle which cannot overflow, and convey it by a tight conduit to a safe outfall beyond the walls of the building. This will be somewhat costly, and the builder, and perhaps the church committee, desirous of avoiding needless expense, will quote the example of other structures in the neighborhood which have uncovered springs in the cellar, and where they are allowed to flow away by an open channel, but the architect or superintendent should not allow himself to be persuaded by these arguments. He will find, if he cares to inquire, that in every one of the buildings mentioned, the cellar walls and ceilings are dripping with moisture, the first story beams are blackening with incipient decay, the structures themselves are chilly and difficult to warm in winter, and a penetrating smell hangs about them in summer, especially after rains.

Water Vein in Rock.

Wet Cellars.

These are the houses where the young people die of consumption, one after the other; or the churches that one enters with a sudden depression of spirits, and leaves with a headache or a cold. Let the architect claim the authority due to superior knowledge, and refuse to sanction anything short of absolute security against water within the cellar walls.

Fortunately, there is but one spring, although that is a copious one, flowing some fifty gallons per hour. We will therefore excavate, by pick and by blasting, a rough well on the line of the seam, just outside the cellar wall, and carried to a depth of at least 2½ feet below the cellar floor. If there had been several water-bearing seams, we should have been compelled, instead of excavating the well outside the wall, to make it beneath the wall itself, by cutting the trenches two feet or more below the cellar floor, and putting in the first foundation stones dry, without mortar, so that the water could collect in the vacant spaces. This would keep the moisture from invading the cellar, but the wall might be damp from the water standing beneath it, so that a well entirely outside of the wall is preferable. We will, however, to provide for the possibility of water coming in wet weather through seams now dry, deepen the trenches about a foot, and lay the first course of stones dry, bringing this trench into communication with the well, so that water entering under any part of the wall will find its way to the well. A channel is then to be made, and a tight pipe laid with cemented joints below the cellar floor from the well, across the tower and under the opposite wall to the outside of the building, until the gravel is reached, where the pipe may end in a pit filled with loose stones.

Having plainly indicated the arches, piers, drains and well, the question is to be settled, — Who shall pay for all this extra work?

The principle to be kept in view in the decision is that, unless some special agreement has been made, the builder cannot be obliged to pay the cost of extra foundation, concrete, or other works rendered necessary by peculiarities of the ground which could not have been reasonably expected or foreseen when the contract was signed: he is, however, assumed to have examined the ground where the proposed building was to stand, and to have included in his contract price the risk of common defects, such as clay beds in gravel, rock in a spot where the ledge appears on the surface near by, or of springs in any soil.

Of course the best way would have been to bore at different points around the building, to find out the depth and nature of the soil, and by the light of these tests to draw the foundation plans and specify the various works, but this is rarely done in ordinary buildings, and the object of this treatise is as much to come to the rescue in the common cases of forgetfulness, omission, or unforeseen difficulty, as to point out the course which would be absolutely the best for all buildings.

In the present case, it is decided that, the clay seam being a common occurrence in gravelly soils, the contractor shall bear the expense of the trench and drain for cutting off the water which would flow over its surface toward the building; and shall also pay for the drain to carry off the spring-water from under the tower; but that the cost of carrying down the foundations of the west wall beyond the point shown on the drawings, the extra width of footings under the north wall, and the necessary blasting under the tower, shall fall on the church, for the reason that the ledge did not appear above ground anywhere near the site of the building, and therefore its existence so near the surface as to interfere with the foundations would not reasonably be inferred with sufficient certainty to form an element in the contract price; the same rule applying also to the clay bed resting on the rock.

Apportionment of Cost.

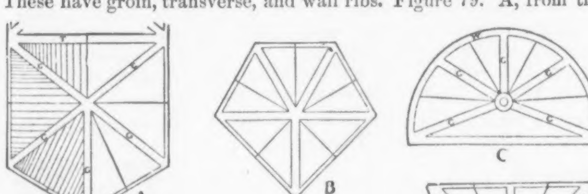
The new work should be clearly described in a supplementary specification, giving the proportion of cement, sand, and pebbles in the concrete, mentioning the large flat stones which should form the upper part of the piers, and from which the arches will spring; requiring that the arches shall be built on centres, of good, hard brick, in mortar made with one part sand to one of cement, in four rowlocks for the small arches, and five in the large one; with any other particulars which may make the meaning more clear. The drawings should be rectified by notes and diagrams in the margin, a record of all the facts, with copies of all instructions and orders, kept by the superintendent, and a price agreed upon, setting off against the cost of blasting under the tower the amount of earth excavation saved, and the value of the rough stone obtained. An additional agreement, embodying the supplementary specification and the extra price agreed upon, is drawn up, signed by both parties, and attached to the original contract, and the work is ready to proceed.

All this sounds long, but it is time well spent, for a few hours more in arranging the preliminaries will save days as well as dollars to both parties in the final settlement. A glance at the rough stone delivered, with an admonition to the builder to get the footing-stones as flat as possible, and the summary sending off the ground of a lot of staging lumber which has just arrived, containing a number of knotty and shaky poles, calling the builder's attention at the same time to their rejection, may terminate our duties for the day.

VAULTS. — VIII.

SPRINGERS.

3. QUINQUEPARTITE. *a.* For covering a pentagonal space. These have groin, transverse, and wall ribs. Figure 79. A, from the



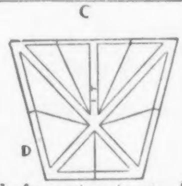


Fig. 79.

choir aisle of St. Mary's, Lubeck; B, from Bruges and Oppenheim; C, from Noyon. They occur over the chapels which form the *chevets* of the apsidal choirs.

b. For covering a rectangular space. Figure 80, from Luneburg. Three of the wall-ribs, 1, 2, 3, on the plan, are over, or are parts of, arches which open, 1 into the nave, 2 and 3 into the adjoining compartments of the aisle, 4 and 5 are on the aisle wall, and there is a window under each. On this side, what would otherwise be a single cell is divided by an intermediate transverse-rib into two oblique cells. Figure 80 *a*, is from the aisles of Lincoln Cathedral.

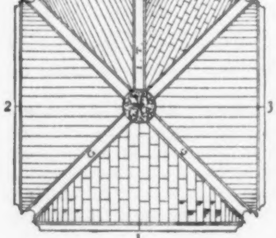


Fig. 80.

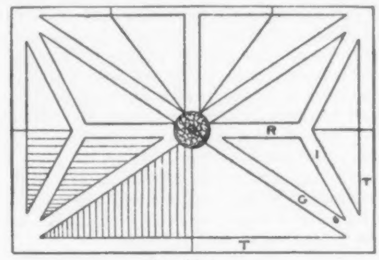


Fig. 80 *a*.

c. The above adapted to a trapezoidal space. Figure 79, D, from the choir triforium of Magdeburg Cathedral. Four of the cells are oblique.

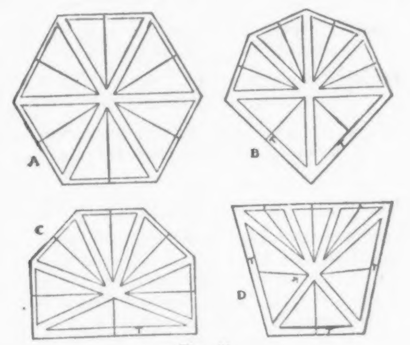


Fig. 81.

4. SEXPARTITE. In Figure 81 are plans of vaults with six cells. A is from the clerestory of the hexagonal chapel at Cobern. B from Treves, covering a space which belongs partly to the aisle and partly to a chapel. C from St. Werner's Chapel, Bacharach; and from Antwerp Cathedral. D from Auxerre, over a compartment of the aisle.

The form commonly known as sexpartite, or hexapartite, is shown in Figures 82 and 83. It is very common in the late Romanesque and early Gothic. Examples may be found at Lincoln, Canterbury, Mantes, Laon, Caen, Dijon, Auxerre, Sens, Notre-Dame-de-Paris,

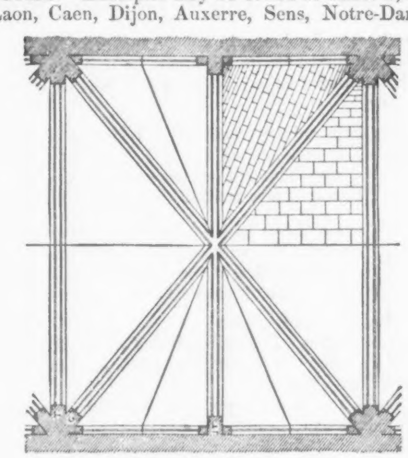


Fig. 82.

H. Aposteln at Cologne, etc. The side vaults are double and oblique, separated by an intermediate transverse-rib. In early examples the wall-ribs are semicircular; and in many cases they spring from a higher level than the other ribs.

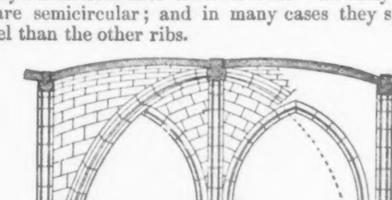


Fig. 83.

5. SEPTPARTITE. Figure 84 shows the common form. It is used over rectangular compartments, in towers and transepts chiefly, which have walls on three sides and an arch on the other. Limburg Cathedral.

BUILDERS' PRICE BOOKS.

IN answer to the question of a correspondent some weeks ago regarding price books, we omitted to mention the chapter on values (of labor only) for various kinds of carpenter-work contained in Vogdes' Architects' and Builders' Pocket Companion, and forming not the least valuable portion of that excellent little book. No doubt, a list including the values both of material and labor, and in a variety of trades, would be most acceptable to architects, but, as Mr. Vogdes says, our markets for materials vary so much that such prices are not reliable, and can only serve as guides to comparative cost, while the average time required for a man to do a given kind of carpenter-work is invariable, and the cost of the labor involved is in a fixed ratio to the standard of a day's wages, and can be calculated with perfect certainty, so that such prices as he includes are practically accurate. — EDS. AMERICAN ARCHITECT.

THE ILLUSTRATIONS.

INTERIOR OF THE NATIONAL MUSEUM, WASHINGTON, D. C. MESSRS. CLUSS & SCHULTZE, ARCHITECTS, WASHINGTON, D. C.

HORSE-CAR STABLES, AVONDALE, O. MR. J. W. MCLAUGHLIN, ARCHITECT, CINCINNATI, O.

MEMORIAL CHAPEL, FOXBURGH, PA. MR. JAMES P. SIMS, ARCHITECT, PHILADELPHIA, PA.

HOUSE FOR MR. A. O. DAVIDSON, WATERTOWN, MASS. MR. H. W. HARTWELL, ARCHITECT, BOSTON, MASS.

THE STRENGTH OF WROUGHT-IRON COLUMNS.[1]

THE construction of the bridge over the Ohio River for the crossing of the Cincinnati Southern Railway in 1875, and the subsequent letting during the same year of the contracts for nineteen other iron bridges and viaducts for the same road, including the important structures over the Kentucky and Cumberland Rivers, were the occasion of my first experiments on the strength of wrought-iron columns.

Gordon's and Rankine's empirical formulæ, deduced from Hodgkinson's experiments on solid bars of small sizes, and used almost exclusively by American engineers for the determination of the sectional areas of compression members, are as follows: —

Gordon's $\dfrac{P}{S} = \dfrac{f}{1 + \dfrac{a\,l^2}{h^2}}$ Rankine's $\dfrac{P}{S} = \dfrac{f}{1 + \dfrac{a'\,l^2}{r^2}}$

P = Ultimate load in lbs., producing the crushing or bending of column.
S = Sectional area of column, in square inches.
f = Constant, supposed to be equal to the ultimate resistance per square inch of a short column whose length is equal to its diameter.

a = Constant:
- For columns with flat bearings at ends $= \frac{1}{3000}$
- For columns with flat bearing at one end and rounded at the other . . . . $= \frac{2}{3000}$
- For columns rounded at both ends . . $= \frac{4}{3000}$

a' = Constant:
- For columns with flat bearings at both ends $= \frac{1}{36000}$
- For columns with flat bearing at one end and rounded at the other . . . . . $= \frac{2}{36000}$
- For columns rounded at both ends . . $= \frac{4}{36000}$

l = Length of column in inches.
h = Diameter of column in the direction of its greatest deflection.
r = Radius of gyration of cross section of column in the direction of its greatest deflection.

Gordon's formula, the more popular of the two, seemed to be accepted without sufficient experimental evidence of its correctness, as applied to a great variety of shapes, almost every individual bridge-builder having his preferred value for constant "f."

In preparing the specifications for the above named structures, I prescribed Gordon's formula, with the proviso that experiments would have to be made to determine the value of the constant "f" to be used for each kind of iron and shape of column proposed by the contractors.

Thirty-four experiments were made during the year 1875 in accordance with these specifications, whereby columns and struts of various shapes and of the full size to be used in the structures were crippled under pressure in a hydraulic press.

The following table gives the sizes and other characteristics of each of the columns tested, the results of each test, and the corresponding calculated value of the constants for Gordon's and Rankine's formulæ.

In 1877, two experiments not here tabulated were made on the occasion of the construction of the bridge across the Tennessee River for the Cincinnati Southern Railway, to verify the assumption made in the calculations that an open column composed of two channel bars latticed should be calculated by Rankine's formula, with the same constant as for a closed column composed of channel bars and plates of the same kind of iron.

In 1878 and 1879, similar latticed posts having been adopted in the designs of the thirty-four iron structures contracted for by the Keystone Bridge Company, for the completion of the road, other experiments were made to test the result previously given by the two experiments just referred to, and to regulate the spacing of the lattice bars and the thickness of metal in the channel bars.

In all these experiments the posts were placed horizontally in the press, without any intermediate guide or support, excepting a counter-balance in the centre, of about one-half their weight. The pressure, recorded by a mercurial guage, was applied by increments of from 1000 to 2000 pounds per square inch of sectional area of column, and completely released between each application.

The vertical and lateral deflection and the compression of the column under each application of pressure, and its permanent deformation after each release, were carefully measured.

Figures 1 to 4 (see *Transactions* of the American Society of Civil Engineers, Dec., 1880) show the apparatus used for measuring the compression.

A brass frame F bears a lever $m\ l\ n$, the long arm of which commands, by means of rod $m\ v$, a vernier v, moving on a graduated inch scale $g\ r$. The small arm bears an articulated rod $n\ p$ forked at the loose end p. Two footings $S\ S$, at the bottom of frame F, allow of its being fastened by means of clamp screws on to a wooden bar $A\ B$, made fast at one end to flange $f\ f$ of column by clamp C and moving freely at the other end through clamp D as a guide. Clamp D is fastened to the flange of the column at such a distance from frame F as will allow the forked end of rod $n\ p$ to bear on a small pin p, borne by clamp D.

A small weight W maintains the contact at p. The distance, moved by point p, being the compression of the length L of column between clamps C and D, is multiplied ten times on scale $g\ r$; the vernier reading the $\frac{1}{200}$ of an inch, the compression is observed to the nearest $\frac{1}{2000}$ of an inch, which for a length of twenty feet and a modulus of 24,000,000 corresponds to a pressure of fifty pounds per square inch.

After all parts had been brought to a good bearing by the first application of pressure (from five to eight thousand pounds per square inch), there was generally no permanent deformation observable until a pressure had been reached of about 15,000 pounds per square inch for the long columns, when a slight permanent set in deflection and compression would usually appear simultaneously and increase gradually until the crippling point was reached, when the column would yield faster than the pressure could be maintained by the pump.

The compression of the column during the period of perfect elasticity was carefully noted and used for the determination of the modulus. The modulus thus obtained is undoubtedly somewhat smaller than the modulus of the metal, a part of the observed compression being due to the bending of the column, but this error of observation being nearly the same for all columns of the same length does not affect materially the comparison of the results. The same may be said of the influence of the neglected friction of the plunger, and of the vibration due to the close proximity of heavy working machinery in the shops where the experiments were made.

These experiments, although very incomplete, and made under somewhat unfavorable circumstances, have enabled me to accomplish substantially the object for which they were instituted, viz.: the proportioning of the compression members in the structures built by different contractors with the same margin of safety, and they have led me to the following conclusions, derived from a careful comparison of results obtained.

1st. As between Rankine's and Gordon's formulæ, Rankine's is the more accurate of the two. This is shown by the results of the tests on the Phœnix and closed square posts, where, the parts being thoroughly united together, the large factor due to defective construction and workmanship may be considered as eliminated in a great measure. These results compare as follows: —

EXTREME VALUES OF CONSTANTS OBTAINED FOR PHŒNIX POSTS WITH FLAT ENDS.

	Rankine.	Gordon.
Largest value	49,400	57,500
Smallest value	41,100	43,700
Difference	8,300	13,800
	Less than 17%	More than 22%

EXTREME VALUES OF CONSTANTS OBTAINED FOR SQUARE CLOSED POSTS WITH FLAT ENDS.

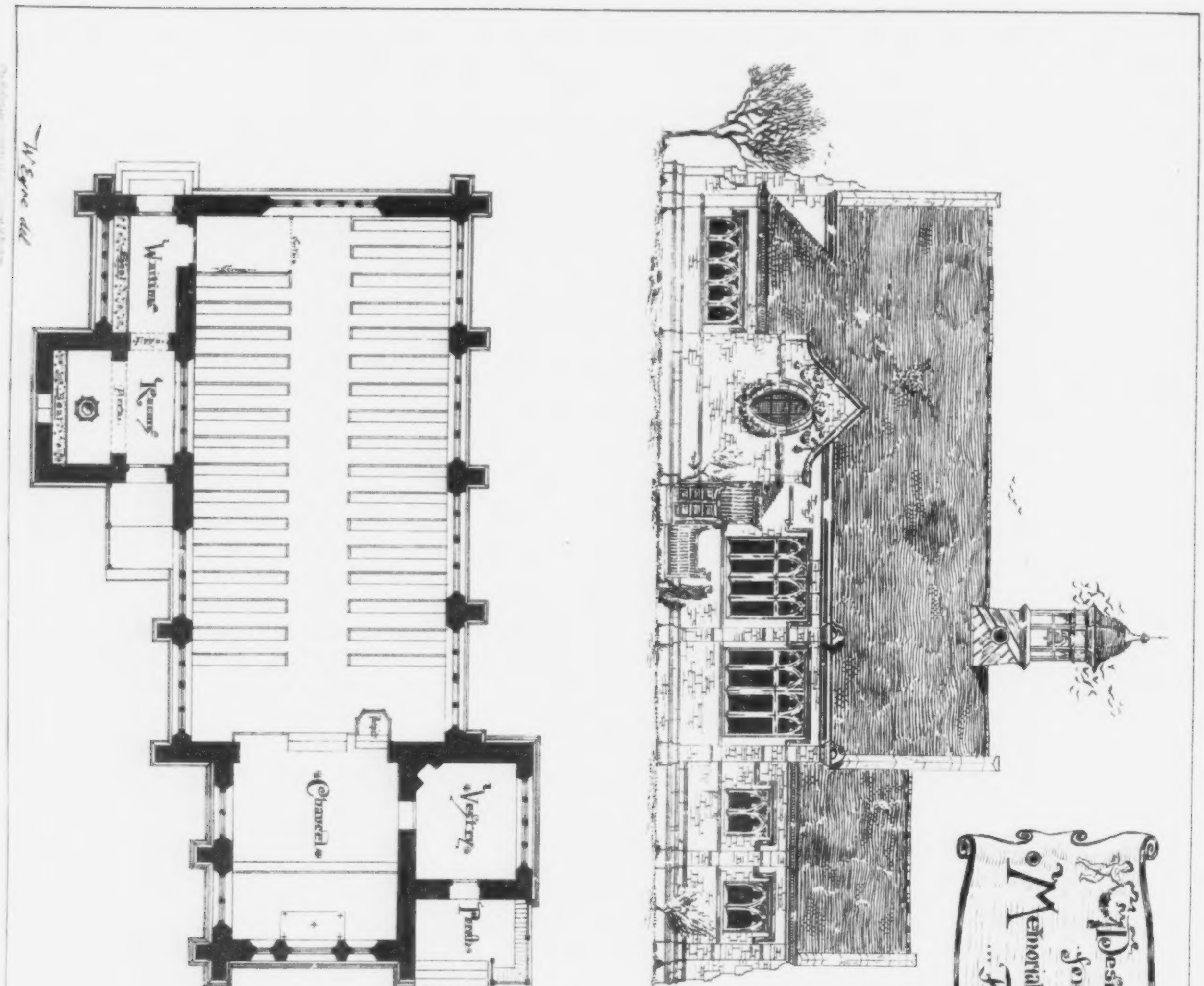
	Rankine.	Gordon.
Largest value	39,800	47,300
Smallest value	38,300	39,800
Difference	1,500	7,500
	Less than 4%	More than 15%

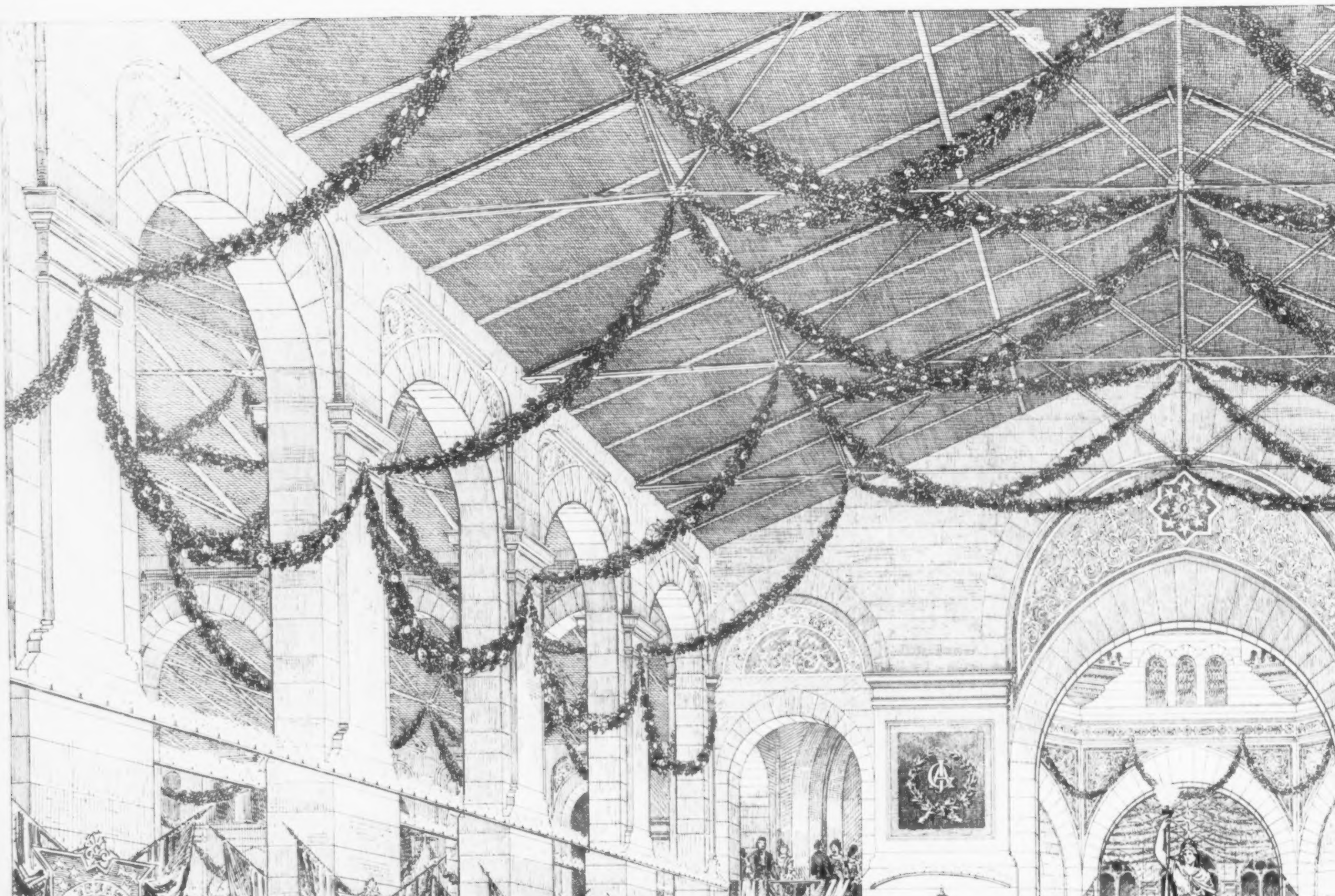
2d. Iron of the highest modulus does not necessarily make the strongest column.

This conclusion, which is at variance with the opinion entertained by many engineers, is shown in a remarkable manner by the same experiments on the Phœnix and closed square posts, where not only do the values of constant "f" fail to follow any proportional relation to the corresponding moduli, but the greatest value of "f" obtained for the Phœnix posts actually corresponds to the smallest modulus.

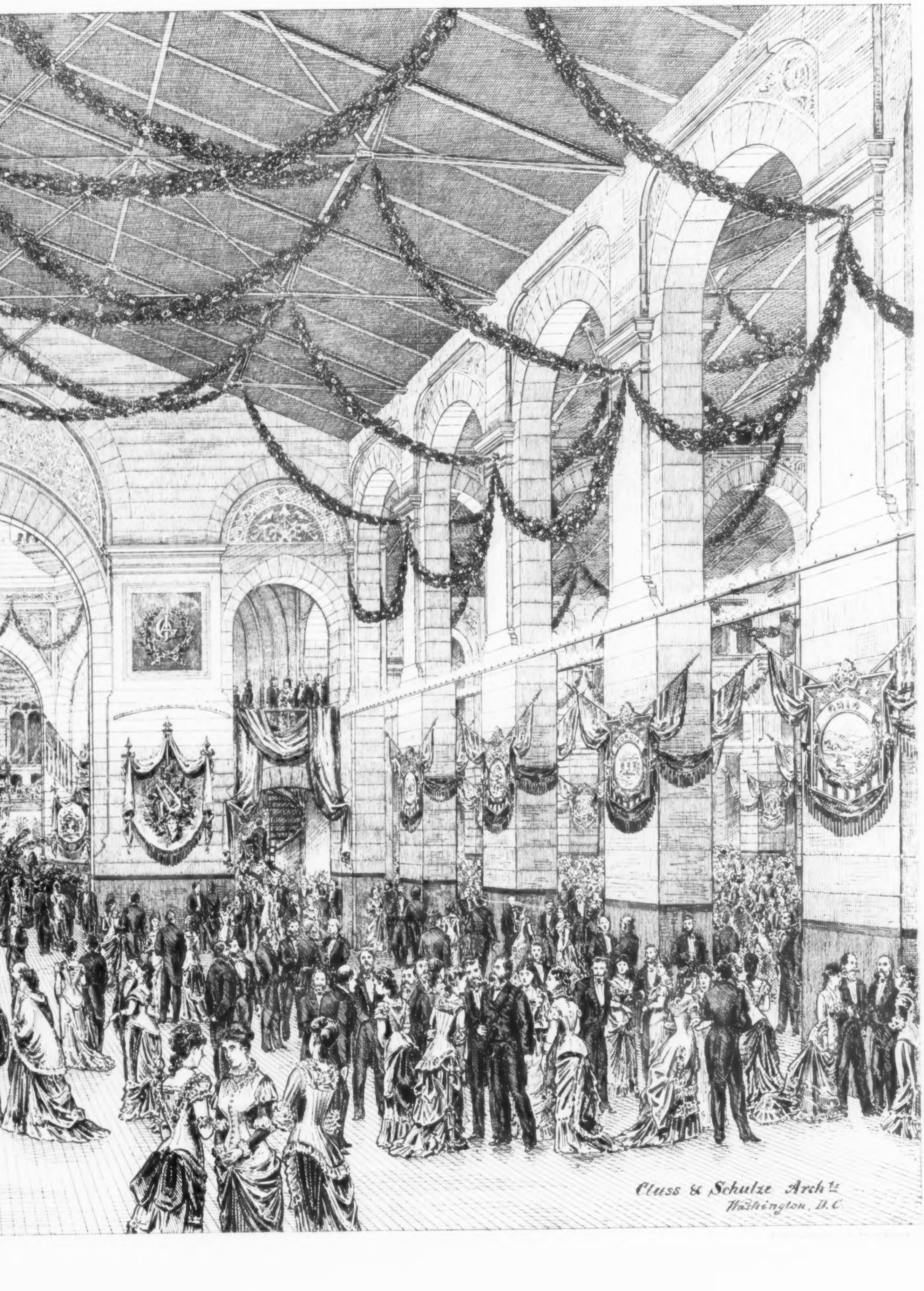
[*Continued on page* 117.]

[1] A paper by G. Bouscaren, A. S. C. E., read before the American Society of Civil Engineers, Sept. 1, 1880.
The tables which accompany this paper were rearranged for publication in the *Engineering News*, and our thanks are due to the publisher of that journal for his ready assent to our benefiting by his labors and for the use of the original illustrative cuts. — EDS.


Design for Memorial Chapel ... Foxburg ... Pa
Waiting Room
Porch
Chancel
Vestry
Porch
James P. Sims
Architect
Philadelphia



National Museum, Washington D.C.
Evening March 4th 1881.


Cluss & Schulze Arch'ts
Washington, D.C.

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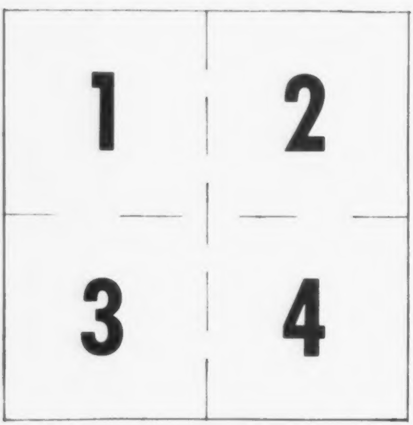
diagrams illustrate the method.



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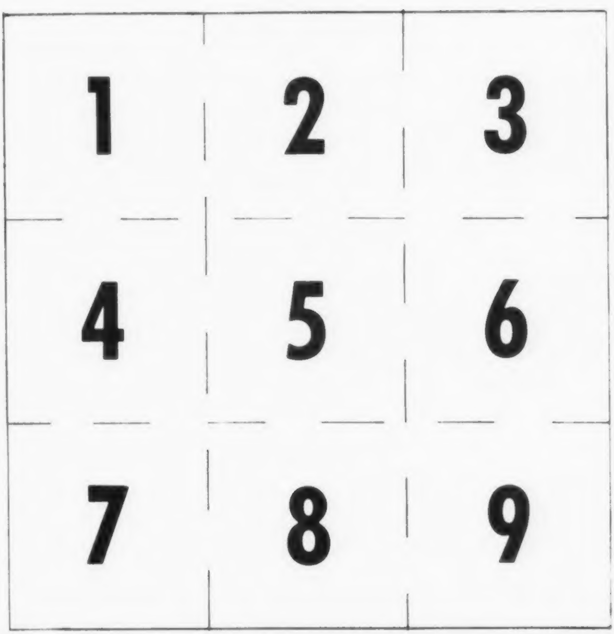
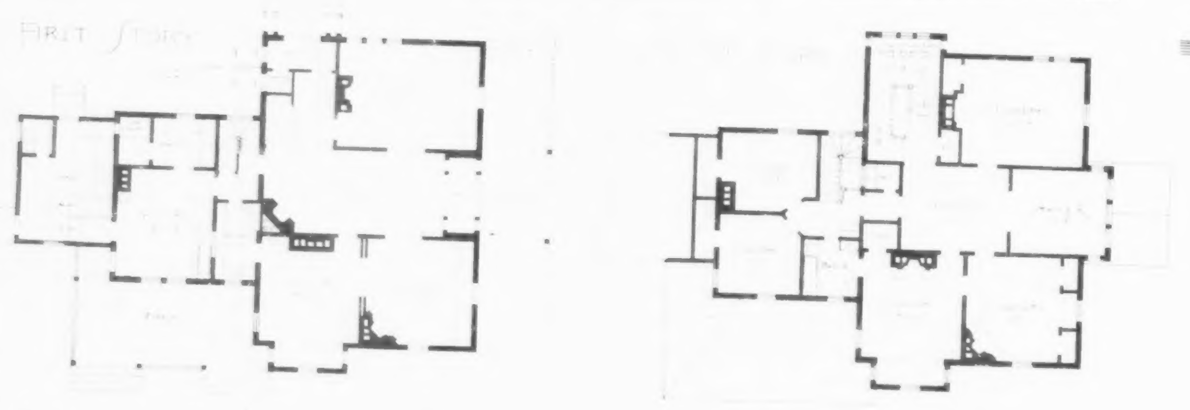
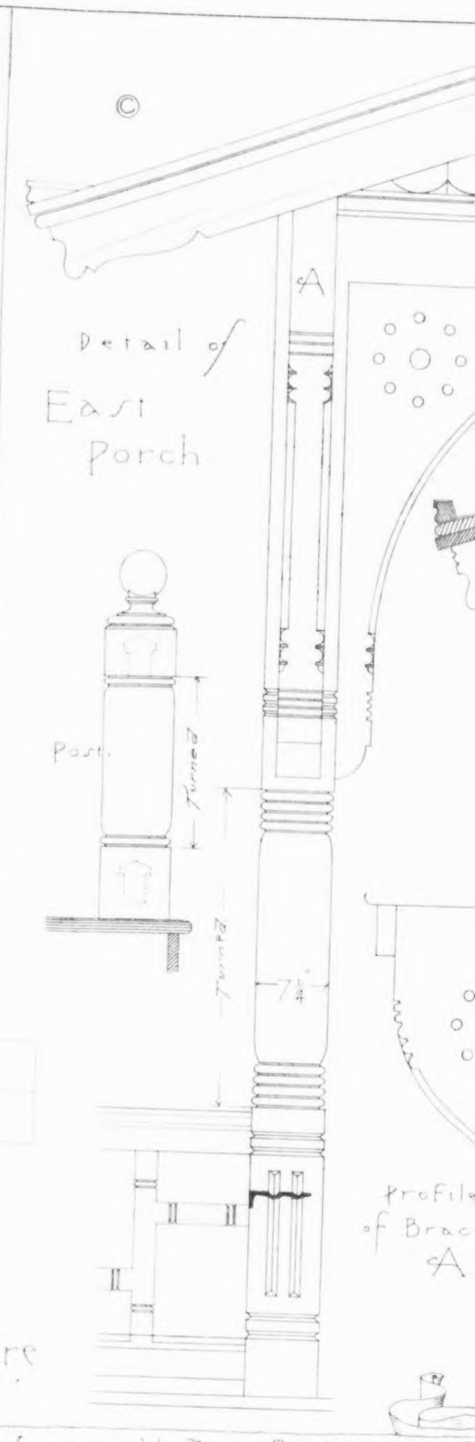
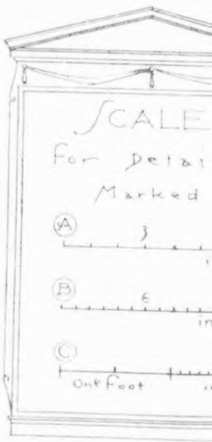
rames as required. The following

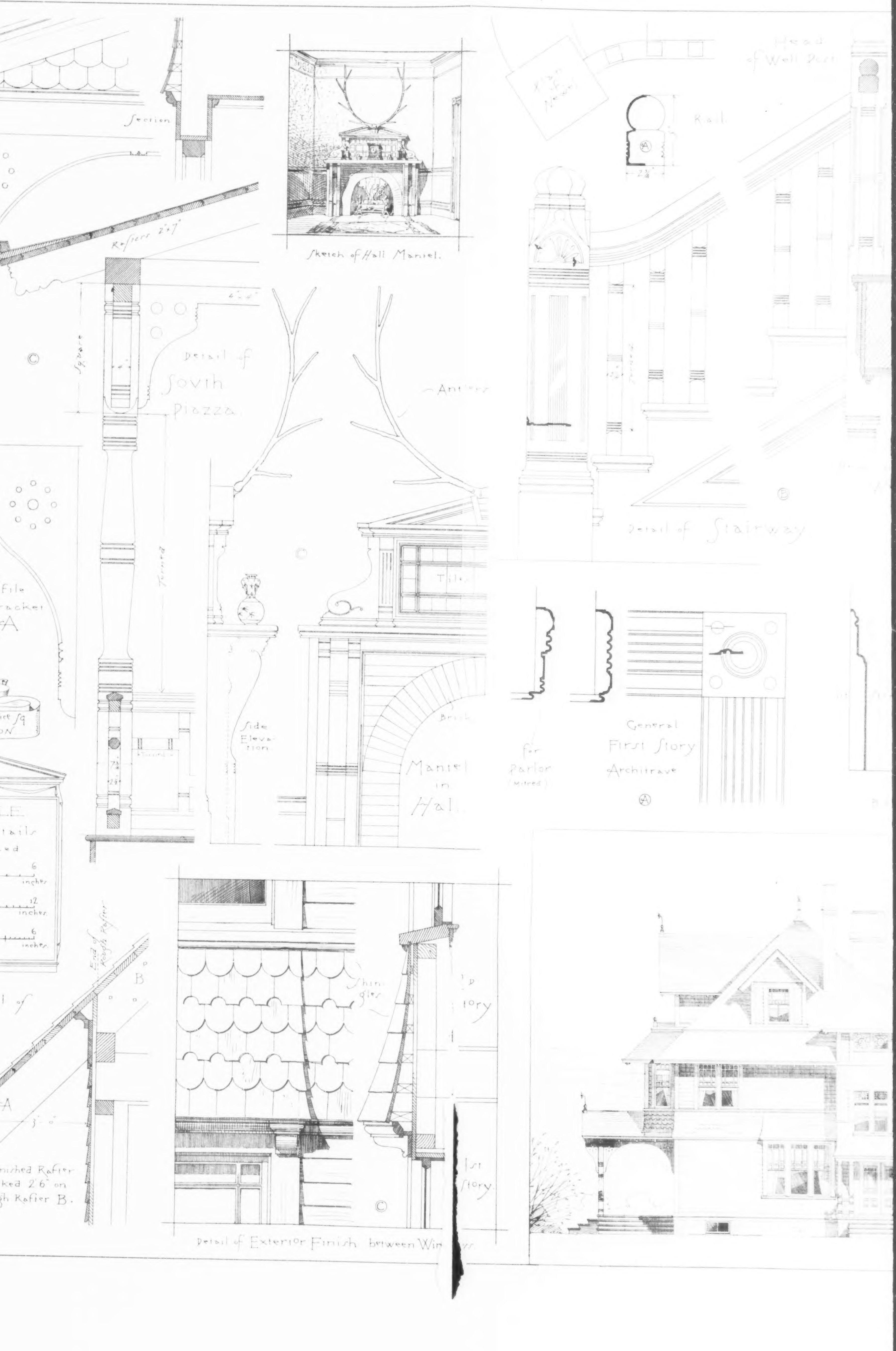


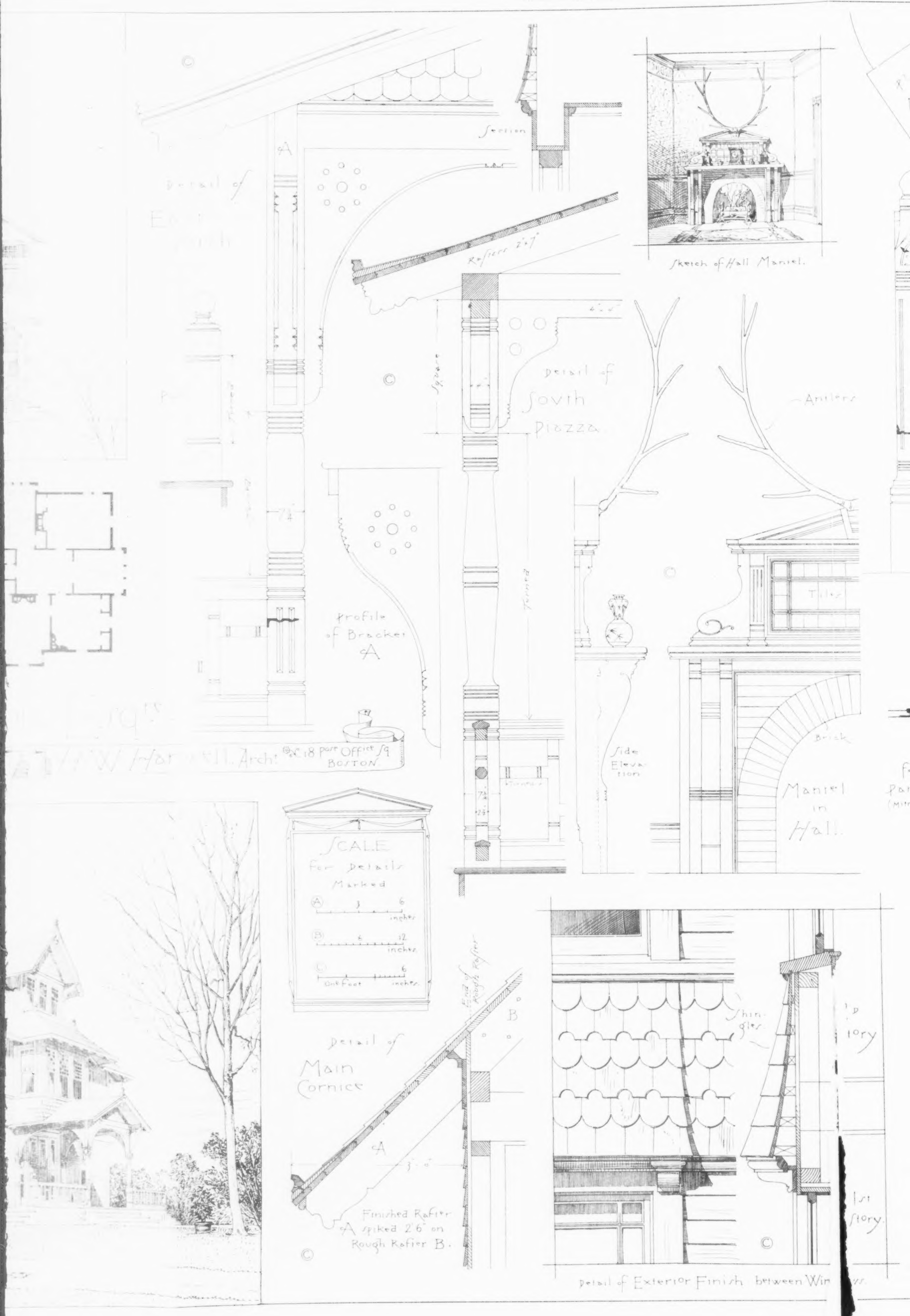


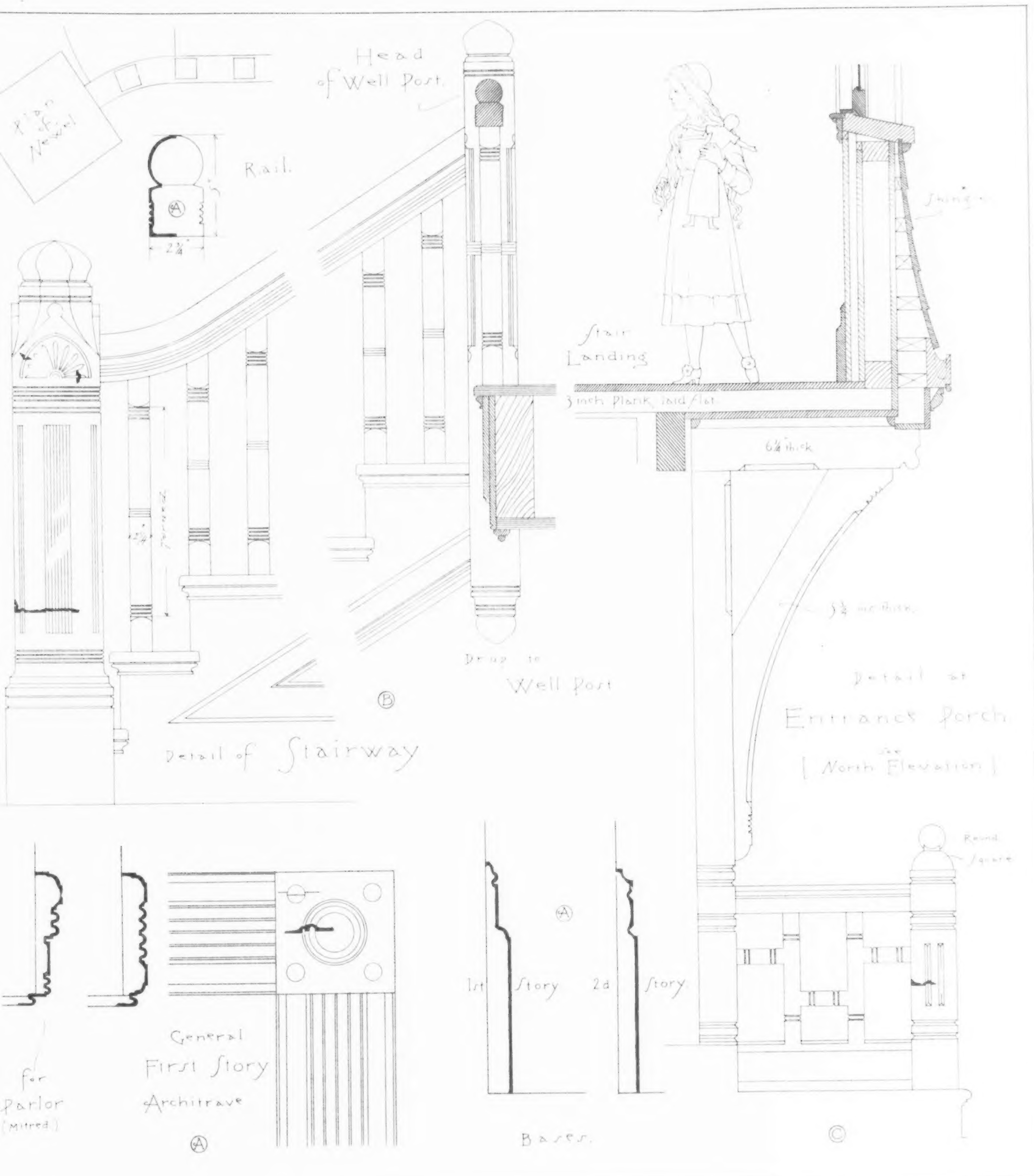


Residence of A·O·Davidson Esq^re
Watertown Mass: H·W·Hartwell, Arch^t No 18 Post Office Sq
BOSTON



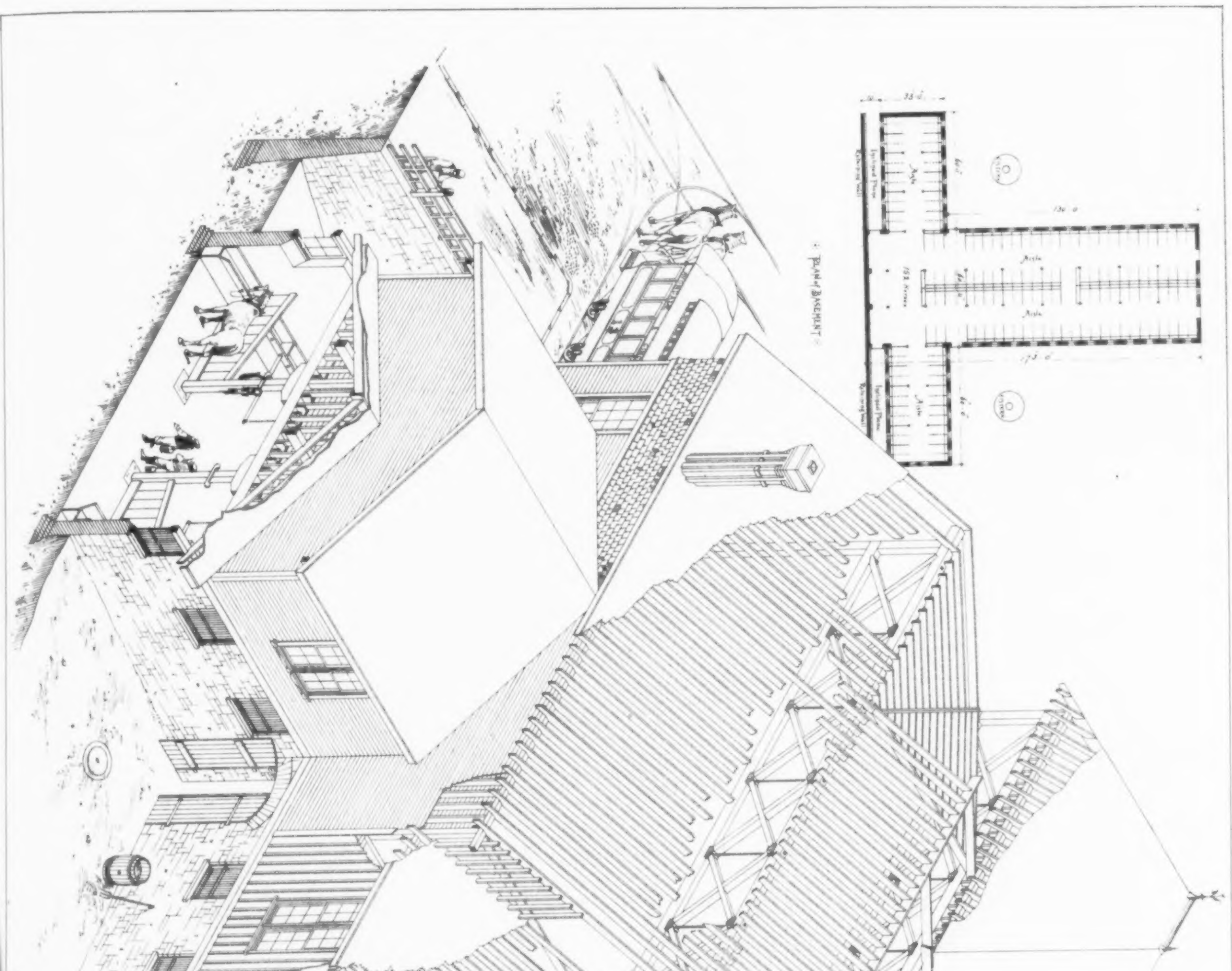

Section
Rafters 2'-7"
Sketch of Hall Mantel.
Head of Well Post
Rail
Detail of South Piazza
Antlers
Square
Turned
Side Elevation
Tile
Brick
Mantel in Hall.
for Parlor (Mitred)
General First Story Architrave
Detail of Stairway
Shingles
2D Story
1st Story
Detail of Exterior Finish between Windows
End of Rough Rafter
inches
Finished Rafter
Rough Rafter B.


Section
Rafters 2"x7"
Sketch of Hall Mantel.
Detail of
South
Piazza
Antlers
Profile
of Bracket
A
Tiles
Side
Elevation
Brick
Mantel
in
Hall
Arch't No 18 Post Office Sq
BOSTON
SCALE
For Details
Marked
inches
One Foot
Detail of
Main
Cornice
Finished Rafter
A spiked 2'6" on
Rough Rafter B.
Shingles
1st
Story
Detail of Exterior Finish between Windows.

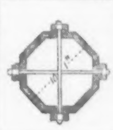
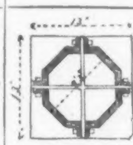
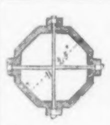
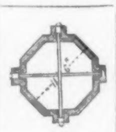
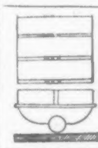
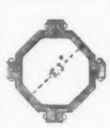
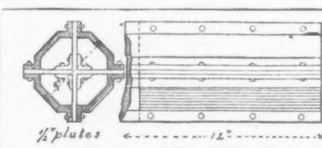
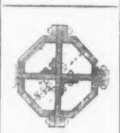
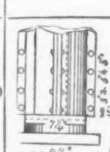
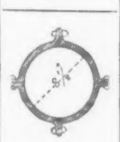
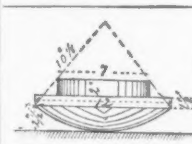
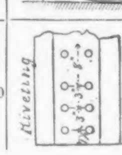


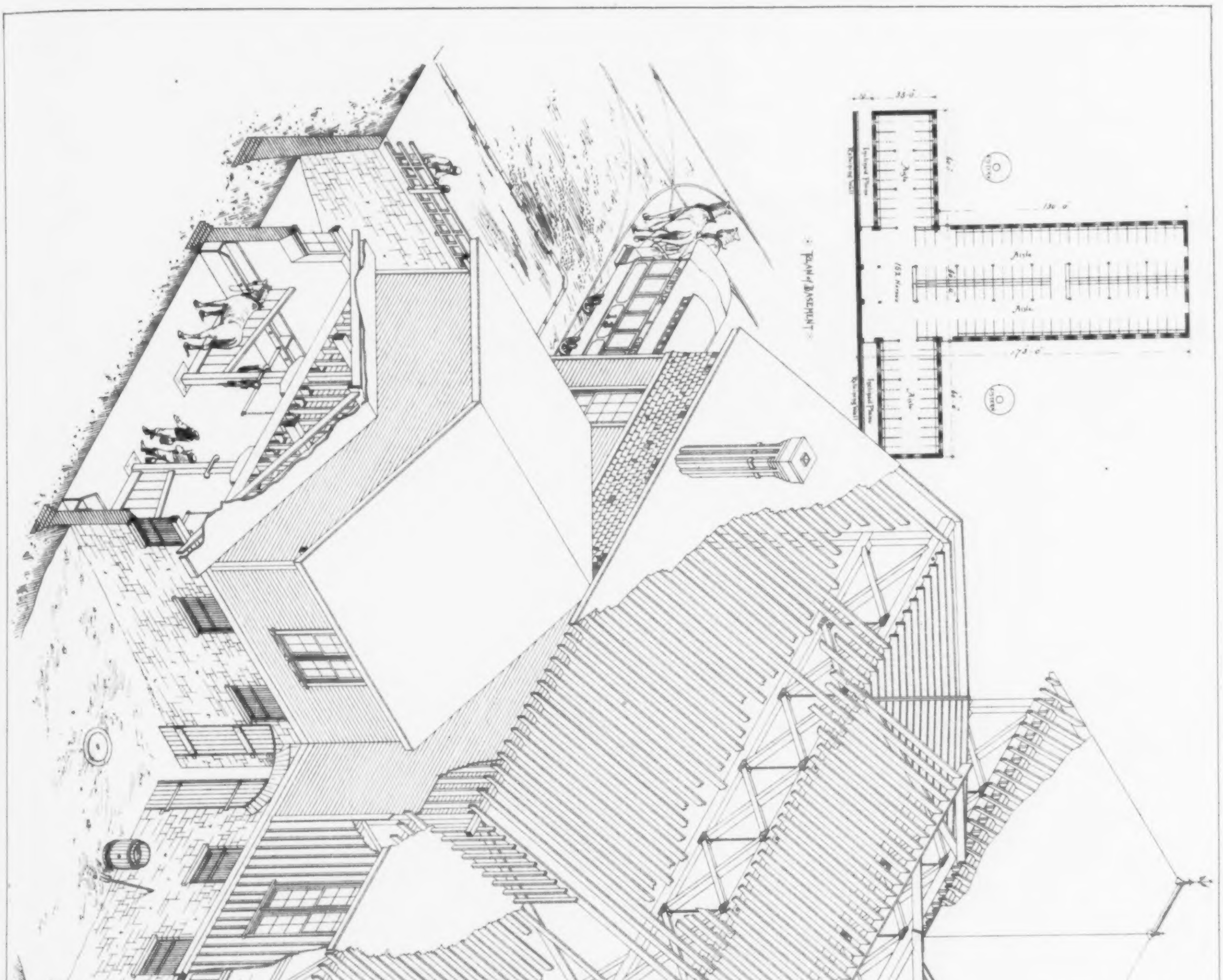
Head of Well Post
Plan of Newel
Rail
2¼
Stair Landing
3 inch Plank laid flat
6¼ thick
Drop to Well Post
Detail of Stairway
Detail at Entrance Porch
(See North Elevation)
Round
Square
for Parlor (Mitred)
General First Story Architrave
1st Story
2d Story
Bases

North Elevation


Plan of Basement
Plan of First Floor
Isometrical View
of Construction of
CAR HOUSE & STABLES
for the
Cincinnati Street Railway Co.
Avondale Ohio.

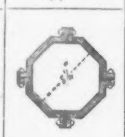
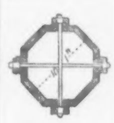
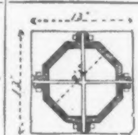
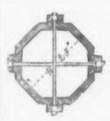
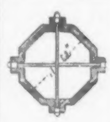
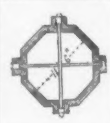
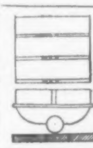
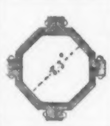
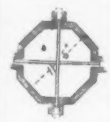
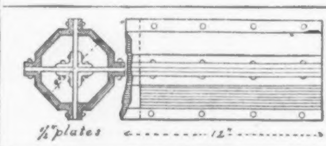
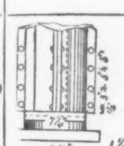
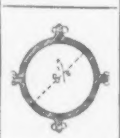
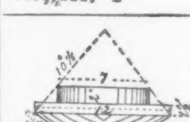
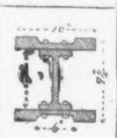
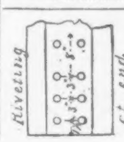
EXPERIMENTS ON WROUGHT-IRON COLUMNS.

No.	Kind of Column.	Iron, where rolled.	Tests, where made.	Date of test.	Length of Column.	Sectional area in square inches.	Middle section and diameter.	Distance f'm centre to centre of rivets.	Pressure per sq. in. producing permanent set in lbs.	Pressure per sq. in. causing fracture in lbs.	Modulus of elasticity.	Remarks.
					Ft. In.			In.				
1	Keystone, riveted through flanges.	Union Iron Mills, Pittsburgh, Pa.	Pittsburgh, Pa.	April 19, 1875.	0 9	14.25		5	40,000 commenced buckling between rivets.	51,500 Plates buckled.	....	Planed at both ends.
2	Keystone, riveted diametrically between flanges. Column swelled.	Union Iron Mills, Pittsburgh, Pa.	Pittsburgh, Pa.	April 19, 1875.	5 0	14.25		15	......	33,600 Broke by buckling between rivets.	....	 Fitted with square castings and bolted at ends.
3	Keystone, riveted diametrically between flanges. Column swelled.	Union Iron Mills, Pittsburgh, Pa.	Pittsburgh, Pa.	April 19, 1875.	15 0	14.84		15	......	28,000 Broke by deflection.	....	Same as above. Diameter 9.2 inches at ends.
4	Keystone, riveted diametrically between flanges. Column swelled.	Union Iron Mills, Pittsburgh, Pa.	Pittsburgh, Pa.	April 20, 1875.	27 0	12.96		15	16,700	24,100 Broke by deflection.	....	Same as above. Diameter 9.2 inches at ends.
5	Keystone, riveted diametrically between flanges. Column swelled.	Union Iron Mills, Pittsburgh, Pa.	Pittsburgh, Pa.	April 21, 1875.	27 0	13.12		15	15,000	22,000 Broke by deflection.	29,500,000	 Square castings at ends with flanges fitting on a pin, the whole length of the latter bearing against an abutting casting. Diameter of column at ends = 9.22 inches.
6	Phœnix, riveted through flanges.	Phœnixville, Pa.	Pittsburgh, Pa.	April 27, 1875.	15 0	14.09		6	35,000	37,500 Broke by deflection.	27,400,000	Column planed at both ends. No shoes.
7	Keystone, riveted through flanges.	Union Iron Mills, Pittsburgh, Pa.	Pittsburgh, Pa.	April 27, 1875.	15 0	14.62		6	17,500	30,000 Broke by deflection.	23,800,000	Column planed at both ends. No shoes.
8	Keystone, riveted diametrically between flanges. Column swelled.	Union Iron Mills, Pittsburgh, Pa.	Pittsburgh, Pa.	April 28, 1875.	15 0	14.8		15	15,000	36,900 Broke by buckling between rivets.	29,600,000	 Ends riveted with cross plates and angle-irons, and planed.
9	Keystone, riveted through flanges. Column not swelled.	Union Iron Mills, Pittsburgh, Pa.	Pittsburgh, Pa.	April 28, 1875.	15 0	23.67		6	19,000	32,000 Broke by deflection.	24,700,000	Planed at both ends. No shoes.
10	Phœnix, riveted through flanges.	Phœnixville, Pa.	Chicago, Ill.	June 2, 1875.	27 0	13.7		6	18,000	31,000 Broke by deflection.	29,100,000	 Column fitted with square castings at ends, and last four rivets spaced 3 inches from centre to centre.
11	Phœnix, riveted through flanges.	Phœnixville, Pa.	Chicago, Ill.	June 2, 1875.	27 0	13.89		6	17,000	21,700 Broke by deflection.	27,100,000	 Ends closely riveted as above and fitted with castings having spherical abutting surfaces.
12	American Bridge Co.	Cleveland Rolling Mills, Cleveland, O.	Chicago, Ill.	June 2, 1875.	20 0	20.1		8	15.000	Column discovered not to fit well, and trial discontinued at 19,000.	20,200,000	 Ends planed to fit squarely on abutting casting.

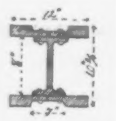
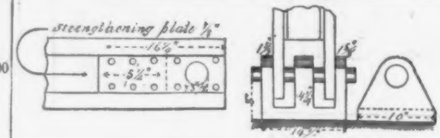
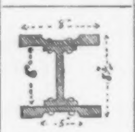
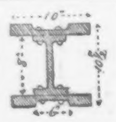
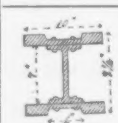
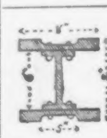
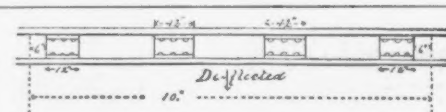
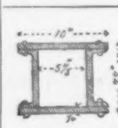
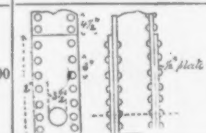
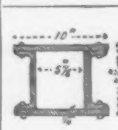
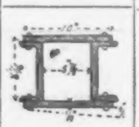
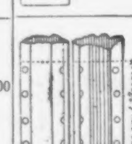


Isometrical View
of Construction of
CAR HOUSE & STABLES
for the
CINCINNATI STREET RAILWAY CO.
Avondale Ohio.
PLAN of BASEMENT
PLAN of FIRST FLOOR

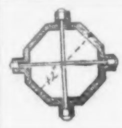
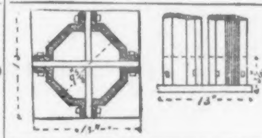
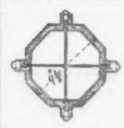
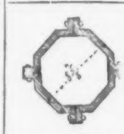
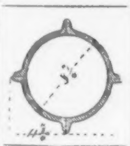
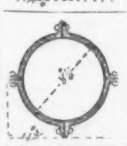
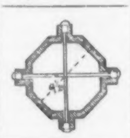
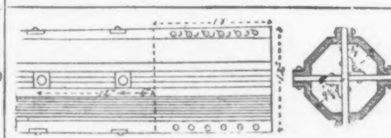
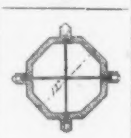
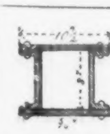
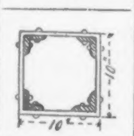
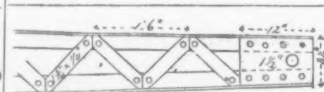
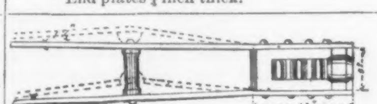
EXPERIMENTS ON WROUGHT-IRON COLUMNS.

No.	KIND OF COLUMN.	Iron, where rolled.	Tests, where made.	Date of test.	Length of Column. Ft. In.	Sectional area in square inches.	Middle section and diameter.	Distance f'm centre to centre of rivets. In.	Pressure per sq. in. producing permanent set in lbs.	Pressure per sq. in. causing fracture in lbs.	Modulus of elasticity.	REMARKS.
1	Keystone, riveted through flanges.	Union Iron Mills, Pittsburgh, Pa.	Pittsburgh, Pa.	April 19, 1875.	0 9	14.25		5	40,000 commenced buckling between rivets.	51,500 Plates buckled.	....	Planed at both ends.
2	Keystone, riveted diametrically between flanges. Column swelled.	Union Iron Mills, Pittsburgh, Pa.	Pittsburgh, Pa.	April 19, 1875.	5 0	14.25		15	......	33,600 Broke by buckling between rivets.	....	 Fitted with square castings and bolted at ends.
3	Keystone, riveted diametrically between flanges. Column swelled.	Union Iron Mills, Pittsburgh, Pa.	Pittsburgh, Pa.	April 19, 1875.	15 0	14.84		15	......	28,000 Broke by deflection.	....	Same as above. Diameter 9.2 inches at ends.
4	Keystone, riveted diametrically between flanges. Column swelled.	Union Iron Mills, Pittsburgh, Pa.	Pittsburgh, Pa.	April 20, 1875.	27 0	12.96		15	16,700	24,100 Broke by deflection.	....	Same as above. Diameter 9.2 inches at ends.
5	Keystone, riveted diametrically between flanges. Column swelled.	Union Iron Mills, Pittsburgh, Pa.	Pittsburgh, Pa.	April 21, 1875.	27 0	13.12		15	15,000	22,000 Broke by deflection.	29,500,000	 Square castings at ends with flanges fitting on a pin, the whole length of the latter bearing against an abutting casting. Diameter of column at ends = 9.22 inches.
6	Phœnix, riveted through flanges.	Phœnixville, Pa.	Pittsburgh, Pa.	April 27, 1875.	15 0	14.09		6	35,000	37,500 Broke by deflection.	27,400,000	Column planed at both ends. No shoes.
7	Keystone, riveted through flanges.	Union Iron Mills, Pittsburgh, Pa.	Pittsburgh, Pa.	April 27, 1875.	15 0	14.62		6	17,500	30,000 Broke by deflection.	23,800,000	Column planed at both ends. No shoes.
8	Keystone, riveted diametrically between flanges. Column swelled.	Union Iron Mills, Pittsburgh, Pa.	Pittsburgh, Pa.	April 28, 1875.	15 0	14.8		15	15,000	36,900 Broke by buckling between rivets.	29,600,000	 Ends riveted with cross plates and angle-irons, and planed.
9	Keystone, riveted through flanges. Column not swelled.	Union Iron Mills, Pittsburgh, Pa.	Pittsburgh, Pa.	April 28, 1875.	15 0	23.67		6	19,000	32,000 Broke by deflection.	24,700,000	Planed at both ends. No shoes.
10	Phœnix, riveted through flanges.	Phœnixville, Pa.	Chicago, Ill.	June 2, 1875.	27 0	13.7		6	18,000	31,000 Broke by deflection.	29,100,000	 Column fitted with square castings at ends, and last four rivets spaced 3 inches from centre to centre.
11	Phœnix, riveted through flanges.	Phœnixville, Pa.	Chicago, Ill.	June 2, 1875.	27 0	13.89		6	17,000	21,700 Broke by deflection.	27,100,000	 Ends closely riveted as above and fitted with castings having spherical abutting surfaces.
12	American Bridge Co.	Cleveland Rolling Mills, Cleveland, O.	Chicago, Ill.	June 2, 1875.	20 0	20.1		8	15.000	Column discovered not to fit well, and trial discontinued at 19,000.	20,200,000	 Ends planed to fit squarely on abutting casting.

EXPERIMENTS ON WROUGHT-IRON COLUMNS. — *Continued.*

No.	Kind of Column.	Iron, where rolled.	Tests, where made.	Date of Test.	Length of Column.	Sectional area in square inches.	Middle section and diameter.	Distance f'm centre to centre of rivets.	Pressure per sq. in. producing permanent set, in lbs.	Pressure per sq. in. causing fracture in lbs.	Modulus of elasticity.	Remarks.
					Ft. In.			In.				
13	American Bridge Co.	Cleveland Rolling Mills, Cleveland, O.	Chicago, Ill.	June 2, 1875.	26 0	25.05		8	12,000	24,000 Broke by deflection downward.	30,400,000	 Pin ends.
14	American Bridge Co.	Cleveland Rolling Mills, Cleveland, O.	Chicago, Ill.	June 3, 1875.	26 0	20.72		8	14,000	22,000 Broke by deflection sideways.	26,000,000	Pin ends as above.
15	American Bridge Co.	Cleveland Rolling Mills, Cleveland, O.	Chicago, Ill.	June 3, 1875.	30 0	14.97		8	13,000	23,700 Broke by deflection sideways.	26,000,000	Ends planed and riveted as for No. 12. Columns balanced at centre with 500 lbs.
16	American Bridge Co.	Cleveland Rolling Mills, Cleveland, O.	Chicago, Ill.	June 3, 1875.	20 0	12.5		8	15,000	26,700 Broke by deflection sideways.	28,900,000	Pin ends as for No. 13.
17	American Bridge Co.	Cleveland Rolling Mills, Cleveland, O.	Chicago, Ill.	June 3, 1875.	20 0	19.9		8	12,000	26,500 Broke by deflection sideways.	23,100,000	Pin ends as for No. 13.
18	American Bridge Co., same column as for No. 12.	Cleveland Rolling Mills, Cleveland, O.	Chicago, Ill.	June 3, 1875.	20 0	20.1		8	23,000	31,500 Broke by deflection.	23,600,000	Ends planed and riveted as for No. 12.
19	American Bridge Co.	Cleveland Rolling Mills, Cleveland, O.	Chicago, Ill.	June 3, 1875.	27 0	20.1		8	24,000	27,800 Broke by deflection upward.	32,900,000	Ends planed and riveted as for No. 12.
20	American Bridge Co.'s strut for girders of iron viaduct.	Cleveland Rolling Mills, Cleveland, O.	Chicago, Ill.	June 3, 1875.	10 0	9.66		..	8,000	20,000 Broke by deflection downward.	21,600,000	 Pin ends as for No. 14.
21	Louisville Bridge Co.'s square column: 2 channel bars and 2 plates, riveted.	Ohio Falls Iron Works, New Albany, Ind	Chicago, Ill.	June 29, 1875.	25 9	13.6		4½	18,000	25,5000 Broke by deflection sideways.	31,000,000	 Pin ends. Castings as for No. 14. Column balanced with 300 lbs. at centre.
22	Louisville Bridge Co.'s square column: 2 channel bars and 2 plates, riveted.	Ohio Falls Iron Works, New Albany, Ind.	Chicago, Ill.	June 29, 1875.	26 0	13.6		4½	20,000	30,000 Broke by deflection upward.	27,800,000	 Ends planed and closely riveted. Column balanced at centre with 300 lbs.
23	Baltimore Bridge Co.'s square column: 3 channel bars and 2 plates, riveted.	Pencoyd Iron Works, near Philadelphia, Pa.	Chicago, Ill.	June 29, 1875.	24 0	13.7		4	15,000	33,200 Broke by deflection downward.	28,900,000	 Column twisted before test 7-16 inch. Ends planed and closely riveted. Plates buckled. Column balanced at centre with 300 lbs.
24	Keystone, riveted diametrically between flanges. Column not swelled.	Union Iron Mills, Pittsburgh, Pa.	Pittsburgh, Pa.	July 2, 1875.	27 0	19.2		12	15,000	25,000 Broke by deflection sideways.	26,500,000	 Ends fitted with diagonal plates and planed.

EXPERIMENTS ON WROUGHT-IRON COLUMNS. — *Concluded.*

No.	Kind of Column.	Iron, where rolled.	Tests, where made.	Date of Test.	Length of column.	Sectional area in square inches.	Middle section and diameter.	Distance f'm centre to centre of rivets.	Pressure per sq. in. producing permanent set in lbs.	Pressure per sq. in. causing fracture in lbs.	Modulus of elasticity.	Remarks.
					Ft. In.			In.				
25	Keystone, riveted diametrically between flanges. Column swelled.	Union Iron Mills, Pittsburgh, Pa.	Pittsburgh, Pa.	July 3, 1875.	27 0	18.83		12	12,000	21,100 Broke by deflection downward.	28,100,000	 Fitted with square castings and bolted at ends.
26	Keystone, riveted diametrically between flanges. Column not swelled.	Union Iron Mills, Pittsburgh, Pa.	Pittsburgh, Pa.	July 3, 1875.	27 0	14.49		12	17,000	27,500 Broke by deflection downward.	27,500,000	Ends as for No. 25.
27	Keystone riveted through flanges. Column not swelled.	Union Iron Mills, Pittsburgh, Pa.	Pittsburgh, Pa.	July 3, 1875.	27 0	18.83		12	18,000	27,800 Broke by deflection downward.	23,700,000	Ends planed. Iron of column soft and badly welded in rolling.
28	Phœnix riveted through flanges.	Phœnixville, Pa.	Pittsburgh, Pa.	Aug. 5, 1875.	28 0	13.58		6	22,000	34,800 Broke by deflection downward.	25,700,000	Ends planed. Last five rivets at both ends spaced 3 inches from centre to centre. Balanced at centre with 650 lbs.
29	Phœnix riveted through flanges.	Phœnixville, Pa.	Pittsburgh, Pa.	Aug. 5, 1875.	28 0	13.58		6	18,000	36,600 Broke by deflection upward.	28,500,000	Ends planed and riveted as for No. 28. Column balanced at centre with 650 lbs.
30	Keystone, riveted diametrically between flanges. Column not swelled.	Union Iron Mills, Pittsburgh, Pa.	Pittsburgh, Pa.	Aug. 5, 1875.	27 0	15.13		12	12,000	30,000	19,300,000	 Ends planed. No shoes.
31	Keystone, riveted diametrically between flanges. Column swelled.	Union Iron Mills, Pittsburgh, Pa.	Pittsburgh, Pa.	Aug. 5, 1875.	27 0	15.13		....	16,000	25,400	23,600,000	Ends as for No. 30.
32	Keystone, square column, 2 channel bars and 2 plates, riveted.	Union Iron Mills, Pittsburgh, Pa.	Pittsburgh, Pa.	Aug. 26, 1875.	27 0	26.75		6	15,000	30,200 Broke by deflection sideways.	30,100,000	Column planed at both ends. No shoes.
33	American Bridge Co.'s latticed strut iron for trestles.	Cleveland Rolling Mills, Cleveland, O.	Pittsburgh, Pa.	Nov. 22, 1875.	28 6⅝	4 angle irons 5.68		18	21,100	31,700 Broke by deflection upward.	32,400,000	 Angle-irons, 2½ × 2½ inches. End plates ½ inch thick. Angle-irons fractured at one end near plates, and near middle of strut.
34	Louisville Bridge and Iron Co.'s strut.	Ohio Falls Iron Works, New Albany, Ind.	Chicago, Ill.	Dec. 4, 1875.	12 3	6.00		15½	16,000	17,600 Broke by deflection upward.	....	 Flat ends. Dotted lines show manner in which column gave way.

It is proper to state here that although the average moduli of the Phœnix and square posts were very nearly the same, the iron in the two kinds of posts differed widely as to other characteristics, the Phœnix iron being a very close-grained, fibrous and hard metal, whilst the iron of the square posts was comparatively soft and of a coarser texture, which explains the difference in the average values of "f" obtained for these two kinds of posts.

3d. It is essential in built columns to fasten thoroughly together the several parts or segments that they may act in a solidary manner as one continuous metallic body, and to guard not only against lateral flexure or buckling of each part, but also against longitudinal relative motion.

The importance of these conditions is demonstrated by the great variation in the results of tests of columns of the same length and shape, made of the same quality of iron, but differing in the fastening together of their several parts, as shown by Experiments 3 and 8, and 25 and 31, where the substitution of close riveting at the ends in place of cast shoes bolted on made a difference of 22 per cent and 17 per cent respectively in the strength of the columns.

The anomalous result of test No. 19, where the column failed by flexure in the direction of the largest radius of gyration, is also due very probably to the insufficiency of the riveting.

4th. A due regard to the economy of material demands that the thickness of the metal and, in built columns, the spacing of the rivets, be so proportioned that the column shall fail by flexure, as a whole, before any local buckling or flexure shall take place.

This is well illustrated by experiments, which are not here tabulated, instituted for the purpose of determining the largest spacing of rivets and the smallest thickness of metal allowable for a particular style and length of post. Columns Nos. 37 and 38, having both failed by the buckling of the metal in the channel, and the local flexure of the channel between rivets, pieces of channels were tested of the same shape and sectional area as those used in the posts, and of lengths equal to the distance between the lattice rivets; they failed in the same manner as the channels had failed in the long columns, but under somewhat higher pressure per square inch, confirming the first results.

Column No. 41, in all respects similar to Nos. 37 and 38, but with thickness of metal slightly increased and spacing of rivets reduced to 20 inches, was then tried and failed by the simultaneous flexion and buckling of the metal in the channel and the bending of the column bodily, showing that the column was properly proportioned, being of equal strength in all its parts.

Test No. 42 confirmed No. 41, and it was established that for that ratio of length to diameter the thickness of the metal should not be less than $\frac{1}{30}$ of the distance between supports transversely, which confirms Fairbairn's rule, and that the distance between rivets longitudinally should be such that the length of channel spanning it, considered as a column, and calculated by Rankine's formula, shall give the same resistance per square inch of area as the column itself treated in the same manner with the same constant "*f*."

5th. It may be concluded from Experiments Nos. 13, 14, 16, 17, 21, 36 and 43, made with columns hinged on pins at both ends, that Rankine's formula with constant "*a'*" assumed at double its value as applied to columns with flat ends, is practically correct, the variations in the values of "*f*" derived from these tests, being probably attributable, in a large measure, to the difference in the fitting of the pin, a "close fit" giving invariably higher results, the friction resisting, of course, the tendency to flexion.

The very large variation of the calculated value of "*f*" for Nos. 36 and 42 must, however, be ascribed to another cause, viz.: the now well established property of iron, that its limit of elasticity is increased after the metal has been once subjected to a strain beyond its limit of elasticity and then allowed to rest. This circumstance accidentally occurred for column No. 36.

Tests Nos. 6 and 18 were also made on columns which had previously been strained beyond their elastic limit, and further confirm the same property.

Many important questions concerning wrought-iron columns as used in our modern structures remain to be elucidated by direct experiments.

It would be useful to test: —

1st. The effect of the eccentricity of the line of pressure to the axis of the column, — which occurs frequently through the unequal tension of tie-bars.

2d. The effect of a force acting transversely to the axis of the column. This occurs as a rule in all horizontal or inclined compression members, and in all posts riveted to floor beams.

3d. The applicability of the Rankine formula to the tiers of a long column guided at intervals, as is the case for the continuous posts of high trestles and piers held in line by the systems of horizontal and vertical bracing, the tiers being assimilable to neither flat nor pin-end posts.

4th. The influence on the strength of a long post, of the support afforded by a stiff but yielding web, as it occurs for the top flange of plate girders and the top chord of partly over-grade trusses.

In this line of investigation our large bridge-contracting firms should take the lead. They have at hand the facilities for conducting leisurely and methodically such experiments. The contractor and the engineer should join hands in an endeavor to reduce from *six* to *five* or even *four* the irrepressible "factor of safety" invented to cover two large fields, the "incidental" and the "unknown," the limits of which should gradually contract under the light of well observed facts.

CARPENTERS' WAGES IN ST. LOUIS.

St. Louis, Feb. 24, 1881.

To the Editors of the American Architect:—

I inclose circular received to-day from the St. Louis Carpenters' Union asking an increase of wages after April 1, 1881. It is dated a month earlier than its issue. It seems worthy of notice for the fairness and courtesy to employers which has prompted it, and which marks its language. It may be hoped that the example thus set by the St. Louis Carpenters' Union may be followed elsewhere and among other trades.

This fair and conciliatory appeal of the carpenters would be the more likely to succeed were there not a general agitation in other lines for a raise of wages coupled with an attempt to advance the price of brick, stone, and other materials. The effect of all these movements combined has been to increase the cost of building so considerably that the prospect of an unusually active season this year has suffered seriously, and unless large concessions are soon made we must apprehend a dull opening at the least. One party alone reports twenty-three jobs which have been abandoned by their owners after bids were received because the price was too high.

It is to be regretted that this experiment at fair dealing by the St. Louis Carpenters' Union should be tried under such unfavorable circumstances; the more so since advocates of the violent policy usually adopted will be confirmed in their opposition to fair dealing hereafter. Undoubtedly the usual tactics of maintaining silence till employers have their hands full of work on time contracts, and then striking for a raise, would be more certain of a temporary gain than the plan adopted. Of course the gain is temporary and delusive, since the striking mechanic is the first one to be dismissed when his employer can spare him, while a sacrifice will be made to retain the better class through a dull season. C. E. Illsley.

HALL OF CARPENTERS' AND JOINERS' PROTECTIVE UNION, NO. I.

St. Louis, Mo., Jan. 22, 1881.

Mr. C. E. Illsley:—

Sir, — At a joint session of Unions Nos. 1, 2, and 3, of the above date, called for the purpose of considering the advisability of demanding a raise of wages the coming spring, it was unanimously determined to ask a raise to $3.00 per day from April 1, 1881. Some objection being had to the publication of these facts through the newspapers, notification through this circular was agreed upon, as being most satisfactory to our employers. Feeling that your interests and ours are identical, we hope this demand will meet with your approval, and that you will estimate your work accordingly. Yours respectfully,

Committee on Ways and Means, { Robert Stofiel, Sebastian Meyrl, Henry Sliegelmeyer, Charles Ehrlicher, John Casey.

[We reproduce the circular of the St. Louis carpenters, on account of its interesting character, and hope no annoyance will be caused to the Union thereby. Although sharing to a certain extent Mr. Illsley's fear that this movement of the carpenters may be so unsuccessful as to suggest a return to the old piratical system of extorting increased wages by unexpected assaults upon the masters while helpless under the pressure of contracts, we hope that the innate manliness and common-sense of Americans will in the end prevail over the blind and weak disposition to accomplish their ends by violence which has so degraded workmen in foreign countries. We sympathize sincerely with the endeavor of skilled artisans to secure the highest return for the labor which they have to sell, and although they may have to learn that there is an important difference between asking and obtaining the price which they fix upon, the study of the market with a view to continuous profit will itself be a most salutary exercise for men who have hitherto been too prone to regard themselves in the light of children, dependent for their living upon the favors which they could beg or extort from the world at large, than as important members of society, subject to the same laws, and bound to the same duties, as the rest of mankind. — Eds. American Architect.]

DEAFENING FLOORS.

To the Editors of the American Architect:—

Sirs, —I want to build a brick house containing a basement, store on first floor, living apartments on second, and tailor's shop on third floor. Would you, or some member of the profession, be so kind as to let me know, through your valuable paper, what will be the best and cheapest way to deaden the floor of third story, so that the noise of sewing-machines would not be heard through the floor in second story? Will double joists, one for ceiling, the other for floor, separated from each other, be of any use? Yours obediently, J.

[The double flooring which J. mentions is undoubtedly the most effectual means for preventing the transmission of sound through the floor, as it will accomplish what none of the ordinary felt or mortar deafenings will — the prevention of any transmission of jar from the upper surface to the lower. He can, if he has any control over the occupants of the upper story, do something also to lessen the noise and vibration of the sewing-machines themselves, by causing their supports to be set on cushions of thick hair-felt, or, still better, in boxes of sand. The latter device has just been patented for application to elevated railroads by a lady in New York, who remembered having seen her father, a blacksmith, set his anvil in sand to diminish the noise and jar of hammering, and was ingenious enough to devise a mode of bedding the joints of railway tracks in a similar way. — Eds. American Architect.]

Washington's Idea of House-Building. — The following original letter is on exhibition at Ellis's music store, in New York, to be raffled off for a charitable object. This letter was presented by a lady of this city, and was written by Gen. Washington to Dr. Wm. Thornton, one of the three commissioners who laid out the city of Washington. The houses described in the letter are now known as the "Hillman House," situated on North Capitol Street, near B Street: —

William Thornton, Esq.,
Federal City.

Favored by Thomas Law, Esq. }

Mount Vernon, Dec. 20, 1798.

Dear Sir, — Enclosed is a check on the Bank of Alexandria for $500 to enable Mr. Blagden, by your draughts, to proceed in laying in materials for carrying on my buildings in the Federal City. I saw a building in Philadelphia of about the same front and elevation that are to be given to my two houses which pleased me. It consisted also of two houses united — doors in the centre — a pediment in the roof, and dormer window on each side of it in front — sky-lights in the rear. If this is not incongruous with rules of architecture, I should be glad to have my two houses executed in this style. Let me request the favor of you to know from Mr. Blagden what the additional cost will be. I am, dear Sir, your most obedient, humble servant, Geo. Washington.

William Thornton, Esq.

Mountain Mahogany. — The Virginia City *Enterprise* says that they have in their State a tree called mountain mahogany, of a rich red color and very hard. When used for fuel it produces such intense heat as to burn out stoves more rapidly than any coal. It blazes as long as ordinary wood would last, and then becomes converted into a sort of charcoal that lasts twice as long as ordinary wood. A cord of this wood brings the same price as a ton of coal.

Losses by Fire. — The *Insurance Chronicle* states that during the five years previous to the close of last December there were 55,777 fires in the United States and Canada, and that property valued at $405,269,700 was destroyed thereby. Of this large loss the insurance companies lose more than half, $219,182,800. The number of fires in factories, workshops, etc., was 29,248, while the number of mills and shops, where lumber is manufactured, destroyed or on fire was 4,123. The loss in the United States during the year 1880 was $74,838,000, being less than that of 1879 by about $3,000,000. The same is true of Canada. The fact that there were no large fires the past year makes these figures more startling. At this rate we are burning up a city the size of Chicago every two years, and are losing a sum which represents the work of 200,000 men for a whole year.

BUILDING INTELLIGENCE.

[Reported for The American Architect and Building News].

[Although a large portion of the building intelligence is provided by their regular correspondents, the editors greatly desire to receive voluntary information, especially from the smaller and outlying towns.]

BUILDING PATENTS.

[Printed specifications of any patents here mentioned, together with full detail illustrations, may be obtained of the Commissioner of Patents, at Washington, for twenty-five cents.]

237,945. BRICK-KILN. — William Barckley, Buffalo, N. Y.

237,961. STONE-DRESSING MACHINE. — Thomas H. Cook, Oswego, N. Y.

237,973. TRANSOM-VENTILATOR. — Henry C. Hart and Thomas A. Bissell, Detroit, Mich.

237,977. SAW-SWAGE. — Patrick J. Hogan, Cincinnati, Ohio.

237,981. ELEVATOR. — Joseph B. Johnson, Lynn, Mass.

237,987. APPARATUS FOR TESTING PIPES AND TUBES. — William S. McManus, South Chester, Pa.

237,992. PIPE-CUTTER. — John Miller, Cambridgeport, Mass.

238,003. HOT-AIR FURNACE. — Matthew H. Roberts, Philadelphia, Pa.

238,041. PIPE AND NUT WRENCH. — Lawrence Glynn, Cambridgeport, Mass.

238,067. LADDER. — Lorenzo P. Teed, Erie, Pa.

238,077. HOT-WATER HEATING APPARATUS. — Edward Backus, Rochester, N. Y.

238,112. SAND POINT FOR WELLS. — Charles L. Halstead, La Crosse, Wis.

238,113. LOCK. — Ekins Hand, Rochester, N. Y.

238,116. DRAUGHT DEVICE FOR CHIMNEYS. — James Hicinbothem and Harry M. Doubleday, Brooklyn, N. Y.

238,131. STOVE-PIPE THIMBLE. — William L. Leader, Monmouth, Ill.

238,163. DOOR-KNOB. — Sam'l Russell, Shepherds Bush, England.

238,168. FASTENER FOR MEETING RAILS OF SASHES. — William Sibrey, Washington, D. C.

238,185. VENTILATOR FOR CHIMNEYS. — Ezekiel Van Noorden, Boston, Mass.

9,582. BIT-STOCK AND SHANK. — Oscar G. Stratton, Greenfield, Mass.

9,583. COOLING DAIRIES. — John Wilkinson, Harvard, Ill.

9,584. BRAKE FOR ELEVATORS. — Felix P. Canfield, Boston, Mass.

SUMMARY OF THE WEEK.

Baltimore.

BUILDING PERMITS. — Twenty-one building permits have been issued since the last report the following only being of sufficient importance to be mentioned.

W. F. Gilbert, 2 three-st'y brick buildings, on Calhoun St., near Lombard.

John Wheeler, three-st'y brick building on Richmond St., between Howard and Cathedral St.

Henry Mohrman, 3 two-st'y brick buildings on Bethel St., between Eastern and Canton Aves.

James D. Mason, 2 five-st'y warehouses on Pratt St., near Charles.

Edward J. M. Miller, 9 two-st'y brick buildings on Charles St., near Winder.

James Patterson, three-st'y brick building, n w cor. Broadway and Eager St., 36' x 60'.

Christian Wiegand, three-st'y brick building on Druid Hill Ave., near Preston St.

James Haswell, three-st'y brick building on Oxford St., between Druid Hill and Pennsylvania Ave.

Newbold & Sons, four-st'y warehouse on Hanover St., between Pratt and Lombard Sts., 31' x 145'.

Messrs. Geo. Siemens & Co. have awarded the contract for the erection of their new factory on W. Pratt St. to Messrs. S. H., and J. F. Adams.

The factory to be 60' x 100,' three-st'y high, of brick, Mr. Chas. L. Carson, architect.

Henry Hellman, three-st'y brick building on Stricker St., near Pressman.

Caleb Warfield, three-st'y brick building, n w cor. Warner St., and Burgundy Alley.

HOUSES. — Messrs. Dixon & Kennedy have in hand several residences in Baltimore County for Mrs. Handy, near Lake Station, J. J. Nicholson, near Sherwood, and two at Mt. Washington, one for Mr. George Hollyday, and one for Mr. S. J. Shoop.

NEW HOTEL. — Subscriptions are now being received at Cumberland, Md., for the erection of a new hotel to be built at Frostburg, Md., to cost about $30,000.

NEW MILL. — Work has commenced on the new Mount Vernon cotton duck mill, and is being pushed forward rapidly. The building is to be 55' x 170', three-st'y high, with a picking-house 45' x 80', three-st'y high, they will be of brick with stone foundation. The work will be done under the management of Mr. Albert H. Carroll. The building when completed will cost (with the machinery) about $400,000.

NEW FACTORY. — Work on two large canning factories at Westminster, Md., will be commenced as soon as the weather will allow.

NEW CHURCH. — The Episcopalians of Gaithersburg, Md., have purchased a lot of ground, and are about to commence the erection of a new church edifice.

WAREHOUSES. — Messrs. Johnston Bros. & Co. are about to build two warehouses on Howard St., between German and Lombard, each 26' x 110', five-st'y and basement, the fronts to be of iron and brick with North River stone, terra-cotta and moulded brick finish, to cost about $50,000; Mr. Jackson C. Gott is the architect.

Boston.

BUILDING PERMITS. — *Brick and Stone.* — 29 *Brimmer St.*, for Chas. Faulkner, dwell., 20' x 72', three-st'y; Thos. J. Whidden; builder.

Granite, near Richards St., for Standard Sugar Refining Co., boiler house, 30' x 39'; Standard Sugar Refining Co.: builders.

205 *Newbury St.*, for Silas W. Merrill, dwell., 32' x 50', three-st'y, mansard; Silas W. Merrill; builder.

207 *and* 209 *Newbury St.*, for Silas W. Merrill, 2 dwell., 24' x 50', three-st'y and mansard; Silas W. Merrill; builder.

Wood. — *Raymond St.*, near Lamartine St., for Patrick Murphy, dwell., 22' x 30', three-st y; John L. Lakin; builder.

Centre St., near Lagrange St., for Geo. K. Guild, carriage-house, 34' x 20'; Anson H. Waterman; builder.

We hear of numerous building contracts for the early spring, mostly of dwelling-houses on the Back Bay lands.

CADETS' ARMORY. — It is announced that during the past year $50,000 have been subscribed toward building a new armory for the corps. As has already been announced, the building, to be an elegant one costing $150,000, will probably be located on Columbus Avenue, where the Siege of Paris building stood. Plans will soon be decided upon, and the work of erection will probably soon be commenced.

Brooklyn.

BUILDING PERMITS. — *South Tenth St., Nos.* 63 *and* 65, n s, abt 77' w Third St., 2 three-st'y brown-stone dwells., 18' 9" x 42'; cost, $4,500 each; owner, John M. Stearns, 140 Fourth St.; architect, Jas. Barrett; builder, Wm. Bills.

Warren St., n s, 103' 6" w Columbia St., four-st'y brick tenement, 23' 1" x 65'; cost, about $6,000; owner, Peter McKeon, cor. Amity and Columbia Sts.; architect, Fred. E. Lockwood.

Washington Ave., e s, 95' s DeKalb Ave., three-st'y brick dwell., 25' x 76'; owner, Chester B. Lawrence 177 Dean St.; architect, M. J. Morrill; builders, C, Cameron and J. S. McRea.

South Second St., n s, 100' e Second St., four-st'y brick tenement, 25' x 57' 6"; owner, Mary O'Conneil; architect, Thos. F. Houghton; builders, Jas. Rooney and Francis G. Turner.

Hope St., n s, 75' e Sixth St., rear, three-st'y brick factory, 24' x 86'; cost, $8,000; owner, James Kavanagh; architect, W. H. Gaylor; builder, Thos. Gibbons.

ALTERATIONS. — *Fifth St.*, e s, bet South Third and South Fourth Sts., new tier of beams, etc.; c st, $2,000; owner, Joseph Beesley, Sixth St., near Grand St.; builders, A. Hayes and S. Hough.

First Pl., No. 115, one-st'y brick extension, 10' 6" x 18' 3"; cost, $3,500; owner, Charles Morningstar, 119 First Place; architects, Parfitt Bros.; builders, S. Rippingale and Morris & Selover.

Fulton St. Nos. 70 *and* 72, asphalt roof, also one-st'y brick extension, 19' 2" 18' 8" and 19' x abt 40', asphalt roof, iron work, etc.; cost, $4,000; owners, Geo. Pool & Sons, on premises; architect, George Chappell; builder, W. Ovington.

HOSPITAL. — Land has been given by George J. Seney, in connection with the sum of $200,000, to found a hospital in Seventh Ave., running from Union to President St., within two blocks of Prospect Park. It has not been decided whether the building will be placed there or in some other location.

Buffalo.

DEPOT. — The N. Y. Central & Hudson River R. R. will rebuild that portion of their depot destroyed by the falling of the roof on the 8th ult. The addition, 120' x 460', will consist of an extension of the present train room. The plans were prepared by the engineer of the road.

STORES. — Plans have been prepared by Mr. Geo. J. Metzger for two stores on Main St., near Genesee St., having a frontage of 63' on Main St., and 83' on Washington St., to be of brick, with Ohio sand-stone finish; owners, Messrs. Irlbacher & Davis and F. J. Handel; cost, $35,000.

Chicago.

BUILDING PERMITS. — G. Tawfer, two-st'y brick dwell., 3659 Wentworth Ave.; cost, $3,000.

E. T. Harris, four-st'y brick factory, 60' x 80', Monroe and Desplaines Sts.; cost, $15,000.

C. Paget, brick theatre, 72' x 134', Sedgwick and Division Sts.; cost, $60,000.

J. W. Doane, two-st'y brick dwell., Prairie Ave., near Eighteenth St.; cost, $100,000.

E. Dwyer, three-st'y brick store and dwell., 18' x 48', 355 Kinzie St.; cost, $3,500.

Union Shoe Co., two st'y brick factory, 40' x 100', Halstead St., and Webster Ave.; cost, $40,000.

G. W. Lucke, three-st'y brick dwell., 30' x 54', 1011 North Clarke St.; cost, $5,500.

James Brejcha, two-st'y brick dwell., 20½' x 66', Eighteenth St., near Blue Island Ave.; cost, $6,000.

Simson E. Beers, two-st'y brick dwell., 21' x 34', Honore St., near Thirty-Fifth; cost, $5,000.

New York.

BUILDING PERMITS. — *Fifty-First St.*, s s, 160' 3" e Ninth Ave., five-st'y brick apartment-house, 38' 6" x 100'; cost, $25,000; owner, Charles Gahren, 346 West Fortieth St.; architect, Joseph M. Dunn.

Fulton Ave., w s, 100' n One Hundred and Sixty-Ninth St., two-st'y frame dwell., 24' x 31' 6" x 40'; cost, $5,000; owner, Louis Koch, on premises; architect, Julius Kastner.

Monroe St., No. 158, six-st'y brick factory, 23' 1" x 95'; cost, $12,000; owners, M. and H. Schrenkeisen, s w cor. Canal and Elizabeth Sts.; architect, F. W. Klemt; builders, Murphy & McGinty.

East Seventy-Fifth St., No. 32, four-st'y brick dwell., 25' x 61'; cost, $22,000; owner and architect, Edward H. Kendall, 71 Broadway; builders, Marc Eidlitz and Chas. F. True.

West Fifteenth St., No. 132, five-st'y brick flat, 25' x 81' 2"; cost, about $20,000; owner, James F. Woodhouse, 106 Broadway; architect, R. N. Anderson; builders, John Bannen and Steele & Costigan.

Stanton St., No. 265, five-st'y brick tobacco factory, 25' x 100'; cost, $14,000; owner, Mrs. G. B. Miller & Co., 97 Columbia St.; architect, W. Wheeler Smith.

Fifty-Sixth St., s s, 275' e Ninth Ave., six-st'y brick apartment-house, 50' x 85'; cost, $60,000; owner, Herman Hoefer, 418 West Fiftieth St.; architects, Thom & Wilson.

Ave. A, n e cor. Twenty-Second St., three-st'y brick factory, 36' x 49' 5"; cost, $4,600; owner, Brewer estate, 54 Wall St.: architects and builders, C. W. Klappert & Sons, and I. Johnson.

East One Hundred and Twenty-Third St., No. 167, rear, three-st'y brick shop, 21' 6" x 27'; cost, $2,500; lessee, Charles Schneider, on premises; architect, W. Graul.

Seventieth St., foot of, at East River, one-st'y frame shooting-gallery, 30' x 69' 6"; cost, $5,000; lessee, Emma C. Gent, foot of Sixty-Ninth St., East River; architect, Julius Kastner.

ALTERATIONS. — *New Church St., Nos.* 60 *to* 68, repair damage by fire; cost, $2,577; owner Western Union Telegraph; builder, E. Smith.

Elm St., Nos. 115 *and* 117, raised one story; cost, $3,000; owner, Fred. Hollender; architect, Wm. Kuhles; builder, not selected.

Washington Ave., e s, 242' n One Hundred and Sixty-Seventh St., partitions, etc.; cost, $2,000; owner, E. F. Bacon; architect and builder, Louis Falk.

Lexington Ave., No. 52, two-st'y brick extension, 24' 8" x 51', tin roof, brick and iron cornice and interior alterations; cost, $4,000; owner, Columbia Club, on premises; architect, F. Kafka; builder, not selected.

Broadway, No. 1293, cor. Thirty-Third St., interior and front alterations; cost, $2,500; owner, Thomas A. Lawrence, Coleman House; architect and builder, W. L. Goetchius.

FLATS. — Mr. Henry I. Dudley, late Superintendent of Buildings, 1193 Broadway, has prepared plans for French flats on Twenty-Seventh St., on the old Ingersoll property, between Seventh and Eighth Aves. The building will be 90' x 175', of brick and stone. Cost will be about $500,000. Mr. F. Draper is associated with Mr. Dudley in the construction. The ground is now being cleared, and work will be commenced very shortly.

On Fifty-Eighth St., 200' east of Tenth Ave., French flats, 125' x 80', are to be erected from designs of Mr. Henry J. Dudley. The building is to be of brick and stone, and will cost about $150,000, independent of the lots. Portions of the work are already contracted for.

On Fifty-First St., between Eighth and Ninth Aves., flats to be of brick with Ohio-stone trimmings, 38' 6" x 85' are to be erected from designs of Mr. Jos. M. Dunn, at a cost of about $25,000.

The same architect will alter the dwelling on Fourth Ave., between Twenty-Ninth and Thirtieth Sts., into flats, at a cost of $10,000.

FULTON MARKET. — The present improvements, which will cost $80,000, are under the superintendence of Mr. Douglas Smyth, architect.

STORES. — On Broadway we hear of several stores to be built after May 1st. On Leonard St. one is to be built from designs of Mr. T. M. Clark, of Boston. At No. 81 White St. a store is to be erected from designs of Mr. Chas. C. Haight.

WAREHOUSE. — On the corner of West Broadway and Franklin Sts., a warehouse about 100' square is to be built from designs of Mr. Geo. W. Da Cunha.

WALLACK'S THEATRE. — Mr. Geo. A. Freeman, Jr., has finished the plans for the new Wallack's Theatre, n e cor. Broadway and Thirtieth St. The building will be of brick, terra-cotta and stone. The height will be 60'; size, 75' x 110'; seating capacity about 1500; there will be 10 private boxes. Cost is estimated about $100,000.

APARTMENT-HOUSE FOR BACHELORS. — Mr. G. A. Freeman, Jr., has drawn the designs for the apartment-house which is to be built on the corner adjoining Wallack's Theatre, and above its lobby on Broadway. The cost of this will be about $200,000. The front will be incorporated with that of the theatre, and the two buildings will cover 105' 4" on Broadway, and 122' on Thirtieth St.

ENGINE-HOUSE. — A fire and hook-and-ladder house, 30' x 100', of brick and stone, is to be built by the city at a cost of $15,000.

CITY WORK. — On the dock of Bellevue Hospital grounds a pavilion, 40' x 60', for erysipelas patients, is to be built of corrugated iron, fire-proof floors, at a cost of $6,000. On the grounds the Marquand Pavilion, of brick and terra-cotta, to accommodate 50 children, is to be built at a cost of $18,000 for those suffering from children's diseases.

In connection with the hospital a new water-closet tower is to be built at a cost of $15,000.

A new east wing to the insane asylum on Ward's Island, of brick and Ohio stone, to cost $100,000, is to be built.

On Blackwell's Island an addition to Retreat Building, to be of brick and stone, is to be built at a cost of $50,000.

On Hart's Island a new pavilion, to be of brick, to cost $20,000, and a laundry, kitchen, and boiler-house, also of brick, to cost $15,000, are to be built.

On Randall's Island a pavilion, brick and stone, for children, is to be built at a cost of $20,000.

On Blackwell's Island a pavilion and almshouse for old men is to be erected at a cost of $18,000; and an addition and alterations to kitchen, laundry and engine-house of lunatic asylum will cost $25,600. All from designs of Mr. Jos. M. Dunn.

Philadelphia.

BUILDING PERMITS. — *Twenty-First St.*, cor. Summer St., three-st'y dwell., 16' x 50'; Thos. E. Sheldrick, contractor.

Sutherland Ave., south of Bainbridge, two-st'y stable, 35' x 58'; Chas. B. Reese & Co.

Arch St., between Twentieth and Twenty-First Sts., 5 three-st'y dwells., 18' x 80'; H. G. Harris, owner.

Branch St., north of Mill St., above Branchtown, 2 three-st'y dwells., 13' x 46'; J. P. Spicer, owner.

[*Continued on next page.*]

Publishers' Department.

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New Advertisements.

TO SUBSCRIBERS.

The publishers respectfully refer subscribers who have not yet paid their subscription for 1881, to the notification printed at the head of their respective bills, and desire to remind them that the time within which subscribers *who pay in advance* can benefit by the discount of $1.50 on the subscription price ($7.50) has elapsed.

BUILDING INTELLIGENCE.

Arch St., No. 1222, five-st'y publishing-house, 60' x 188'; Jas. B. Doyle, contractor.

Sixth St., n Jefferson St., 9 three-st'y dwells., 16' x 60'; Keely & Brownback, owners.

Marsdon and Oxford Sts., 2 two-st'y dwells., 13' x 32'; W. H. Pole, contractor.

Girard St., e Merrion St., two-st'y office, 15' x 30'; Davis & Co.

Callowhill St., No. 2586, two-st'y dwell., 18' x 36; Oliver Bradin, contractor.

Number of permits issued last month, 105; viz.: 29 additions and alterations, 8 brick buildings, 15 two-story dwellings, 24 three-story dwellings, 1 one-story store, 1 two story store, 2 three-story stores and dwellings, 1 four-story store and dwelling, 1 five-story store and dwelling, 7 stables, 1 storehouse, 3 offices, 1 theatre, 3 boiler-houses, 2 shops, 1 ice-house, 1 factory, 1 warehouse, 1 dye-house.

MARKET. — Slate, Select Lehigh (delivered), $3.75. The general market quiet, but steady.

St. Louis.

BUILDING PERMITS. — Thirty-four permits have been issued since our last report, of which 7 are for frame structures of slight importance. Of the rest, those worth $2,500 or over are as follows:—

OWNERS' NAME.	USE.	Sy's.	Rm's.	Cost.
E. O. Horting,	Dwell.,	2	18	$5,000
D. C. Gamble,	Stores & office,	3	30	30,000
St. Louis Fire and Marine Ins. Co.,	Restaurant and Office,	4	13	10,000
Hughes, Loomis & Co.,	Ice House,	1	1	4,500
Mrs. L. G. Hamilton,	Dwell.,	3	10	7,000
J. M. Hamilton,	Dwell.,	3	10	6,000
J. M. Hamilton,	Dwell.,	3	10	6,000
H. A. Hienecke,	Dwell.,	2	24	8,000
J. Brazington,	Dwell.,	2	9	2,700
Bremer & Brett,	Dwell.,	2	12	3,000

General Notes.

CAMBRIDGE, MASS. — Two and a half-st'y frame-house is being built for Mr. J. M. Hilton, on Mellen St.

EASTON, MD. — The commissioners of Talbot County, Md., are about to build a new jail and sheriff's house from designs furnished by Messrs. Dixon & Kennedy, architects, of Baltimore, the building to be of stone with brick finish, and to contain 24 cells, arranged in two-st'y.

HOLYOKE, MASS. — John Tilley & Co. have bought two lots on High St., and will put up a brick block this spring, the whole lot being 49' front by 90' deep.

HAMILTON, CANADA. — Plans have been prepared by Mr. R. A. Waite, of Buffalo, N. Y., for an office-building for the Canada Life Assurance Company. The building will be five stories high, will be faced with Connecticut brown sandstone, and cost $160,000.

LANCASTER, PA. — Mr. Jeremiah Roheir is building a four-st'y brick block, with Sutherland Falls marble finish, in Centre Square; Mr. C. M. Howell, contractor for marble work.

LENOX, MASS. — Messrs. Peabody & Stearns, of Boston, are building a house for Charles Lainer, Esq.

David W. Bishop, of New York, will remodel the house on the Comstock place, and will build commodious stables.

LOUISVILLE, KY. — Only one building permit of any importance was issued this week; C. Beuhmann, store and bakery; cost, $5,600.

MT. HOLLY, N. J. — Publication building of the *New Jersey Mirror*, on Main St., built of Philadelphia brick and Connecticut brownstone, 37' 7" front; contract awarded; Hazlehurst & Huckel, architects, Philadelphia.

NEWTON, MASS. — A new church is now building for the Unitarian Society. It is to be built of brownstone and Ohio-stone. It covers ground measuring 144' x 152'; the main church, which is to be finished with open timber roof, will seat 660, and the chapel, 250. Messrs. Norcross Bros., of Boston, contractors for stone-work, and Henry F. Ross, of Newton; carpenter work: cost, $70,000; Mr. G. F. Meacham, of Boston; architect.

A residence is now being built cor. Sargent St., and Waverley Ave., for Mr. George C. Lord. It measures 40' x 42', is two and a half st'y, the first story is of brick, Henry F. Ross, of Newton, contractor; cost, $14,000; Mr. G. F. Meacham, of Boston; architect.

NEWPORT, O. — The Building Committee of St. Paul's Lutheran Church have decided to model the church which they propose to build after the Texas Church, on Clark St., Cincinnati.

ORANGE ISLAND, LA. — Joseph Jefferson, the actor, is building a $35,000 house here.

ORANGE, MASS. — The Messrs. Mann, of Zoar, are preparing to build a four-tenement block.

William Graves, Martin Lehan and Mr. Lawrence will also build a dwelling-house each on Myrtle St.

PUTNAM, CONN. — A large town-meeting, held a week or two ago, voted almost unanimously to give $30,000 towards the erection of suitable buildings, if the capitol of Windham County shall be located here.

ROCHESTER, N. Y. — A committee from the various Masonic bodies in this place has been considering the question of building a grand temple for the use of the different branches of the order. At a meeting held recently plans were presented and discussed. The majority of the committee appeared to favor the erection of a new building, but no definite action was taken.

RUSHVILLE, IND. — Contracts have already been awarded for the building of 8 stores, 13 dwellings and a town-hall the coming summer. Indications are that this will be the most active year for Rushville that it has yet had. Two new and extensive manufacturing establishments have already secured locations.

SPRING LAKE, N. J. — A cottage, to cost about $3,500, for Geo. L. Nevens, is being built from designs of Messrs. Rossiter & Wright, of New York.

STODDARD, N. H. — A new hotel is to be built on the shore of Long Pond.

STORM LAKE, IA. — A two-st'y brick store, 25' x 100', is building for Boutacher & Sweetser, at a cost of $8,000; Mr. Henry Fisher, architect.

Mr. Fisher is also the architect of a frame building, 60' x 74', for J. Sampson, which will cost $10,000.

STREATOR, ILL. — Mr. F. S. Allen, architect, has plans completed and in progress for an opera-house, to be built by Col. Ralph Plumb; cost, $20,000.

(Continued on next page.)