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General Meigs, who is a man of taste as well as an accomplished engineer, has come to the defence of the Capitol at Washington against the designs of a Texas architect, who proposes to satisfy the wishes of those who desire to have the Congressional Library placed under the same roof with the halls of Congress by putting jackscrews under the great dome, raising it fifty feet into the air, and inserting two stories of rooms beneath it. This astonishing plan, placed persistently before the members, attracted attention, and the committee on the Library finally requested General Meigs to express his opinion as to its feasibility. Having many years ago made a thorough examination of the walls and foundation of the present dome, he had no hesitation in replying that the proposed raising would be "a dangerous and perhaps fatal enterprise," while even if it were safe, he condemns the project as injurious to the beauty of the building. As he justly says, "nowhere is to be found a great building of such rich and graceful composition as the present Capitol," and, while the raising of the dome would not improve it, the projection of the central portico beyond the line of the wings would cut off, in any oblique view, one of the wings, and reduce the apparent size of the structure.

The New York Grand Jury, after examining several witnesses regarding the fire in the Potter building on Park Row, has decided not to indict the owner, considering that no evidence was brought before it to show that he was responsible for the calamity. In its opinion, the fire was caused by the leakage of carbonic-oxide gas from the old flue, which, under the influence of the downward draught caused by the vicinity of higher buildings, filled the space between the beams of the floor, and finally, reaching the open air, ignited, spreading the fire in all directions. Such an accident as this, the jurors thought, could not be considered as due to the owner's negligence, and finding that, although there were no fire-escapes in the building, there were two flights of stairs, and that it was possible to reach the roof of the adjoining building without a ladder, they did not feel that he deserved severe censure, still less an indictment for manslaughter, on account of not having provided further safeguards. This seems reasonable enough, and although we hope that Mr. Potter will rebuild the structure in a somewhat more substantial manner, we are certainly very well satisfied that he should not have been made the victim of an inconsistent and irrational public indignation.

A singular contest has been going on within the past few weeks over an attempt of the New Jersey railroads, acting in concert for a common end, to obtain legislative permission for taking nearly the whole river front of Jersey City and Hoboken for their own purposes, cutting off many of the streets of the former city from their present terminus at the water's edge, and threatening some of the most valuable interests of both places, which now have a considerable commercial importance from the deep water along their shores. It certainly seems a questionable exercise of the right of eminent domain in a State government to seize a tract so extensive, and of such peculiar necessity to the interests of two flourishing cities, and hand it over to a combination of railroads in the same manner that a right of way would be given through the pastures and woods of the inland country, but the bill passed both branches of the Legislature by large majorities. The Governor, however, returned the bill to the Legislature without his approval, explaining his action by a presentation of what he considered to be the rights of the inhabitants of the two seaports; the only ones of any importance that the State possesses. Although there is a strong probability that the bill will be passed over the veto, the rejoicing in the water-front cities at the Governor's action was lively as well as sincere. Salutes were fired when the veto was announced; flags were displayed on the public buildings, and a mass meeting of citizens was held to return thanks to the Governor, and to select a committee to oppose actively the second passage of the bill. It is even hinted that the inhabitants of Jersey City and Hoboken are disposed to rise in rebellion against the execution of the law if it should be passed, so that we can but hope that it will be deferred for the present.

The City Council of Montreal, one of the most conservative cities on the western continent, has passed an ordinance making it a misdemeanor, to be punished by fine or imprisonment, for any person to suffer or maintain upon his premises any fireplace or chimney, except the chimney of a private dwelling-house, so constructed as not to consume the smoke arising from the fuel burnt therein; and every proprietor, owner, or tenant of any engine, steam-boiler, factory, chemical-works, or other manufacturing establishment is to be compelled, upon notice from the inspector of boilers, to provide his furnaces with apparatus which will effectually consume the smoke escaping therefrom. Another regulation is added which is quite new, to the effect that the proprietor of any house or building hereafter erected, the chimney of which shall not be more than twelve feet horizontally distant from any other chimney having a higher elevation, shall be bound at his own expense to carry his chimney at least six feet above the apex or roof of the building possessing the high chimney; and the proprietor of a high building erected beside a lower one already standing shall carry up at his own expense all the chimneys of the lower house which are less than twelve feet away from his to the same height with his own.

The latest important labor movement is the anticipated general strike of coal miners in Pennsylvania, West Virginia, and Maryland. Fifteen thousand miners in the latter States have already left their work, and the mines are closed. The ostensible object of the strike is to resist a reduction of wages from sixty-five to fifty cents per ton, but there are probably some private schemes in the background. During the past three years the miners have been very thoroughly organized, or, in other words, have been cowed into abject submission by a system of brutal terrorism, and the order for the strike was accompanied by a notice that disobedience would be "under penalty of death." Nothing would be easier for the chief conspirators than to command anything else they liked, their own political advancement, for instance, under the same penalty, and the order for a strike at this period, when the companies have enormous stocks of coal left on their hands, and would be rejoiced if they could conscientiously turn their hands adrift for a few months, seems intended to produce as severe and lasting misery as possible. The striking woollen-mill operatives at Lawrence are leaving the place in great numbers, much to the relief of the city officers and the directors of the mills, who have ordered assistance to be given to those who would have remained faithful to them if they had not been thrown out of employment by the desertion of their fellows, but do not care to encourage future disorders by extending their kindness to the ring-leaders in the present trouble. The beginning of the present month will undoubtedly witness some disturbance in the building trades, the first of April being the usual date for readjustment of rates of wages for the ensuing season; but the prospect is not such as to encourage exorbitant demands on the part of the men, and speedy settlements may be expected.

The Chevalier da Silva, whose advancing years do not interfere with his activity either of mind or body, writes to the Secretary of the American Institute of Architects, announcing the discovery of Roman remains at Thomar, in the province of Estremadura. In his own words — "While going about the country, as President of the Commission for the Conservation of National Monuments, I stopped at the city of Thomar, and in walking in the fields a mile from the town, where it is supposed, although no investigations have been made, that the ancient Roman city of Nabactia was situated, I thrust my cane into the ground, and in one place turned up some fragments of mosaic. I immediately had excavations commenced, and laid bare a large mosaic pavement of a curved form, some five and a half metres in diameter, composed of geometric figures in four colors with a pretty border. This was buried at a depth of more than a metre, and near it were found some fragments of white Italian marble; but of walls nothing but foundations remained. I cannot yet make up my mind what sort of edifice the work belonged to, but the shape of the mosaic suggests an exedra. However, further excavation will show the rest of the construction." The ancient Lusitania, although the memory of the Roman conquest lingers in the names of many towns and villages, such as Lisbon, the Roman Olisipo, Lagos, the ancient Lacobriga, and others, has preserved few traces of buildings of the classical period, and the discovery of extensive remains in anything like good condition is very important.

The devout pilgrimage of six Indian chiefs from the ancient communal town of Zuñi, in southern New Mexico, to the shores of the "sea of sunrise," was brought this week, under the guidance of their adopted son and brother, the young ethnologist Cushing, to a successful issue. It will be remembered that Mr. Cushing, after a voluntary residence of some years among the Indians, has been admitted to a full share in their simple lives, and by degrees has been made acquainted with their traditions and received into the secret orders which they usually guard so strictly. One qualification only was lacking to make him in all respects one of the tribe, entitled to a share in the mythological, as well as the military ceremonials and ritual of his new brethren. This was membership in the religious order of the Ka Ka, which, however, is forbidden to any but a native Zuñi, and it was probably only on account of the great affection entertained for him by the Indians that a compromise was made, by which he was promised admission to the sacred order in consideration of conducting a party of chiefs to the border of the ocean, to replenish the supply of sea-water which had been preserved in the pueblo, for use in certain annual religious ceremonies, but was now almost exhausted.

The ocean is regarded in the Zuñi mythology as the habitation of the great ancestral gods of the nation, as well as the source of lesser waters, clouds and rain, and the annual offering to the gods of a few drops from the sea is supposed to be efficacious in procuring the showers needed for the growing crops of the pueblo. Their approach to the ocean was therefore an occasion of great excitement among the Indian pilgrims, who supposed themselves to be nearing the presence of their most august deities. On their arrival in Boston it was arranged, in order to avoid the disturbance by an unsympathizing crowd of the solemn function of receiving from the sea the sacred water, that the ceremony should take place on a small island belonging to the city government, where no one could land without a permit, and the government steamer was deputed to convey the chiefs, with a party of invited guests, to the spot. Having ourselves been of the party, we are enabled to describe the transaction with tolerable accuracy. On the way down the harbor, the Indians remained closely shut in the pilot-house, where, as it appeared, overcome with emotion at the sight of the blue expanse before them, they devoted themselves to praying earnestly, chanting sacred songs, and scattering over the water a consecrated meal composed of pounded shells, sand and corn-flour. As they neared the shore, the young cacique Cushing, who had come to the boat in citizen's dress, retired for a moment, and with the help of one of the Zuñis arrayed himself in the native costume appropriate to the occasion. Upon the beach were set two tents, and shutting themselves up in one of these the Zuñis prepared for their duties by putting on the insignia prescribed in their ritual. After a few minutes they came out and walked rapidly to the edge of the shore, where they bowed themselves and continued their prayers and chants. The tide was rising fast, and their feet were soon in the water, but they refused to retreat before the advancing ocean, which, as they imagined, was coming to them to be taken up, in answer to their prayers, and in token of the friendly disposition of the gods. Finally, this part of the ceremony being terminated, they changed their position to a dryer part of the beach, where a semicircle of spectators was quickly formed around them. Here a richly decorated platter was set on the sand by one of the chiefs, and the "prayer-sticks," or bunches of small feathers tied to short sticks, which all the chiefs carried with them, placed in it. The wind, which was very fresh, blew the feathers away, when one of the chiefs, a man of fifty or sixty years, with a peculiarly shrewd, kind face, ran to a lady among the spectators and pleasantly took her shawl from her, then running back spread it as a shield on the windward side of the plate. When all the prayer-sticks were deposited, each chief lighted a sort of cigarette made of a hollow cane filled with tobacco consecrated at Zuñi for the purpose, and stooping down breathed the smoke among the feathers, this being, as it seems, the mode of committing to them the prayers of the faithful, which they are to bear to the gods. The feathered sticks were then dipped, and finally thrown into the water, followed by handfuls of meal which the Zuñis brought with them in bags as a sacrifice to the deities of the ocean.

The introductory rites being now complete, one of the Indians held up the gourd in which their last supply of sea-water had been brought from the Gulf of Mexico, two hundred years before, and after waving it to the four quarters of the heavens, dipped it into the water. Two vases of spar were also filled, and the Indians then returned in solemn procession to the tent, Mr. Cushing and another chief bringing up the rear, whirling sticks tied to the end of thongs, which made a singular buzzing sound, intended, it was said, to notify the gods that the ceremony was over. On arriving in the tent, the chiefs formed in a row, with their faces toward the west, and repeated a final chant, scattering at the same time more of the sacrificial meal before them. In the morning it had been suggested to the Zuñis, to their great delight, that they would be permitted to carry away with them a further supply of the ocean water, as a store for future use, and by Mr. Cushing's direction some good-sized demijohns, cased with wood for transportation, had been brought to the spot. These were then filled, without any particular ceremony, since the water in them was not to be consecrated until its arrival at Zuñi; but Mr. Cushing, as being yet a neophyte in the sacred order, was not suffered to take part in the operation. When it was over, however, he was solemnly initiated into the first degrees of the order. The five chiefs gathered around him, and after a short prayer led him to the edge of the sea, where he dipped in the water the little stick which he still held in his hand, and threw from it drops towards the four quarters of the earth, as an invocation to all the deities. The oldest chief then stooped and took up a little sand and water, which he placed upon Mr. Cushing's head, repeating the operation a second time. He then put his arms around him, and placing his head close to him, murmured a prayer, which was afterwards explained to be an introduction of the novice to the gods of the Zuñi, and a petition on his behalf for courage and faith. Then taking both of Mr. Cushing's white hands in his, he kissed them three times, Mr. Cushing returning the affectionate salutation, and the second chief went through a similar form, followed by all the others. The solemnity and gentleness with which all these rites were gone through deeply impressed the spectators, who needed no help from the policemen in preserving a respectful and sympathizing silence. Mr. Cushing himself was perhaps the most serious of all, as became the hero of so singular an event. Certainly, no more extraordinary scene is recorded in the history of the pursuit of knowledge than this, where in the presence of two hundred curious but quiet people, within sight of the great city of Boston, a young, highly educated and delicately trained man of science, covered with the silver ornaments, the war-paint and the mystic feathers of a savage chief, his hair dripping with the water of baptism into an unknown religion, listened, in the embrace of his savage brethren, to the first words of the secret ritual which he had dared so much and sacrificed so much to learn. When this was over nothing more was left but to return to the city, where the party dispersed.

BUILDING SUPERINTENDENCE.—XVI.

Drainage and Grading.

WHILE the joiners' work is going on inside the house, the operations of drainage, grading and sodding outside should be completed, so that the dust incident to them may be laid before the final painting.

Cesspool.

Unless, as will rarely be the case in the country, drainage by regular sewers is provided, the first of the outside operations should be the selection of a site for, and the construction of, a cesspool of some kind. Usually the position of this is marked approximately on the plans, or indicated in the specification, which is necessary in order to lay out the plumbing intelligently; but circumstances will often modify greatly the character of the construction as executed. For most houses, the ancient leaching cesspool or "dry well" is still adopted, as the cheapest means for disposing of house wastes, but the architect should examine all the conditions with great care before lending his authority to this expedient. If the house is supplied with water from a town or city service, or from springs higher than the building and at a considerable distance, and if the lot on which it stands is so large that the inevitable poisoning of the ground by the soakage of putrefying filth will not affect its inmates or their neighbors, the leaching cesspool may be regarded, in view of the greater cost and trouble of other devices, as an evil to be tolerated so long as the favorable circumstances continue.

Contamination of Wells.

If, however, water is to be drawn for use, either in the house or stable of the proprietor or his neighbors, from any well within three hundred feet of the proposed cesspool, and on the same or a lower level, the architect should refuse his sanction to any plan whatever for discharging sewage into the subsoil.

In rocky districts, and in places where deep wells are necessary, a much greater distance should intervene between them and any porous cesspools.

It is positively proved that the typhoid poison contained in refuse thrown upon the ground on a rocky hillside, and washed by the rain into some hidden seam or depression in the ledge beneath the surface, has been carried down with its qualities unchanged, to infect with very fatal effect a spring, apparently of the purest water, a mile beyond; and it may generally be assumed that with such a subsoil the crevices through which the liquid escapes from a leaching cesspool are, if not the same, at least in communication more or less direct with the seams which, ramifying in all directions, serve to convey water to the wells of the neighborhood. If, again, a well in a porous, gravelly soil is very deep, the extent of the area from which it draws its supply is enormously increased. The pumping out of the excavation in gravelly and clayey soil for a dry-dock near London drained wells at a distance of much more than a mile. After the pumping was discontinued, the wells gradually filled to their normal level, showing that the water was drawn from them to the excavation during the pumping, and that if they had contained foul liquids instead of clear water, and the excavation had been a well instead of a dry-dock basin, the sewage would, even from that distance, have ultimately reached it.

Leaching Cesspools.

Supposing that all danger of contamination to the drinking water of the house is averted, by the introduction of water either from a public service, or from a spring or well whose *bottom* is considerably higher than the proposed cesspool; this may be excavated of a circular form, in diameter from eight to twelve feet, and of the depth requisite to reach an absorbent stratum, the wells lined with a dry wall of stone or brick, and the top drawn over in the form of a rude dome, leaving a man-hole about twenty inches in diameter at the top, which should be covered with a flat stone. Wooden covers soon rot, forming a dangerous trap. The usual way is to fix the height of the masonry so that the top of the cover shall come about four inches beneath the sod, which may be either carried over it, concealing it entirely, or turned down neatly around the edges of the stone.

In sandy or gravelly soils such a cesspool will dispose of the waste liquids of a house for a long time, but in the course of years the earth around it becomes coated with the fatty deposit from the sewage, and a new cesspool must be dug. Where the sand or gravel is very fine, or mixed with clay, the stoppage of its pores takes place quickly, and as years pass by a continually increasing chain of cesspools, each connected with the previous one by an overflow-pipe, serves to saturate the ground around the house with putrefaction, and the air with malaria. In very clayey soils no leaching whatever takes place, and the cesspool fills up like a tight cistern, a few days' use, with one of ordinary size, causing it to overflow. Such ground often, however, contains strata of porous gravel or sand, and if the excavation can be carried to one of these seams, the cesspool may answer well enough; but if not, and no more favorable spot can be found, a different mode of disposal must be adopted.

Tight Cesspool.

The simplest, though not the least troublesome, way of surmounting the difficulty is to drill a hole through the cover of the cesspool, and set over it an ordinary pump, by which the liquid may be pumped out at intervals of days or weeks, according to the capacity of the reservoir, and spread upon the grass, or utilized in the garden. A small tank on wheels, which can be filled at the pump and conveyed quickly to the point where the fertilizing fluid is to be applied, is much used for this purpose. The operation is not offensive, or only very slightly so, since the sewage does not remain in the cesspool long enough for putrefaction to take place, and the results are excellent, but the necessary attention cannot always be given to it, and a neglect which might cause the backing up of the sewage in the drains, to overflow into the cellar of the house, would be a serious matter. To avoid this, it is customary to provide an overflow, through which the liquid can upon occasion escape over the surface of the ground, where although a continued flow would be offensive, its presence is less objectionable than in the house.

Subsoil Irrigation.

A more automatic arrangement, which has been gaining rapidly in favor of late years, consists in substituting for the surface overflow, to be used only in case of temporary need, a permanent outlet, formed by a series of open-jointed pipes, laid a few inches beneath the surface of the ground, where the liquid exuding from between them will be absorbed, partly by the porous loam which always forms the upper stratum, and partly by the roots of the grass or other vegetation growing upon the surface. If properly arranged, this system is very satisfactory, not only disposing of the house waste as completely, and with as little attention, as the ordinary leaching cesspool, but accomplishing this in soils where a leaching cesspool could not be made, and what is of even more importance, performing its work for an indefinite period without causing any contamination of the ground, the actively oxidizing property of the air contained in the pores of the top soil serving to destroy with certainty the last traces of organic impurity in the liquid, which if discharged into the ground a few feet below, beyond the reach of atmospheric changes, would retain its foulness for months, if not for years.

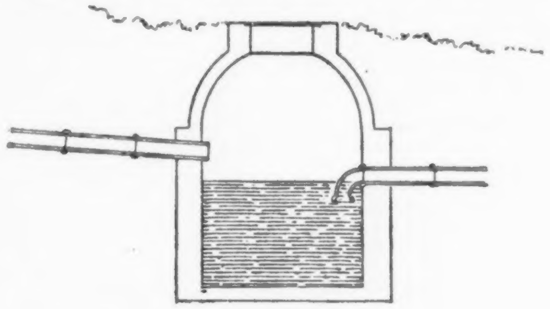

Fig. 173.

An efficient system of subsoil irrigation must consist of two parts: the tight cesspool or tank where the waste matters from the house are retained until they dissolve into a thin, milky liquid, and the network of pipes which receives the sewage from the reservoir, and dissipates it into the ground.

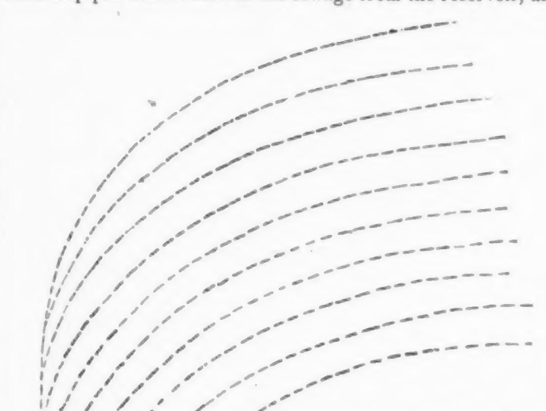

Fig. 174.

The tight cesspool should be constructed as shown in section in Figure 173, of hard brick, laid in cement, circular in plan, about 5 feet in diameter, and 5 feet deep from the mouth of the outlet. The walls should be 8 inches thick in most soils. The bottom may be 4 inches thick, and the top should be covered with a 4-inch dome, with a man-hole 18 or 20 inches in diameter, and a flagstone cover. Whether the cover shall be tight, or be provided with a vent hole and grating, depends upon the arrangement of the drain-pipes. If a separate "foot ventilation" is provided for the main drain near the house, it is best to keep the cesspool closed; but unless fresh air is supplied at the foot of the soil-pipe by a special inlet, a circulation should be insured by omitting all traps in the drain, and providing a grated opening in the cesspool cover. If, as should always be the case, the soil-pipe extends through the roof of the house, no annoyance will be caused by this opening into the cesspool, as the draught will be inward at that point.

The inlet pipe forming the extremity of the main drain should enter the cesspool just above the water line. The outlet pipe should have a quarter-bend cemented in before setting in place, as shown in the figure. The mouth of the bend, turned downward, then protects the outlet from the scum which floats at the surface of the liquid, and would soon choke the irrigation pipes.

The outlet pipe, after leaving the cesspool, should be laid with a very gentle but perfectly uniform pitch, with branches as indicated in Figure 174.

Distributing Pipes.

The best mode is to make it of vitrified pipe, laid with the "hubs" pointing *downward*, instead of upward in the usual way, and having a Y inserted between every two lengths of straight pipe. All the joints should be made tight and smooth with cement, and into the lateral branch of every Y should be cemented a piece of agricultural tile drain. The vitrified pipe forming the main carrier may be 4 inches in diameter, and the agricultural tile should be 2-inch; the Ys forming the connection being of the kind called 2 x 4-inch. Each lateral branch should then be continued by a line of agricultural tiles of the requisite length. If the slope of the lot permits, the outlet pipe should leave the cesspool at least two feet below the surface of the ground, running however in such directions as to bring it, before it begins to ramify, about twelve inches below the sod; and the same or a less distance below the sod should be maintained throughout the system of branches. All the pipes must also be graded to a uniform fall of not more than one inch in twenty-five feet, and to fulfill these two requirements it will generally be necessary to lay all the lines in curves, determined by the irregularities of the surface, and following very nearly a series of contour lines of the ground.

The tiles forming the lateral branches should be laid ½ inch apart, a bit of paper put over the joint, to prevent earth from sifting in, and the trenches then filled. Either round or sole tile may be used, but sole tile are preferable. If round tiles are employed, they should be laid *without* collars, and pebbles put on each side to keep them from rolling out of place.

The end of the main line of vitrified pipe should not be closed, but a reducer should be inserted, and the line continued with open-jointed tiles, in the same way as the lateral branches. The principal object to be kept in view is the avoidance of any check to the continuous flow of the sewage until it issues from the interstices of the drain tiles, to be absorbed and oxidized in the soil. If any such check is offered by the displacement of a pipe, a sudden dip in a line, or an abrupt change in direction, the liquid will throw down at that point a copious black sediment, choking the pipe in a few weeks, or, if the main line is closed at the end, filling it like a pocket, and successively cutting off the lateral branches. With the greatest care some stoppages will take place, and it is wise to provide enough lateral pipe to dispose of any possible flow, with a large margin for contingencies. For an ordinary dwelling-house, inhabited by a family of five or six persons, five hundred feet of lateral outlet pipe is the best rule, and the quantity must be increased for a larger household. The character of the subsoil, whether clayey or sandy, makes with this system very little difference, the exudation being absorbed almost wholly by the surface loam, which is always porous enough to take up a certain quantity of liquid.

On account, probably, of the chemical action of the air by which the upper soil is permeated, the sewage distributed through it leaves no trace of itself. Unlike the earth around a deep cesspool, which when uncovered discloses a foul saturation, the soil surrounding irrigation pipes shows after years of service no trace whatever of the organic matter which has passed through it, and if the pipes are carefully laid, either on hard ground, on strips of board, or in the earthenware channel pieces made for the purpose, so as to avoid depressions which may collect sediment, they will work perfectly for an indefinite period in any kind of soil.

Surface Water.

The disposition of the surface-water about the house is a matter only second in importance to that of drainage. The main point to be kept in mind is that the ground should everywhere slope at a very sensible pitch away from the building, so as to throw rain-water far enough away from the walls to insure its absorption by the soil, or its harmless removal by surface channels. If at any point the ground should be allowed to pitch toward the house, the water of spring rains will be directed against the walls, and sinking through the soft earth which fills the trenches outside of the masonry will make holes or "gullies" close to the building. If the walls are well drained in the manner previously described the water may pass away without finding an entrance into the cellar, but the stone-work will be soaked, and the loose soil carried down by the torrent is liable to be washed into the drain below, so as to choke it and render it useless. This point is generally understood among country contractors, but it is likely to be neglected in practice when the proper grading happens to be inconvenient, particularly under piazzas and porches, where deep holes are often left, to collect the streams of water which soak through from the outside, and direct them against the building.

The lines indicating the surface of the soil as it is intended to be when the work is done should be marked upon the underpinning, bearing in mind that where the ground is to be grassed over two lines will be needed, one showing the grade of the gravel or ordinary earth, and the other that of the loam which must be placed above it to support the proposed vegetation. Where loam enough is at hand it should be spread two feet deep. This will afford a strong, thick growth of grass from seed in a single season. In ordinary cases, however, it is necessary to be contented with a foot or so: less than this cannot be depended upon to produce or sustain a uniform sod. With the usual contracts, where the subsoil is sandy or gravelly, the spreading of the excavated material at a proper grade around the walls, placing the loam on top, with the formation of a gravelled pathway to the doors out of the subsoil material, will constitute all the work to be expected of the contractor; and it will remain for the owner or his gardener to smooth the surface of the loam with a rake, lay a line of sods at the edges of the paths, and sow the rest evenly with "lawn seed," and then drag a bunch of twigs or a tree-branch lightly over it, and leave the rest to nature. Where a bank or terrace forms part of the plan it should be sodded all over; otherwise it will need to be repaired after every heavy rain. Sods should be laid in a bed well soaked with water and kept moist for some days.

It will often be found difficult on sloping ground to keep paths and drive-ways from washing away in severe storms, and even edging them with paved gutters does not always keep their surface in place. Such effects are often due much more to the working in of water at the sides of the path, under the surface, than to the direct action of the rain, which would have little power to disturb the gravel unless previously loosened by the lateral infiltration of water; and the best remedy is to intercept such infiltrations from the sides, and at the same time drain the subsoil of the path, by means of trenches filled with stones on each side. The trenches are best made narrow, but deep: sixteen or eighteen inches of breadth by two feet of depth.

THE STABILITY OF LARGE CHIMNEYS.

A LARGE chimney was designed by the writer for the Illinois Industrial University, and was also erected during the past summer vacation. In studying the question of its stability some new formulæ and methods of procedure were devised, and it is believed that these may be of interest to the profession since they can be readily applied to a practical case by a draughtsman of even moderate ability and intelligence.

From the *British Architect*.

The chimney stands about 75 feet from the boiler-house, with which it is connected by a subterranean smoke-duct, which is about 4 feet wide by 4½ feet high, inside. This boiler-house is intended to contain four Root's tubular boilers of 75 H. P. each, and one high-pressure boiler of about 20 H. P. The chimney receives the smoke from all these boilers. It is also about 6 feet south of the main building, and is therefore fully exposed to the action of the wind for its entire height from east, south, and west. The prevailing winds and the cyclones are from the southwest. The chimney can therefore be considered to be fully exposed to the action of the wind.

The shaft of the chimney is about 90 feet high above the surface of the ground, 80 feet of this being circular, 4 feet inside diameter at top and 5¼ feet at base. The brick wall is 8 inches at top and 17 at the base, exclusive of a 4-inch base. The base of the shaft is of rubble-stone and is octagonal, 11 feet high and 9 feet 7 inches in its external diameter, with its wall 2 feet thick. Below the surface of the ground the shaft is corbelled out square, and stands on a foundation of several courses of solid masonry, which are about 32 inches in thickness, the bottom of the foundation, 8½ feet below the surface of the ground, being 12 feet square. All the masonry below the surface is laid in good cement-mortar.

The interior is protected by a lining-wall of brick 4 inches thick, with 1½ inches air-space, and which rises about 4 feet above the stone base of the chimney, or 14 feet above the surface of the ground.

Had the chimney been built entirely of new materials, its cost would have been $1.000; of this amount $140 was paid for labor on stone masonry, and $267 for labor on brick masonry, inclusive of labor of building scaffolds, thus leaving $593 for the cost of materials, lumber for scaffolds, etc.

A vertical section of the chimney is shown in Figure 1 (see illustration); an elevation in Figure 2; a plan of the top in Figure 5, while sections between the brick shaft and stone base, of stone base, above and below the surface of the ground, are given in Figures 6, 3 and 4 respectively.

There are four general requisites for the stability of a large chimney: —

1. That the area of the foundation be sufficiently great.
2. That no portion of the chimney be liable to be overturned on the edge of any joint by the maximum wind-pressure.
3. That this maximum wind-pressure may not increase the crushing strain at the edge of any joint beyond the safe resistance of the masonry.
4. That vibrations caused by gusts of wind may not overthrow the chimney.

1. SUFFICIENT AREA OF FOUNDATION.

According to Baumann (Isolated Piers, p. 13) the maximum safe pressure of foundations on earth at Chicago is very nearly $1\frac{1}{4}$ net tons per square foot. Trautwine (Civil Engineers' Pocket-Book, p. 314) says that compact sand, gravel or loam, at suitable depth, will safely carry 2 to 3 tons, and that pure damp clay will carry from 1 to $2\frac{1}{2}$ tons per square foot. Rankine (Civil Engineering, p. 381) states that the greatest safe load for firm earth is from $1\frac{1}{4}$ to $1\frac{2}{3}$ tons.

The earth found at the bottom of the excavation was a firm yellowish clay, mixed with some sand and gravel. As it is considerably superior to the earth found at Chicago, containing little sand and no "blue muck," it will be safe to load it to $1\frac{2}{3}$ tons per square foot, if necessary.

According to Trautwine (Civil Engineers' Pocket-Book, p. 386) brick masonry of medium quality weighs 125 pounds per cubic foot, or 16 cubic feet to the net ton. Average rubble masonry in mortar, about 150 pounds.

From the volume of the masonry, the total weight of the chimney, inclusive of the foundations, would be about 207.5 net tons.

As the area of the foundations is 144 square feet the earth would be loaded with 1.44 tons per square foot, which might be increased to perhaps $1\frac{2}{3}$ tons on the leeward edge in case of a severe wind-pressure. But great care was taken to guard against this as far as possible by filling around the chimney with brickbats and broken stone, tamping these down as closely as possible.

The chimney may therefore be considered as safe against this source of danger.

2. LIABILITY OF A PORTION OF THE CHIMNEY TO OVERTURN. — OVERTURNING MOMENT OF WIND-PRESSURE.

Rankine lays down the following principles as to the effect of wind-pressure on a chimney. (Useful Rules and Tables, p. 184.)

If square, the maximum pressure acts on one side only; if round, the maximum pressure will be about one-half that on a square chimney; if octagonal, the effect will be sensibly the same as if round. All these are supposed to be of the same diameter and height.

(As it is evident that the pressure must be greater on an octagonal than on a circular chimney, it is here assumed to be three-fourths that on a square one for safety.)

The resultant of the wind-pressure acts at the centre of gravity of the area exposed to the wind.

Its moment equals the product of the height of this centre above the joint considered, into the area exposed, into the maximum pressure of the wind per square foot.

In Figure 7 draw a trapezoid 1-2-4-3, whose altitude equals that of the circular shaft, making its upper and lower bases respectively equal to half the external diameters of the top and the base of the shaft. Bisect this figure by a centre vertical joining the middle of each base.

The area of this trapezoid in square feet multiplied by the maximum wind-pressure per square foot equals the total wind-pressure on the circular portion of the chimney, and this acts at the centre of gravity of the trapezoid.

This centre of gravity will evidently be found somewhere on the centre vertical. Produce 3-4, making 3-10 equal to 1-2; also produce 1-2, making 2-11 equal to 3-4. Join 11-10, which will intersect the centre vertical at b, the required centre of gravity of the trapezoid.

Make 5-6 equal to three-fourths the external diameter of the octagonal base of the chimney and complete the rectangle 5-6-8-7. Its centre of gravity and pressure will be at its centre 9.

The pressures acting on the shaft and the base will be to each other as the respective areas in Figure 7. The area of the trapezoid is 278.84 square feet; of the rectangle, 79.39, making a total of 358.23 feet.

Draw horizontals through b and 9; draw an oblique line intersecting them, so that 358.23, taken at any convenient scale, may just equal the length of this oblique line between them. Divide this line inversely as the given areas, *i. e.*, lay off 278.84 from its lower end at the same scale. Through the point thus found, draw a horizontal and its intersection with the centre vertical will be the centre or point of action of the resultant of all the wind-pressures which act on the chimney.

The height of this point above the joint A, or the surface of the ground, is readily measured and is found to be 38.7 feet.

Therefore, considering the stability of the chimney at the surface of the ground, the total overturning moment of the wind-pressure acting at that joint A will equal $38.7 \times 358.23 \times$ maximum wind-pressure per square foot.

For the joint B this overturning moment would equal $37.2 \times 278.84 \times$ maximum wind-pressure per square foot.

The circular brick shaft is here assumed to be divided into eight equal sections of nearly 10 feet each, at the points C, D, E, F, G, H and I, at each of which the stability of the chimney is to be examined. Of course it might be divided in any other way if preferred.

It is next necessary to find the centres of pressure for that portion of the wind area above each of these joints in Figure 7.

Produce these joint lines horizontally across the trapezoid in Figure 7, and that portion of the trapezoid above each horizontal will represent the wind area acting at that joint. Make 2-12 equal 13-14; divide 11-12 into seven equal parts (seven equal number of joints). Produce each horizontal, making its length outside the trapezoid equal 1-2, as 14-15, 16-17, etc. Join the ends of these horizontals and the points on 11-12 by right lines as in the figure. The points c, d, e, f, g, h and i, at which these lines intersect the centre vertical, will be the required centres of wind-pressure for the wind areas above the corresponding joints, C, D, E, etc.

The height of each of these centres is measured above the horizontal through the corresponding joint in feet.

From the preceding we may deduce the following general rules: —

1. Draw a trapezoid or rectangle to represent the equivalent area acted on by the full wind-pressure, making its height the same as that of the chimney, and its breadth equal the side of a square chimney three-fourths the diameter of an octagonal or half that of a circular chimney.
2. Divide this into as many sections as may be necessary by horizontals drawn through the joints at which the stability of the chimney is to be examined.
3. Find the area of that portion of the wind area above the joint considered, its centre of pressure, and the height of this centre above the joint, all in feet.
4. The maximum overturning moment arising from the wind-pressure and acting at the joint will equal the product of the wind area, the altitude of the centre of pressure above the joint, and the maximum wind-pressure per square foot of a perpendicular surface.

THE MOMENT OF RESISTANCE OF THE CHIMNEY.

If the tensile strength of the mortar be entirely neglected, as should always be done in this case, and the chimney be supposed to give way by overturning about the extreme leeward edge of a joint as a hinge, its moment of resistance at that joint must equal the product of the weight of that part of the chimney above the joint into the distance from the axis of the chimney to the extreme leeward edge of the joint. For a circular chimney this distance would equal the radius of the exterior of the chimney at the joint considered.

The easiest way to find the weight of the chimney is to suppose its wall to be reduced to a plane wall of one foot in thickness and of the same volume at each joint as the chimney, *i. e.*, its horizontal section would be the same. The weight of any portion will then be readily found from its superficial area.

One-half this weight diagram is shown in Figure 8, 19-22 representing the centre line. The other half is similar, but omitted for want of space.

Make 18-19 equal one-half the sectional area of the chimney at top in square feet. This is readily found by multiplying the mean circumference by the thickness of the wall. Make 20-21 equal to one-half the sectional area at base of shaft, exclusive of the base courses. Join 18-20, and this trapezoid will represent one-half the circular wall reduced to an equivalent wall of one foot thick. Consequently, it will also represent one-half its volume in cubic feet as well. Additional areas can be added to allow for projection of cornice and base, and are to be found in the same manner.

The diagram for the octagonal stone base is found in the same way, but its area must be increased so as to represent an equivalent weight of brick wall one foot thick. Since the weight of good masonry averages about 125 pounds for brick, and 150 pounds for stone, per cubic foot (Trautwine, Civil Engineers' Pocket Book, p. 386), we must increase the width of this rectangle by one-fifth. Allowance is also made for the projecting stone coping.

Continue the horizontals through the joints C, D, etc., across this diagram also. Then the area of that part of the diagram above any horizontal will represent the volume of that portion of the chimney above the corresponding joint in cubic feet.

As the weight of each cubic foot is 125 pounds, 16 cubic feet will weigh one net ton.

The next step will therefore be to find the area of each section of the diagram in square feet: double this, because only half the complete diagram is given, and divide this by 16, which gives the weight of each section. These volumes and weights are written in the proper places on the diagram.

If the weights of all the sections above any joint be added together this total will be the weight of that part of the chimney above that joint. These weights are written at the right of the centre line, near the horizontals through the respective joints.

This process may be formulated in the following general rules: —

1. Draw a diagram, symmetrical about a centre vertical, and rep-

resenting the masonry of the chimney reduced to a wall of one foot in thickness, whose horizontal section shall be the same as that of the chimney at the same point.

2. Divide this by horizontals drawn through the joints at which the stability of the chimney is to be examined.

3. Find the area of each section of the diagram in square feet, which will also be the volume in cubic feet of the corresponding portion of the chimney: divide this by 16, which will give its weight in net tons. (Allowance must be made for extra weight of stone masonry.)

4. The total weight of that part of the chimney above any joint equals the sum of the weights of the sections above it.

5. The moment of resistance at any joint equals the product of the weight above it into the distance from axis of chimney to leeward edge of the joint in feet.

General equation of stability at a joint.

Let $W =$ weight of that part of the chimney above the joint in tons.

Let $A =$ wind area for the same portion in square feet.

Let $y =$ height of centre of pressure of this wind area above the joint in feet.

Let $x =$ distance from axis of chimney to leeward edge of joint in feet.

Let $P =$ maximum pressure of the wind on a perpendicular surface in pounds. $P \div 2000 =$ the same in tons.

Then, $A\ y\ P \div 2000 =$ overturning moment at the joint in foot-tons.

And, $W x =$ resisting moment at the joint also in foot-tons.

When the part of the chimney above the joint is just on the point of overturning about the leeward edge of the joint the two moments are equal, and we have:

$$2000\ W x = A\ y\ P.$$

$$P = 2000 \frac{W x}{A y}. = \left\{ \begin{array}{l} \text{wind-pressure per square foot in pounds} \\ \text{required to overturn chimney at the joint,} \end{array} \right.$$

which is the required general equation of stability at a joint.

The values of all these quantities may be obtained from the diagrams, excepting that of P, which may be found by the equation.

By applying this equation at the different joints, we can easily determine the probable safety of the chimney, and also find the location of the point at which it would be most likely to give way.

Applying it at the joint A, at the surface of the ground, we have

$$P = \frac{2000 \times 151.4 \times 4.79}{358.23 \times 38.7} = 104.62 \text{ pounds.}$$

In the same way we find the corresponding maximum pressures for the other joints as follows:

At B, including projection of base, 95.16 pounds, or exclusive of this, 88.24 pounds; at C, 93.5 pounds; at D, 99.24 pounds; at E, 106.8 pounds; at F, 119.98 pounds; at G, 141.73 pounds; at H, 190.5 pounds; and at I, 343.93 pounds.

The weakest point would be at the top of the base courses of the circular shaft, but the maximum wind-pressure required to overthrow the chimney would be greater than 88.24 pounds per square foot, so that the chimney can be considered to be perfectly safe against this source of danger, as the maximum wind-pressure rarely exceeds 50 pounds, and then only during the most violent tornadoes and cyclones, which would prostrate all other buildings. In this case the factor of safety need not much exceed unity, since the weight of the chimney is the source of its resistance, and there is no need for allowing much for defects of materials.

3. RESISTANCE TO CRUSHING AT LEEWARD EDGE OF JOINT.

The maximum pressure of the wind might not be sufficient to overturn about the leeward edge of any joint that part of the chimney above it. But it is evident that the effect of this pressure would be to lessen the intensity of the loading at the windward, and to correspondingly increase it at the leeward edge of any joint, so that it would be possible for the chimney to give way by the crushing of the masonry under the weight of the chimney above it. This source of danger will therefore require investigation, and a means of determining the corresponding wind-pressure.

Trautwine states that ordinary brick masonry cracks under a load of 20-30 gross tons, equal to 22.4-33.6 net tons, per square foot. (Civil Engineers' Pocket Book, p. 175.)

Wood, that the ultimate resistance of ordinary brick masonry is from 36 to 57.6 tons. (Resistance of Materials, p. 312.)

The Committee of Experts on Rockford Court-House assumed the maximum safe resistance to crushing of hard bricks laid in mortar of equal parts of lime and cement to be 12 tons per square foot. (*American Architect*, 1877, p. 173.)

It will therefore not be unreasonable to assume 10 tons per square foot as the maximum safe resistance to cracking for the brick masonry on the extreme leeward edge of a joint.

Rankine says that this maximum intensity should not exceed twice the mean intensity of the loading per square foot of the solid sectional area of the chimney at the joint. (Applied Mechanics, p. 241.)

Otherwise, the intensity at the windward edge would become negative, *i. e.*, the masonry would be subjected to tension upwards, instead of to crushing. The limiting value of this intensity at the windward edge of any joint will be zero.

GENERAL FORMULÆ.

If a hollow right prism or cylinder, as the case may be, be constructed, of which the base is the solid section of the chimney at the joint considered, made by a horizontal plane, and whose axis or altitude equals the mean intensity of loading in tons per square foot, when the wind is not acting on the chimney the volume of this prism or cylinder will equal and represent the weight of that part of the chimney above the joint in net tons.

Neglecting the adhesion of the mortar, suppose the wind to act against one side of the chimney with its maximum intensity. Construct a second prism or cylinder, on the same base as before, but so that its altitude at any point of the base shall be such as to equal the new intensity of the loading at that point. It is evident that the upper base of the cylinder will be a plane, that it will be inclined toward the point from which the wind comes, that the shortest element of the cylinder will be at the windward, and the longest at the leeward edge of the section or joint.

It will also be true that the volume of this cylinder will be exactly the same as that of the first cylinder or prism, and that the upper base cannot intersect the lower one within the convex surface of the cylinder.

Let $W =$ the volume of this imaginary cylinder or prism, $=$ weight of that part of the chimney above the joint considered in tons.

Let $S =$ area of solid horizontal section of the chimney at the joint in square feet.

Let $x =$ distance from axis of chimney to leeward edge of joint.

Let $z = 10$ tons, $=$ maximum intensity of loading at extreme windward edge of joint in tons per square foot.

Let $v =$ mean intensity of the loading without wind in tons per square foot, $=$ length of axis of either cylinder.

Then $v = W \div S$.

There will be three possible cases, each of which is represented in the drawings.

(1.) v less than $z \div 2$, or less than 5 tons. (Fig. 9.)

In this case, the chimney might overturn on the leeward edge of the joint without any danger of crushing the masonry, at least before the overturning destroyed the chimney.

(2.) $v = z \div 2, = 5$ tons. (Fig. 10.)

In this case the masonry would give way simultaneously by crushing and by overturning.

Therefore in neither of these two cases would there be any need of investigating the stability of the chimney, excepting with regard to its overturning.

(3.) v greater than $z \div 2$ or 5 greater than tons.

In this case the axis of our imaginary cylinder would be greater than 5 tons, and as the longest vertical element of the cylinder, that at the leeward edge, could not have a length greater than 10, the plane of the upper base would intersect the extreme windward element at a point above the lower base. The length of this shortest element would then be $= 2v - z = 2v - 10$.

Suppose a plane to be passed through the upper end of this shortest element and parallel to the lower base of the cylinder. That part of the weight of the chimney which is represented by the portion of the cylinder between the parallel bases would not be available for resisting the overturning moment of the wind-pressure, since it would have no useful effect until the intensity of loading at the extreme leeward edge had reached the maximum safe value of $z = 10$ tons.

Consequently the available weight would be represented by that part of the cylinder above the cutting auxiliary plane.

The volume of this would be $= S\,(z - v) = S\,(10 - v)$.

If this value be now substituted in the formulæ previously obtained for resistance to overturning in place of W the new formulæ will give a smaller result, which is to be taken as the maximum safe wind-pressure per square foot on that part of the chimney above the joint considered.

In this case the chimney would give way by crushing at the extreme leeward edge of the joint considered, and would be in no danger of overturning.

Making this substitution, we have the following:—

$$P = 2000 \frac{S\ x}{A\ y} (10 - v) = \text{maximum safe wind-pressure in pounds per square foot.}$$

Examining the joint B we find:—

$$v = \frac{W}{S} = \frac{108.71}{41\ 28} = 2.63 \text{ tons per square foot.}$$

Since this is less than 5 tons it will not be necessary to apply the formulæ for resistance to crushing, as the chimney would give way at the joint by overturning rather than by crushing.

The same is found to be true of all the other joints of this chimney examined, although this might not have been the case if thinner walls had been employed.

4. RESISTANCE TO VIBRATION.

If sudden and severe gusts of wind were to strike the chimney it would evidently be forced slightly in the same direction, vibrating in the opposite direction when the wind diminished, thus setting up vibrations in the same vertical plane as that of the wind.

If the interval between these gusts exactly equalled the times of vibration of the chimney, and they happened to strike at the times of greatest possible effect, it is easy to see that a chimney might be


Residence of
P. R. Mitchell, Esq.
Walnut Hills
Cincinnati
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Jas. W. McLaughlin
Archt
Porch
K
D. R.
Passage
H
P
L
Veranda

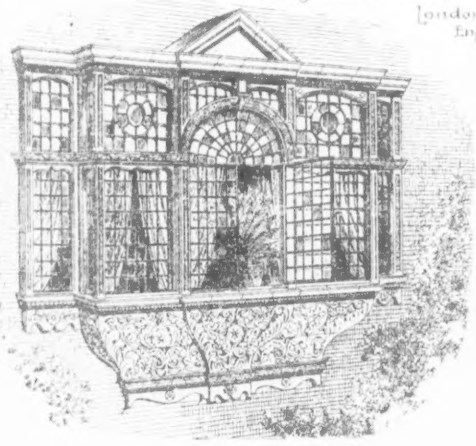

From House for A. J. Winslow Esq. Cincinnati, Ohio.
Mr. J. W. McLaughlin, Arch't. Cincinnati.
From Design for a City House: Mr. W. G. Preston: Arch't. Boston
An Oriel Window :: Design by Mr. T. P. Chandler Arch't. Phila.
For the House for Vanderbi
Mr. R. M. Hunt: New York
From College Building = Oxford England.
Mr. Basil Champneys ::: Arch't.
From Tavern and Hostelry Newark on Trent England.
Ernest George & Peto Archts.
Eastgate House :: Roch
Drawn by
From Hotel: London, Eng.
Messrs. Vigers & Wagstaff Arch'ts.
From House Harrington Gardens London.
Ernest George & Peto: Arch'ts.
Bay W. for three Stories above Ground Floor:
From Houses on Chelsea Embankment London Eng.
R. Norman Shaw R.A. Architect
From Houses at South Hampstead London:
Messrs. H. Saxon Snell and Son: Arch'ts.
From the New Corn Exchange Sheffield England
Messrs. M. E. Hadfield and Son. Arch'ts.

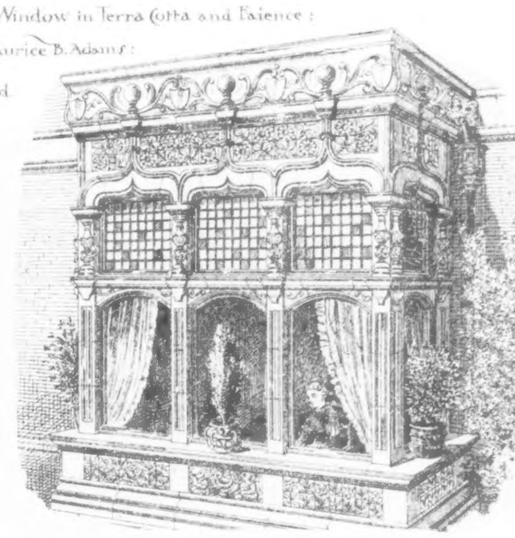
BAY WINDOWS AND ORIELS

...erbilt Esq
...ork :

From House at Lloyds Neck : N.J.
Messrs McKim Mead & Bigelow : Archt's New York

Oriel and Bay Window in Terra Cotta and Faience :
Designed and drawn by Mr. Maurice B. Adams : London : England





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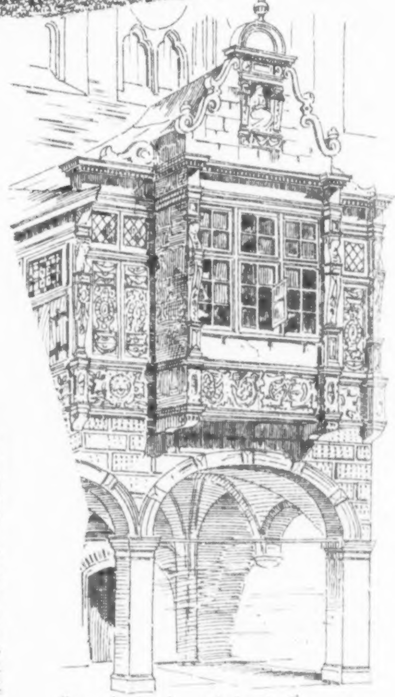
...Rochester : England :
...n by Mr. E. G. Hardy ·



From the Rathaus, Lubeck, Germany

From "Colthurst"
The Residence of Lord Justice Holker England :
Mr. E. J. Tarver, Archt.

Drawn by Mr. T. Raffles Davison.

From Library Chester : Eng
Mr. M. J. Douglas Arch't

From House at Broughton Park Manchester England.

Messrs Bell & Roper Arch'ts

From House at Holland Park : London Eng :
Mr Philip Webb Archt

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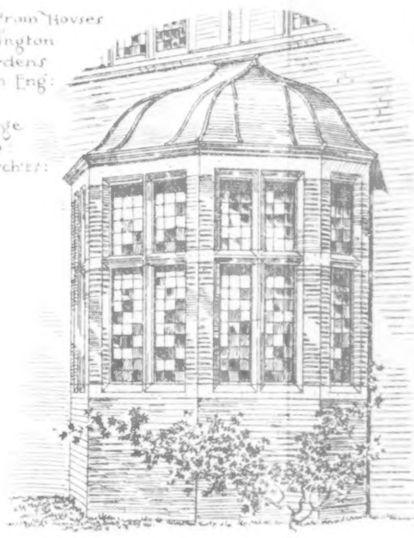
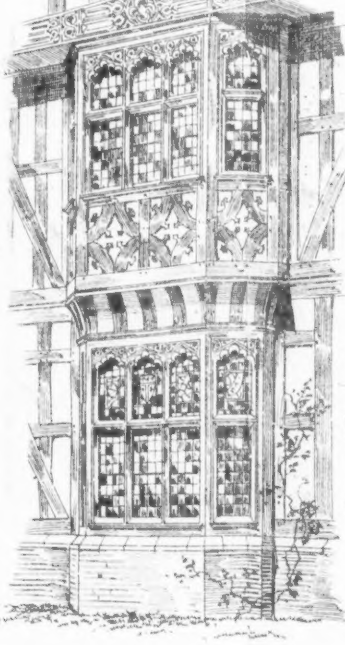
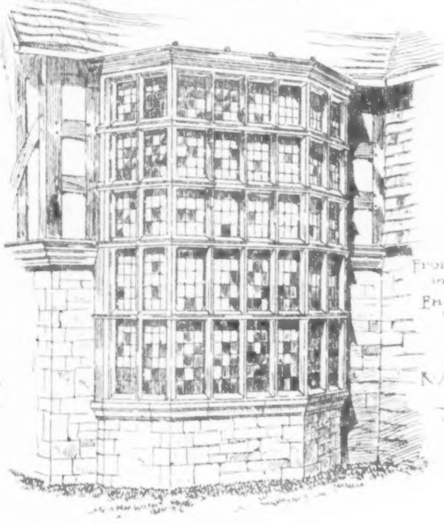
Ernest George & Peto Arch'ts



From House at Bournemouth England
Mr Basil Champneys Archt

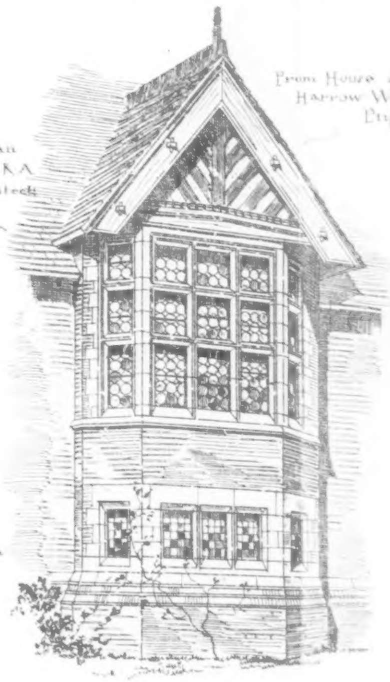


From Rowden "Abbey" England
Mr. J. Douglas Archt



From House in Surrey : Eng :
R. Norman Shaw R.A. Architect

From House at Harrow Weald England
R. Norman Shaw R.A. Architect



American Architect and Building News. Apr. 1, 1882
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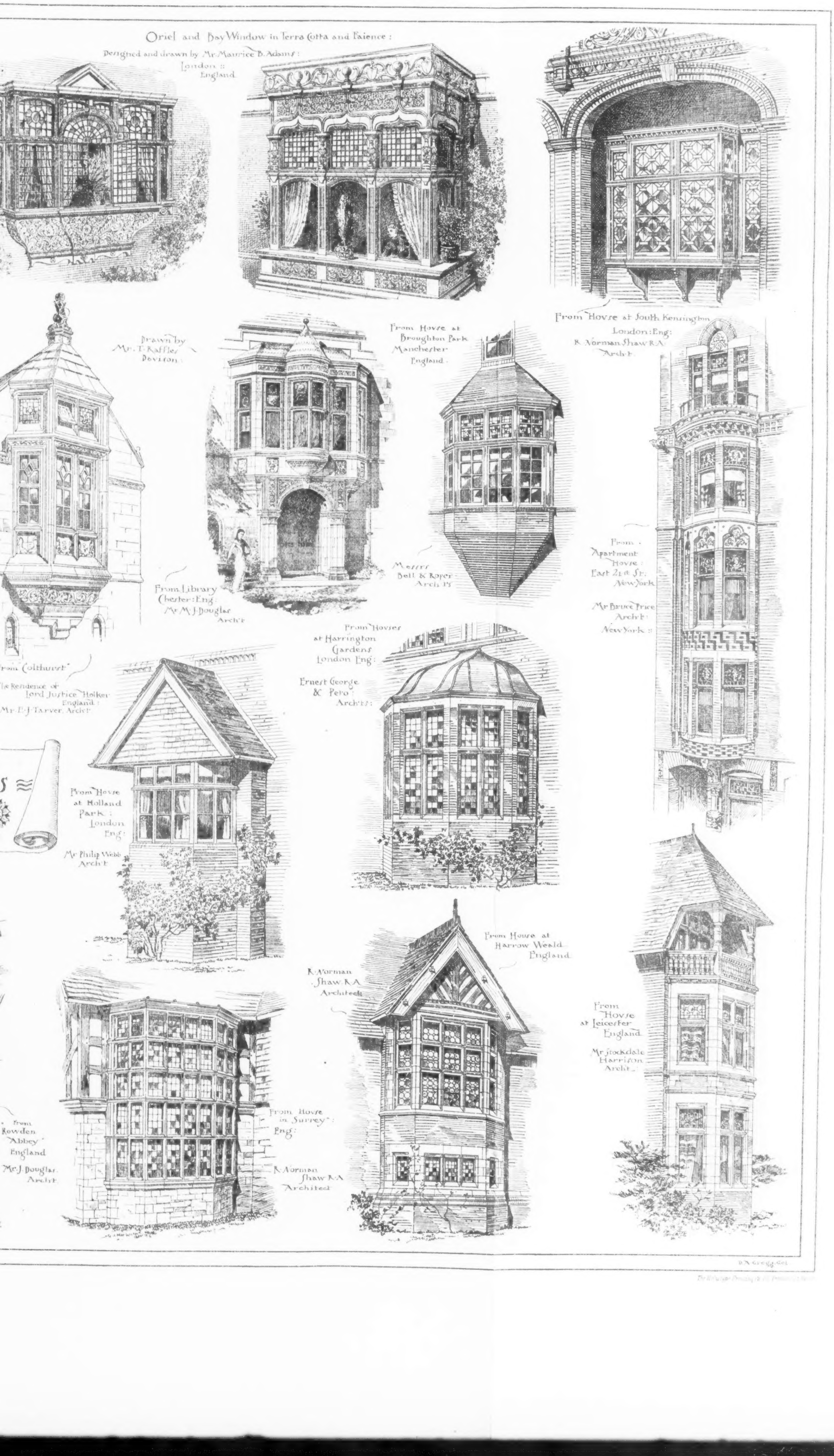
Oriel and Bay Window in Terra Cotta and Faience :
Designed and drawn by Mr. Maurice B. Adams :
London ::
England
From House at South Kensington
London : Eng :
R. Norman Shaw R.A.
Arch't
Drawn by
Mr. T. Raffles
Davison :
From House at
Broughton Park
Manchester
England .
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Messrs
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Apartment
House :
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New York ::
rom "Colthurst"
he Residence of
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From Houses
at Harrington
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London Eng :
Ernest George
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Arch'ts :
From House
at Holland
Park :
London
Eng :
Mr Philip Webb
Arch't
From House at
Harrow Weald
England
R. Norman
Shaw R.A.
Architect
From
House
at Leicester
England
Mr Stockdale
Harrison
Arch't
From
Rowden
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R. Norman
Shaw R.A.
Architect
D. A. Gregg, del.

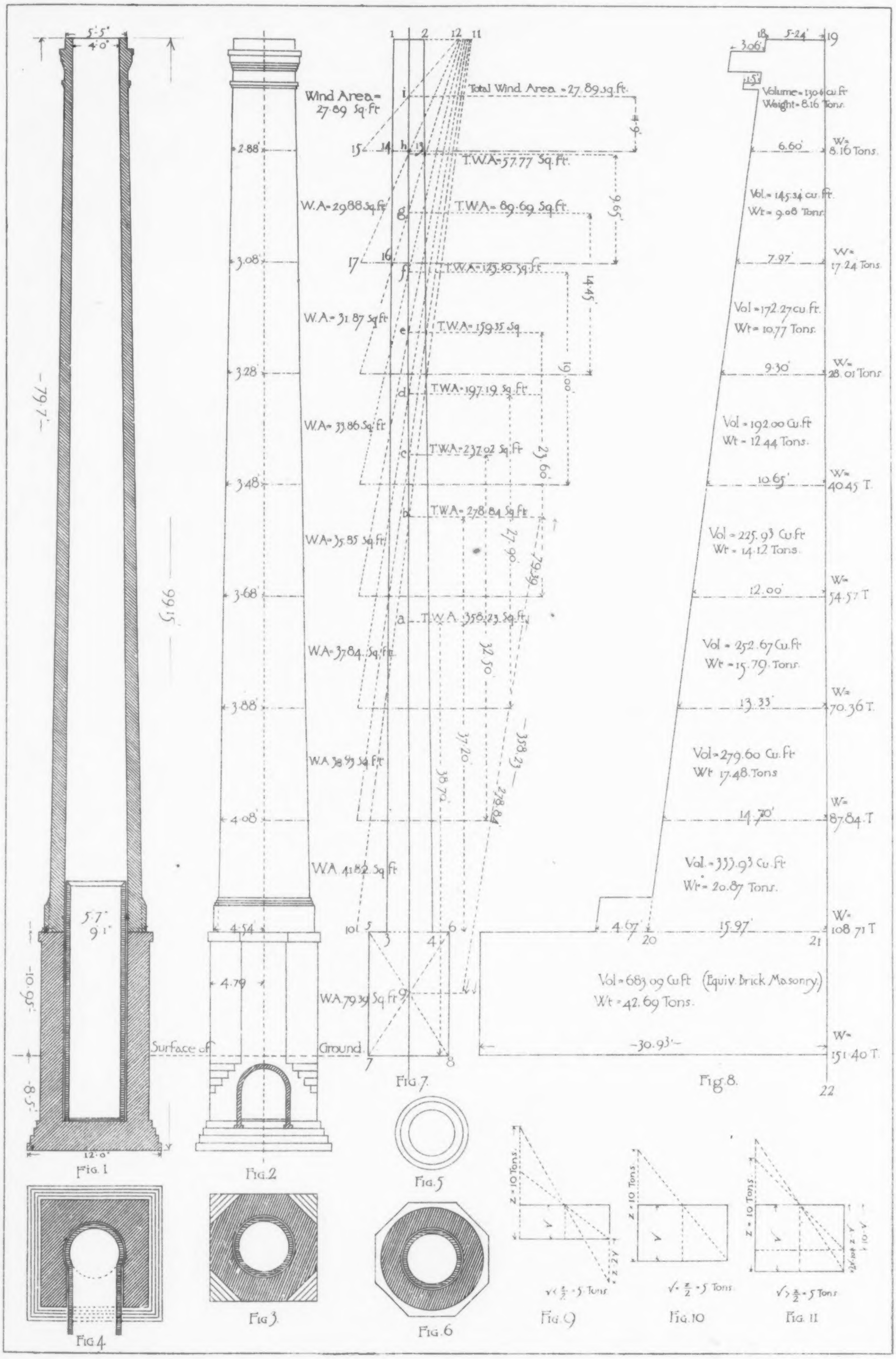


Diagram showing Stability of Chimneys

prostrated by a wind-pressure too small to exercise any injurious effect if it were constant. But the present state of this branch of scientific knowledge is not yet sufficiently advanced that this question may be investigated with the prospect of obtaining results of any practical value. Neither is it at all probable that the gusts and vibrations would ever be sufficiently isochronous to effect the destruction of a chimney in this manner.

It might possibly be resisted by banding the chimney near the point whose height above the ground is equal to the radius of gyration of the mass of the chimney about a horizontal axis at the centre of the chimney and the ground surface; then several cables or wire ropes could be firmly attached to the band, drawn tight, allowing for changes of temperature, and firmly fastened to equidistant points in the ground around the base of chimney. These would check the vibrations.

A short time after its completion, and while the mortar was still only partially hardened, the chimney in question was observed to vibrate about one half-inch each way from its normal position during the action of a high wind. N. Clifford Ricker.

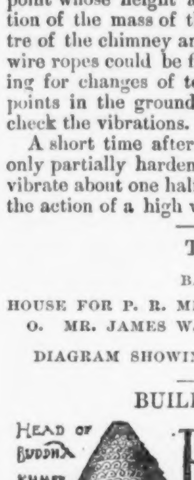
THE ILLUSTRATIONS.

BAY AND ORIEL WINDOWS.

HOUSE FOR P. R. MITCHELL, ESQ., WALNUT HILLS, CINCINNATI, O. MR. JAMES W. McLAUGHLIN, ARCHITECT, CINCINNATI, O.

DIAGRAM SHOWING THE STABILITY OF LARGE CHIMNEYS.

BUILDERS' SCAFFOLDING.—II.



BUILDERS' scaffolding in its ordinary forms, as used in common brick-walling, is ledger scaffolding which consists of vertical standards or uprights of the height of the proposed building, placed in a row parallel to proposed wall and distant from it 5 to 10 feet, according to the magnitude and nature of the building,—it requiring to be wider wherever "runs" for hod-carriers, wheelbarrows, etc., become necessary outside of the breadth reserved for the bricklayers' use,—and 8 to 12 feet apart, according to the transverse strength of proposed ledgers. To the standards are fastened diagonal bracing and counter-bracing at convenient intervals where proper fastening is most readily attainable, both longitudinally of the scaffold as well as transversely. To the inside of the standards (the lowest ledger is usually fastened on the outside of them) are fastened horizontal scantlings called ledgers, in continuous tiers, commencing usually 5 feet to 5½ feet above ground or lowest joists, and the same distance apart above each other as the wall rises. The ledgers are joined together or spliced at a standard which affords the means of making a secure splice the better to withstand transverse strain. Across these, with one end resting on the ledgers and the other resting on the wall being built, are laid putlogs of 3″ x 4″ section (notched down to thickness of a brick at the end which rests on the wall) in a horizontal position and 4 to 5 feet apart, depending on length and strength of scaffold boards; across the putlogs are laid close together stock boards one inch thick, (and frequently in large buildings 2″ thick plank are laid on the lower scaffold where the greatest traffic will occur), the ends of the boards or planks having bearing on a putlog, and overlapping each other so that they will not tip up. This forms a platform from which the bricklayers work until the wall attains the height of the next scaffold, 5 feet or 5½ feet above, when the next tier of ledgers is fastened to the standards, and more putlogs are laid horizontally across them, and on the wall in a similar way to that at the last erected stage of its height, which is the interval of 4 heading courses with 5 courses of stretchers between them, making together 24 courses of ordinary size common brick in the West, 2¼ inches thick laid with a ½ inch thick mortar joint, making 2¾ inches each course high; however, it is only tall bricklayers or those with a high "reach" who can conveniently lay the last 5 or 6 courses of a light brick wall, and therefore a "foot-scaffold," or footing for the bricklayer to stand upon, temporarily built on the main scaffold, is made use of to lay the latter courses from in light walling. It consists of a joist or a plank 2″ x 12″ laid on small trestles, or small temporary piers are built of dry brick gradually raised to the requisite height convenient to reach up from; for heavier walls the inside lower heading courses are left uncovered as benches to form foot-scaffolds, thus the scaffolding is continually raised at intervals of 5 to 5½ feet stages by laying fresh putlogs on the ledgers as they rise up coincidentally with the walling, the boards being transferred each time to form the next higher scaffold, until the wall has attained its total height,—most of the putlogs are also transferred each time to the higher stages, only a few being left in the lower stages to steady the scaffolding. As the scaffold rises it becomes necessary to supply more diagonal bracing higher up so as to form a secure stay against collapse, as the weight and vibratory oscillation produced by moving of material and men on the scaffold at the higher stages has a longer leverage, producing greater intensity of stress on the standards and other parts. This description of scaffolding is distinguished as "single," or single-faced ledger scaffolding. The other varieties and modifications of scaffolding adapted to the several kinds and classes and magnitudes of work and the peculiarities relating to each in works of exceptional magnitude and character, in which improved facilities for extensive concurrent operations are demanded, are reserved for description further on in connection with the application of the principles of mechanics to the construction of scaffolding.

The prevailing insecurity of scaffolding may arise from an innumerable number and variety of defects—moral no less than material. It may be attributable to cupidity and recklessness or caprice of the contractor, and to carelessness and ignorance displayed in its construction and erection, or to varied combinations of these aggregated in the contractor and his employés—these may be termed personal or moral attributes and usually develop in physical form in some or all of the following particulars:—

First. Defective design which may arise in a misunderstanding or confounding, and falsely estimating the amount and direction of all or any of the active forces, or their resultants or components, or a wrong relation of point of application of resistance to centre of gravity of the object to be sustained or force to be counteracted, which induces crippling stresses in any of the parts of a structure under any of the circumstances by which a preponderating change of the directions or intensities of any of the forces may arise, as in moving loads or masses of materials.

In a misunderstanding of the relative duty of each support in a series of sustaining parts in the nature of a continuous girder or beams.

In not placing the direction of the normal transverse or longitudinal resistance of any piece or part of a structure in a directly opposite line coincident with the line of acting forces, or their resultant,—*e. g.*, a joist placed the *flat* way against a transverse strain or load.

In not arranging the longitudinal direction or axis of pieces to the most efficient angle for receiving and transferring, distributing, or resisting oblique strains axially of the piece, as in the angle of bracing to secure stability. In deficient cross sections of pieces for a safe ratio of their required lengths, whereby they are liable to break by bending before approaching their estimated crushing strength as struts or standards.

In the lateral or side-ways stiffness not being equivalent to transverse stiffness of a piece, as its ledgers, if of thin boards, which under weight would spring out sideways and buckle from the wall and withdraw and consequently let down the putlogs.

In doubtful or defective methods of joining, splicing and connecting together pieces and parts of a structure.

Second. In defective materials for parts or connections and fastenings, as being unsound, partly decayed or affected with rot, sap or green wood, which are less firm than dry seasoned heart-wood, an inferior quality or grade cut from crooked timbers, crooked in form and crooked in grain, worn out, having splits, shakes, checks, cracks, cross-limb knots, splintered and shattered, coarse, loose fibres,—especially where these defects interfere with nails, bolts, or screws—nails that are too brittle or soft or improper in size for the work and for the pieces into which they enter, and similar defects in bolts, straps, screws, etc.

Third. In defective construction, meaning thereby clumsy and unscientific conformation of pieces as well as fabrication of parts not included under the caption Erection separately specified below, its object being to adapt and combine fit materials to retain in use the forms and dispositions assigned to each part,—for although the materials may be sufficient if properly disposed according to correct scientific design, yet through carelessness and ignorance the dispositions are materially varied or badly fitted, the joining parts misfitting, shoulders, tenons, mortises, etc., too weak or made on an imperfect piece, thereby greatly lessening the effective strength of the structure; bolts are wrongly placed, or placed in a weak or defective part of the timber, where splices or joints occur, and no intervening strengthening device is supplied.

Nails and spikes are the ever-ready resort of scaffold builders for making all joints and connections and fastenings, and usually the inferior kind of nailing which is perpetrated, not only by those unwisely entrusted with scaffold building, but by carpenters also, is certainly enough to account for many casualties. Thus nails and spikes are driven in defective places, or are wrongly driven to secure the best holding power of the grain, or the best direction to be secure against withdrawing, their greatest section being driven *across* the fibre of the wood, thereby cutting or splitting up the fibre into fragments; or driven near knots where, in consequence of the greater compactness it is liable to split and loosen the hold of the nails; or driven into checks, shakes, or splintered or shattered parts in which the adhesion of nails is greatly diminished, or as sometimes happens, wholly destroyed; or too many nails are used, whereby the piece is actually "nailed off," instead of secured to another piece by destroying the holding power of the wood; or too few or too small, or too large nails, spikes, bolts, etc., are employed without discernment of mechanical effects, or adaptability; or the joints, splicings and fastenings may be generally defective in method, materials and workmanship, as in *lapping* and nailing joints and splices which are to resist great thrust or weight, instead of *butting* the ends of the pieces against each other at joints, or in the case of a brace strut its not being inserted against a proper notching or shoulder in the standard ledger, etc., but merely nailed against it.

In the cases of nailing or spiking scantlings together which have the direction of their fibres perpendicular to each other as in standard and ledger, or the directions of fibres obliquely to each other as in braces and standards, or braces and ledgers, usually the nail is made to enter the *outside* piece flatwise between the fibres, and broadwise between the fibres of the inner piece, which thereby, by reason of its point being somewhat chisel-shaped, ruptures the fibres and prevents their holding, whereas the inside piece being the most essential for holding, and the more particularly so as the small end of the nail or spike is ultimately retained there, the nail or spike should be driven so as to enter the *inside* piece wedge-like, flatwise between the fibres longitudinally, which thus secures the greatest retentiveness, as less fibres are cut, and the elastic pressure of the fibre sideways is made to act forcibly against the larger surface of the nail there imbedded. When the nail is intended to resist a sideways pull, across the axis of nail, and in the direction of length of fibre of timber it ought to be driven with its broad side across the grain, and thus by rupturing the fibres gain a leverage bearing against the cut ends of the fibres.

Fourth. *Erection.* Careless erection may render dangerous any scaffold however sufficient it may be in scientific design, materials and construction. Insecure footings under standards and braces; insufficient tie-posts for tension braces where strut-braces are not convenient or economical; insufficient bearings for putlogs, or green walls,[1] etc.; misplacing of braces and other pieces and parts; not setting vertical pieces plumb, and horizontal pieces level, and the defects in nailing, spiking, bolting, etc., alluded to in caption third also all apply with equal force under this caption.

LEGAL NOTES AND CASES.

Negligence.—Escaping Gas in Sewer from Main Pipes.—Explosion from entering Sewer with Light.

A CIVIL engineer of a city went into a sewer with a light and was injured by the explosion of gas which had escaped from the pipes of a gas company, which were laid under the highway near the sewer; he smelled the gas as he was entering the sewer. In an action by him for negligence he recovered damages, but the Supreme Court of Pennsylvania, on November 7, 1881, reversed the judgment in the case, *Oil City Gas Company vs. Robinson.* Judge Gordon, in the opinion, said: It is contended that the company's neglect in not repairing the pipe was, at most, but the remote and not the proximate cause of the accident; but to this proposition we cannot assent. The gas-pipe and sewer were in the immediate vicinity of each other; in the former there was a defect, and from it the gas, not merely by absorption or by gravity, but also by pressure, found its way into the sewer. This certainly resulted from the defendant's negligence, because but for the defective pipe there could have been no escape of the gas; and if this was not the proximate cause, where, we ask, was the intervening one by which the consequences of the accident are to be shifted from the defendant to some other person or thing? That the city contractor, in building the sewer, disturbed the pipe and so caused the break has no effect to shift the cause, for it still remains that that was the escaping gas; neither does it excuse the company if, knowing the defect, it neglected to make the necessary repairs. So, even if the plaintiff by his own negligence occasioned the defect, that would not make the cause less direct, though his suit might thereby be defeated on the ground of contributory negligence.

But again it is said the company is not liable for this accident because the penetration of the gas into the sewer was not a reasonable probability. But what was there unreasonable about the probability of gas being forced from a broken pipe through three or four feet of loose earth into an adjacent sewer? Gas permeates iron, and why not earth and brick? The company was responsible for what might, in the nature of things, occur from its neglect, and its responsibility was not limited by what its officers may have thought to be improbable or even impossible.

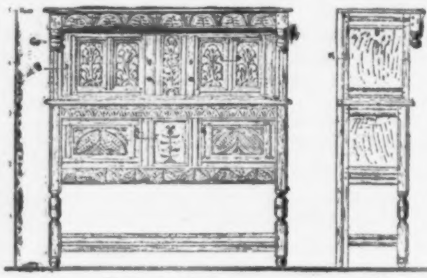
But plaintiff was also bound to the exercise of a reasonable care for his own safety. He was a civil engineer and may be presumed to have had some knowledge of the dangerous nature of illuminating gas, of its power to penetrate the earth, and of its explosive character when mixed in certain quantities with common air. He certainly did know, for he so testifies, that the gas was escaping and saturating the adjacent earth; hence, it seems to us that he ought to have been on his guard. We cannot apply one rule to the company and another to the plaintiff, or vary the rule as concerning negligence, except in this: The defendant was bound for the consequences of its neglect, though those consequences were not, and could not, by any ordinary prudence have been anticipated, whilst the plaintiff was bound only to a knowledge of the probable consequences of the fact, of which he was cognizant and to that ordinary prudence which the circumstances required. If it was probable that the gas escaping from the leak would find its way into the sewer in quantities sufficient to produce an explosion he ought to have anticipated the result and not have entered the sewer with a lighted lamp. If he did so under the conditions stated, he was guilty of such contributory negligence as ought to have prevented his recovery. H. E.

[1] It must be noted that the weight of materials, mechanics and attendants on a scaffold has a very decided tendency to buckle green walls, and that any lowering of the ledgers below the level of the wall on which they rest, and consequently throwing the putlogs out of level has a tendency to draw the wall *inwards* or towards the scaffold when on the inside of the building.

Contracts of Corporations. Power to Make Contribution to Public Festival.

Two corporations which were subscribers to a fund to meet any deficiency which might arise after defraying the expenses of the Peace Jubilee and Musical Festival at Boston in 1872 were sued by the executive committee of the subscribers to the fund for their proportion of the loss; but the Court decided that the action could not be maintained, for the corporation had no power to make the contract. *Davis vs. Old Colony R. R. Co.; Same vs. Smith American Organ Co.*, Supreme Judicial Court of Massachusetts, December, 1882. H. E.

A CHAT ON OLD OAK.



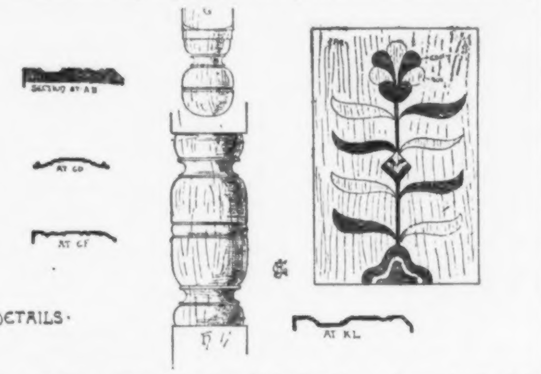
FRONT ELEVATION END

IN the good old time long ago, when knights and barons and abbots and monks built their castles and towers and cathedrals and monasteries, they made their furniture in the same spirit that they did the building, rightly, sternly thoroughly and well, and so it comes to pass that for centuries it has remained firm and strong, and endured the vicissitudes of ages with a fortitude that true principles alone can give. Sometimes in the old world one stumbles upon such an old relic, old and brown, staunch and firm, a venerable protest against the rubbish, which under the name of furniture is made in this enlightened age. Furniture which chiefly seems only put together that it may fall to pieces at the earliest convenient season, and even so long as it exists, taxes the patience of its unhappy possessor in gathering up the fragments of it, and paying frequent bills for the regluing and adjusting of its scattered particles.

In the early days of the mediæval ages domestic architecture was in a very crude state. Few except the knights or barons were able to build, and the buildings were half fortress, half house, a great hall in which the baron and his retainers ate, and caroused, and slept, flanked by towers containing a few "bowers" or apartments for the use of the ladies. Such places were rudely furnished, a few rough oaken tables, and benches, and beds, were all; but as property became more secure by the establishment of good governments and the making of wise laws, chivalry began to destroy barbarism. Knights built stately castles less of the fortress, more of the home, and being less occupied in fighting with their next-door neighbors, domestic life flourished and made advances and property was accumulated. The ladies spun fine linens and wools which were woven and made into fine garments and dresses, and coffers had to be made to stow these away. The knights must have drinking cups of silver and flagons for their ale, and dishes for their venison, and so they must needs make them dressers and buffets to display these upon when not in use, and thus article after article was added to the household store, and the study of the history of furniture from this age till it reached its culmination in the glorious examples of the fifteenth and sixteenth centuries is at once most interesting and delightful and necessary to every art student of the present day. There are few examples remaining of these early ages of furniture, but we have abundant records of their shape and character from the missals and illuminations prior to the eleventh and twelfth centuries, and from that time to the present there are in various museums and collections numerous examples that may be thoroughly studied. The most impressive features of this early furniture are the truthfulness and thoroughness of its construction, its simplicity, its fitness, the severity of its lines, and the perfection of its decoration. At first simple slabs of smoothed wood were used, well pegged together with wooden pegs, and then decorated with diapers or geometrical rosettes in very low relief; occasionally the corners were protected with corner-pieces of exquisitely-wrought iron, and the hinges of the same character almost covered the door, or the lid. Everything was solid, stern and severe; by-and-by greater progress was made: instead of using solid slabs of wood, first was made a strong framing honestly tennoned together, and the spaces between the framings filled up with panels or doors; scratchings on the framing took the shape of mouldings in the simple form of beads and hollows, and the carving grew more vigorous and less geometric; conventional flowers and foliage appeared; then as the workman became more skilled in his craft, turning was introduced, greater refinement of design, richer ornamentation, and so from stage to stage furniture developed from barbarism to beauty, and in castle and in cathedral were erected choir stalls and screens, buffets and coffers, and presses, and chairs, which have never been surpassed and which are still the wonder and the glory of this age. It is remarkable that in the whole of Northern Europe as far south as Italy the favorite wood in these ages was oak: it is a very rare thing to find any other wood employed. Rigidly and sternly did these old mediævalists refuse any other wood: it was the most fitting in qualities of strength and endurance, and thus we learn with what serious intention they built their furniture that it might last;

it passed down from father to son, from generation to generation; it was the pride of the household, well-cared for and beloved, and often upon it was carved the pictured story of some famous deed of valor, or some history connected with its possessor, or the family arms, or some wise motto or saying; such old oak was indeed "furniture" in the highest sense of the word. Like the men who built strong and true, what remains calmly stands to-day as an everlasting rebuke to an age of shams. But now came a new era of which it is not my intention to say anything. With the birth of the Renaissance came the end of the truth and strength of mediævalism, and presently came the riot of furniture: it must be carved and shaped, no longer firmly constructed but stuck together bit by bit; now came the era of the glue-pot, French polish and veneer, and alas! the majority of us to-day are surrounded with shams, and tricks, and rubbish, while some few of us are patiently struggling to bring back into the construction of modern furniture the principles still preached by the old oak.

It is a delightful thing to possess a few pieces of this old work. As

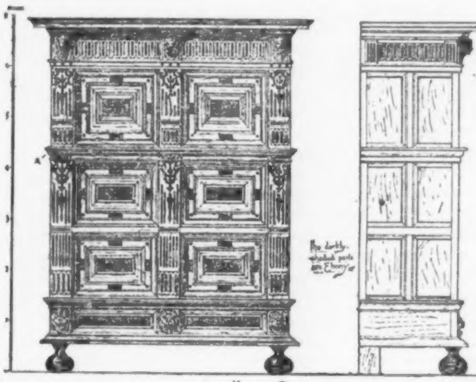


I sit in my studio writing this, the old buffet (here shown in the initial cut) stands opposite to me; it has become quite a familiar friend and is a constant inspiration to me, and I often speculate as to what manner of man made it, and through what strange scenes it has passed. It came out of an old manor-house near my home in Lancashire, and little thought I when I bought it, it would ever travel so far from Merrie England. It is a fine example of seventeenth-century work, of fine English oak of that deep rich color age only can give. It is well and truthfully constructed, numerous honestly pegged pegs very visible. Its proportions are fine — notice how beautifully the spaces are broken up. Its decoration is exquisite and quite a study, the carvings possess considerable delicacy and the ornament is admirably placed — notice the spacing of the pattern in the frieze. The scratched moulds and beads are sharp and clean, and it has a remarkable feature in the shape of a marquetrie panel which is exceedingly good in color and very decorative, and I consider it a perfect specimen of what a piece of furniture should be in construction, utility, proportion and decorative effect.

Of late it has become quite the fashion to collect old oak; the revival of decorative art during the last few years has again turned attention to old work, and its value is now fully recognized: it is becoming rare. Ten years ago numerous specimens were to be had in the old timbered farm-houses in Lancashire and Cheshire; much of it still remained as it had been for centuries, and I have many pleasant recollections of the old kitchens, with open fireplaces and low ceiling well supported on oak beams, filled with grand old tables, corner-cupboards, buffets and pewter racks, well stored with the brightly-polished pewter. I remember some instances where the old

oak had been put to very ignominious uses. I have seen fine old coffers used as corn-bins in stables, and I rescued once a noble buffet which a boy had turned into the home of four pink-eyed ferrets. Some years ago Belgium was an excellent field, and during one trip there I collected in Antwerp, Ghent, Maline, Bruges and the little towns in their vicinity, over a dozen of the finest specimens of Flemish work I ever saw; last year I went over the same ground without finding one desirable antique, although I found lots of imitations were to be had, and were being sold as antique. There is an old man in Ghent who imitates them very cleverly, in fact, so successfully that it is really difficult to tell the spurious from the genuine. One day (it was Saturday) I went to see him; he showed me several specimens which I pronounced shams; he was very indignant and assured me they were "his ancient veritable antiques." I went away and next day, Sunday, coming out of a church near his place, I found his yard-door open, and got a view through it of the old sinner very busy with a pot of ammonia and a brush staining up a new cabinet into a "veritable antique." I went into the yard and found the old fellow had quite a collection of old panels, moulds and carvings which he manufactured into tables and cabinets, and sold as genuine.

The other old oak cabinet here shown is a fine piece of early seventeenth-century Flemish work. I bought it in Ghent some years ago. It is of a rich brown color, the sameness of which is broken by the



OLD·OAK CABINET FLEMISH 17th CENT — property of J R Gandy

introduction of ebony inlays. It has a charming simplicity of line and proportion, and its chief effect is dependent upon its exquisite mouldings which are wrought with the greatest delicacy and sharpness, and produce an effect of light and shade so charming it is impossible to reproduce it in pen-drawing. It is a capital example of what may be done by simple lines. What little carving there is, is executed with great spirit and freedom, and the heads of the frieze have that quaint characteristic expression of the Flemings; unfortunately time and usage have damaged considerably the noses of the latter.

John R. Gandy.

CEMENT-BETON AND ARTIFICIAL STONE.

At an assembly of German cement-makers, Von Froideville made a report, which was published in the *Thonindustrie Zietung*, in which he said: —

A good cement does not crack, and even in a Northern climate is able to resist the weather, supposing it has been properly mixed. If too much water has been used, so that a glassy crust forms on the surface, and the whole mass is not homogeneous, the cement checks or cracks, and as soon as hair cracks appear moisture enters and the frost completely destroys it. A second fault is when the cement strikes out, which it ought not to do. Cement can be colored nicely and permanently with suitable colors, but quite a good deal of color is necessary if it is required to entirely hide the natural color of the cement and give it the exact color desired. The addition of a coloring to cement makes it more friable and softer, so that it takes comparatively more cement than without the color. Cement is only just coming to be understood in practice; but, on the other hand, architects are too distrustful of artificial stone.

For several years artificial stones for curb-stones and street-gutters have been made at Potsdam, and have lasted well. The gutter-stones are very cleanly and neat, and the fear that frosts and the pressure of the earth on both sides would destroy them have proved unfounded.

Granite, when broken up fine, imparts to cement a very considerable strength similar to gravel, but the pieces of stone, being heavier, settle and interfere with its manufacture. On the other hand, the addition of granite to cement without any sand makes an excellent material. In the gymnasium at Potsdam are two pillars made in this way, which support not only a cross-vaulted arch, but also bear the pillars that extend to the upper story.

When marble is combined with cement without the addition of any sand, blocks are obtained of such strength that they are capable of receiving a fine polish, but cement must first assume the strength of stone. The problem was presented of building stairs with steps 40″ long, set into the masonry 8″ at one end, each step having a height of 6½″, and a total width of 14½″. Experimental blocks were prepared, and at the end of six weeks four steps were put up for trial. Railroad iron was piled up on the steps, and the weight gradually increased until it reached 5,940 pounds. The steps held out, but no more could be put on because the masonry began to yield. The load was left on the steps for three days and nights without any injury. The steps subsequently remained unaffected. By adding pieces of marble to the cement different kinds of stone were imitated, with a saving of expense equal to nearly one-half the cost of real granite-work.

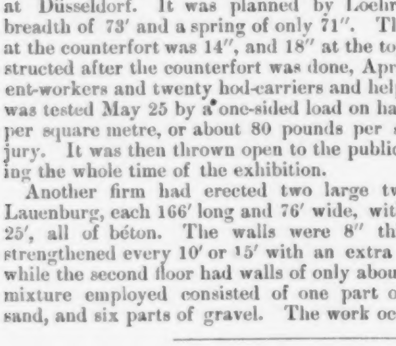
A considerable quantity of cement is used for the flooring of terrace-work. The manufacture of old Roman marble mosaics for parquettes and floors has rested many centuries, and has only recently been revived. The Italians make a ground bed or béton strata from puzzolana, or hydraulic lime, and pieces of brick, and lay the mass also in brick-dust. Portland cement answers much better than these for joining the pieces of marble and such like, and can also be employed for mosaic plates and tiles.

Cement-béton — coarse gravel with cement below, fine sand with cement on top — is a pleasant and durable material used more and more every year for sidewalks and such like purposes. But many other things have been made of it — building objects, floor and cellar coverings, vaults, cattle-cribs, stables, and even whole houses, as well as a series of bridges, that are both good and cheap.

At the meeting referred to, where this report was made, one firm in Amœneburg, near Bilbrich, exhibited photographs of a bridge which they had made for the Düsseldorf exhibition, while a Frankfort firm showed the plans and pictures of another béton bridge, also at Düsseldorf. It was planned by Loehr, and the arch had a breadth of 73′ and a spring of only 71″. The thickness of the arch at the counterfort was 14″, and 18″ at the top. The arch was constructed after the counterfort was done, April 14, 1881, by four cement-workers and twenty hod-carriers and helpers in *eight hours*. It was tested May 25 by a one-sided load on half the arch of 400 kilos per square metre, or about 80 pounds per square foot, without injury. It was then thrown open to the public, and was in use during the whole time of the exhibition.

Another firm had erected two large two-story farmhouses in Lauenburg, each 166′ long and 76′ wide, with an average height of 25′, all of béton. The walls were 8″ thick on the first floor, strengthened every 10′ or 15′ with an extra thickness of 4″ more, while the second floor had walls of only about 7″ in thickness. The mixture employed consisted of one part of cement, two parts of sand, and six parts of gravel. The work occupied two months.

BUILDING STONES.—IV.



As we leave the quarries at Rutland, the northerly one being the "Mountain Quarry" of the Vermont Marble Co., the marble belt seems to be cut by ordinary limestone, to reappear a few miles northerly in Pittsford, where the "Central Vermont Quarry," formerly wrought, is now idle. Just why it is so does not appear, for much of the marble taken out was highly crystalline, and of a peculiar toughness combined with elasticity, which for some work is certainly very desirable. As the pit was full of water, I could not examine the texture at this time, but some specimens given me with the assurance that they came from the bottom of the pit, which was 30 feet from the surface, stand a pressure (as recorded by Maj.-Gen. Q. A. Gilmore) in the government crushing machine of 11,250 pounds to the square inch. As this marble stands the same pressure on bed as side its uniform structure is evident. Its specific gravity is 2,661; weight per cubic foot, 1,663 pounds; ratio of absorption, 1 + 331; first apparent injury by heat 925 degrees; injured so as to be of no use at 1,100 degrees. This marble does not take so fine a polish as the Sutherland Falls, and seems to be of a different character from any of the Rutland marbles. Some two miles farther north there is another outcrop of marble in the same town. The easterly vein on the property of F. W. Smith & Co., where it is finely developed, seems more like the Rutland marble, but the quarry developed by this company is on the western side of the outcrop, and is divided from the easterly vein by some 200 feet of ordinary limestone. This quarry is at the terminus of a branch of the Central Vermont Railroad, made to accommodate the same, but is less than one mile from their main line. The width of this vein is about 400 feet, and its length one-half mile or more. It is very remarkable on account of its surface soundness. The so-called blue layer 16 feet from the surface tests in the government machine, 12,500 pounds to the square inch, which exactly coincides with the similar colored layer in Rutland; as the stone is nearly homogeneous there is no difference between the breakage, whether on side or bed; other layers of inferior quality as now taken near the surface stand a pressure of 12,000 pounds and upwards, being quite homogeneous also. The specific gravity of the best specimen 2,662; weight per cubic foot 1,664 pounds; ratio of absorption, 1 + 336; first apparent injury by heat, 1000 degrees, and like the Rutland marble the injury is but slight until it crumbles in quick-lime, at about 1,200 degrees. The microscope reveals a fine even structure with little alumina or silica. It is known to the trade as the "Florence Italian" of Vermont, grades 1, 2 and 3; also mottled blue and white.

This firm also have control of the old Pittsford Company, and all grades of marble formerly furnished by that quarry are now furnished by them. This quarry is about a half mile farther north, and joins the quarry of Sir Alexander Gault.

This Pittsford quarry has been wrought many years, and its durability is attested by the Commonwealth Hotel, Blackstone National Bank, and many other buildings in Boston, as well as in other cities. Various monuments are also scattered through not only New England, but the West. Its crushing strength 30 feet from surface is 11,250 pounds to the inch, and its specific gravity, ratio of absorption, weight and capability of standing fire the same as that of the "Central Vermont." It however, seems better at the northern end; and marble a third of a mile farther north, at the north end of the quarry of Sir Alexander Gault stands a pressure of 18,750 pounds to the square inch at 35 feet from the surface when crushed on bed. Its specific gravity is 2,672; weight per cubic foot 1,669 pounds; ratio of absorption 1 + 326, and capability of standing heat about the same as the other marbles in this vicinity. The quarries as wrought give good results. Those quarries are all wrought by steam power. Diamond drills are used extensively by most of the quarries in Vermont and these are no exceptions. The amount of marble above described seems practically inexhaustible, and the facilities of taking from the pits will of course be increased as fast as the demand.

H. A. CUTTING.

QUESTIONS IN MENSURATION.

BOSTON, March, 24, 1882.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs, — Being a subscriber to your paper, I take the liberty to ask you a question. I have lately been superintending the construction of a brick building: in my estimate I figured on 23 bricks to a cubic foot, but the contractor claim 25 as the *prevailing custom*. What is right?

The specifications did not specify; but during the work I had cause to call the contractor's attention to the thick joints, the repetition of which was allowed on account of the cold weather. By actual count there were 443 bricks in 20 cubic feet, or a little over 22 bricks per cubic foot. Will you please tell me the custom in Boston, also whether I must pay as much for mortar as for brick?

In the roofing which was tar and gravel to be paid for by the square foot of roofing, the contractor claims that the two inches of felt which was lapped over the edge should be included. Is he right? There was a strip all around the edge, and all he had to do was to nail his felt to it and other parties covered it by a wooden cover strip.

If you will answer the above, you will confer a favor on

A SUBSCRIBER.

[TWENTY-FIVE bricks to the cubic foot is the usual allowance in Eastern Massachusetts. Twenty-two bricks will actually occupy the space in most walls, but the surplus is accounted for by waste in broken or defective bricks. Whether mortar ought to be paid for at the same rate as bricks depends altogether upon the agreement made with the contractor. The common practice is to include the mortar in the price for brickwork.

About the felt roofing, the contractor is undoubtedly right. The expense of tacking the felt to the strips would much more than offset the cost of the tar and gravel.—EDS. AMERICAN ARCHITECT.]

DUMB-WAITERS.

OSWEGO, N. Y., March 12, 1882.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs, — Could you make it convenient to give in your "Monthly Issue" details for dumb-waiter for domestic use, hand-power.

There are, no doubt, recent improvements in fittings and arrangements which could be made useful. Respectfully,

WM. P. JUDSON.

[We shall be pleased to receive and publish designs for dumb-waiters which may be received in response to this suggestion.—EDS. AMERICAN ARCHITECT.]

BUILDERS' SCAFFOLDING.

NEW YORK, March 17, 1882.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs, — In perusing carefully last night the article on Builders' Scaffolding (March 4th, Vol. XI, No. 323, pp. 101-102) I found such a good (?) example of the reckless way some writers are accustomed to use and expound formulas, that I trust you will not deem it an impertinence if I criticise the article, particularly so as no name is attached to the same. On page 102, the "Breaking weight in pounds *per square inch*" of an upright timber is given as

$$= \frac{\text{Sectional area} \times 4800 \text{ lbs.}}{1 + \left(\frac{l \text{ ins. sqd}}{b \text{ ins sqd.}}\right) \times 0.003.}.$$

This formula (though differing slightly,) is presumably founded on Gordon's formula,

$$\frac{\text{Sectional area} \times 7200 \text{ lbs.}}{\left(1 + \left(\frac{l \text{ ins.}}{b \text{ ins.}}\right)^{\text{sqd.}} \times 0.004\right)}$$

which is the formula for the *entire* breaking weight, and not for the "breaking weight *per square inch*," a fact which your correspondent seems to tacitly admit, by dividing the result, 13,151 pounds, by the sectional area 16, though he does not explain this, leaving it for the uninitiated to study out for themselves, the whole process of the division, etc., being stated in this shape, "= 13151 pounds, *or* 822 pounds." He has therefore multiplied once by 16 (sectional area), then divided once by 16 (sectional area), and in order to obtain his final result, a few lines farther on he again multiplies with 16 (sectional area). A rather tedious process of multiplications and divisions, equalled only by some German computations which I have come across in books, where at every step it is necessary to reduce tons to pounds, and feet to inches, and *vice versa*, a dozen times or more during the computation. Again, in a foot-note, your correspondent informs us that "4800 pounds is the crushing resistance of 2″ cubes," that is, of 4 square inches of sectional area. He is either lamentably misinformed (as from 20,000 pounds to 30,000 pounds is the actual crushing resistance of 4 square inches of white pine,—see Hatfield, Transverse Strains, Table XX), or he is entirely unable to *read* his formula. It is the first principle of a formula that all parts must have the same fundamental basis. Now if his basis for crushing strength had been a 2″ cube (or 4 square inches sectional area), he should either reduce the result to one-quarter of 4800, and base his formula on square inches of sectional area, or else, if he keeps the 2″ cube basis, in giving sectional area of his upright, he should base that on *units* of 4 square inches each, and call his sectional area 4 units (of 4 square inches each). Of course the formula and the result attained is right, but it is evidently not the fault of your correspondent, as his explanations (?) of the formula and process of computations clearly show.

Respectfully Yours, LOUIS D. BERG, Architect.

HARDWARE SPECIFICATIONS.

NEW YORK, March 11, 1882.

TO THE EDITORS OF THE AMERICAN ARCHITECT:—

Gentlemen, — The perusal of your last article on "Building Superintendence" suggests to me that it may be of value to some of my professional brethren to acquaint them with a device respecting "hardware specifications" which I have found to be most satisfactory in my own practice, not only because I am able thus to save in my office a large amount of very tedious labor, but because greater satisfaction is thereby given to my clients, who are enabled to have exactly what they want.

There is nothing which a man dislikes more than a thing which he dislikes *a little*, but which is thrust upon his attention *continually*, and a slight dissatisfaction with the hardware in a house is sure to be emphasized in this way.

I am accustomed to include in my specifications the following clause:—

"The hardware to be furnished by the contractor, subject to the approval of the architect, at dealers' net prices; . . . per cent on the amount of the bills for the same to be allowed to the contractor. The contract price is to include the cost of none of the hardware unless elsewhere specifically mentioned, but is to cover the cost of all screws and nails and other material, and also all labor used in fixing said hardware properly in place."

Then follow such general directions as will enable the contractor to avoid error in calculating how much labor will be required in putting the hardware in place.

Where the owner is particularly interested in the work, the architect is thus able to consult with him and choose exactly what he will like without trouble from the contractor. The trouble which accompanies the attempt to compel an unwilling contractor to fulfil his obligations is thus avoided, as is also the contrary difficulty which arises when the contractor is reliable; viz.: the tendency to make his bid include a large amount for sundries or hardware, in order that he may be sure to satisfy both architect and owner.

Yours very truly. X.

[How does our correspondent satisfy himself that the articles are furnished at the *actual* net cost?—EDS. AMERICAN ARCHITECT.]

CELLULOID DOOR-KNOBS.

BOSTON, March 9, 1882.

TO THE EDITORS OF THE AMERICAN ARCHITECT:—

Gentlemen, — The *American Architect and Building News* of March 4 contains an article on "Building Superintendence" in which occurs this statement (page 100), and which is calculated to give a wrong impression of our goods: *Hard rubber and celluloid make durable and pretty furniture for indoors, but do not bear weathering well.* As this statement refers to knobs, we are called upon to notice it. How true it is when reference is made to rubber we do not say, but we do know that long-continued experiments have proved that no extremes of hot, cold, or weather have any effect whatever upon celluloid knobs, and that this company fully warrant their goods to stand any weather without fading or other change.

Very respectfully yours, THE BOSTON KNOB COMPANY.
By GEO. F. WHITING, *Pres.*

NOTES AND CLIPPINGS.

PANAMA.—The town of Panama, which is attracting such general and important interest in connection with M. Lesseps's great project, now contains about 14,000 inhabitants. After the destruction of the old town the new one was built by the Governor, Fernandez de Cordova, on a fresh situation more capable of defence, according to plans designed by the celebrated engineer Alfonso de Villa Certa, who made it the second strongest fortress in America, after Cartagena. He caused the ground to be raised twenty feet above the sea level, and protecting walls of unusual height and thickness to be raised to prevent the encroachment of the sea. These fortifications, however, no longer required to guard against inland invasion, are now beginning to decay, and are used rather as a place of promenade than of protection, with the exception only of those on the sea-face, which are still kept up. It is not more than a hundred years since it was one of the richest and finest towns in the world, as it lay on the high road for gold finders from Peru, and all the adventurers from the Atlantic to the Pacific Oceans. It was materially injured, however, by the war between England and Spain, and sank under the rivalry of other towns, but since the establishment of railways it has risen to more importance again, and should the projected canal become a reality would certainly be restored to its original celebrity and importance. In spite of the devastations caused by frequent fires, and the negligence of its inhabitants, the town is still most interesting to travellers, and contains many old and curious monuments and buildings, among which the most conspicuous is the old Cathedral, still in a very good state of preservation. Its towers are the highest in America, and serve as landmarks at a great distance both from sea and land. The ruins of the church of St. Anna, with their sombre aspect, and the convent of San Francisco, which, though in a somewhat decayed condition, is still used for religious services, as well as the churches of San Juan Dios, of San Felipe, of San Miguel de Malambro, and several others, which are remarkable for a profusion of ornaments, are all well worth a visit, as are also the imposing ruins of the old great convent of Jesuits.—*London Life.*

EXPLOSION OF A GOLD LION.—According to the *North China Herald*, Tso-An, the late-lamented Empress Regent of the Flowery Realm, underwent an uncommonly curious and startling experience in the pleasure-garden of the palace at Pekin a short time before her death. It appears that several huge effigies of lions adorn different parts of the private grounds affected to the special use of the imperial family's female members. Two of these mimic lions, cast in pure gold, stood on either side of a shady path, her Majesty's favorite resort during the hour of pre-prandial exercise. As she was strolling up and down the walk one fine morning last March, attended by her ladies of honor, to her surprise and consternation one of the golden lions suddenly sprang into the air from its pedestal, and, with a tremendous roar like the report of a cannon, fell nearly at her feet, shattered to pieces. Tso-An swooned away on the spot, and was carried into the palace, where she speedily came to herself, and was found to have sustained no damage beyond a severe shock to her nerves. It was subsequently discovered that the hollow body of the lion had been filled with gunpowder, and fired by means of a wire connected with an electric battery fitted up in the private sitting-room of a subordinate palace official. This person's arrest and the depositions subsequently obtained from him by certain ingenious methods of persuasion usually brought to bear upon criminals by the Chinese executive, led to the discovery of an elaborate court conspiracy against the life of the Empress Regent. It is, perhaps, unnecessary to add that the conspirators did not survive their accomplice's revelations for any great length of time. — *London Telegraph.*

CAUSE OF THE FIRE IN THE VIENNA THEATRE.—Mr. G. E. Stevenson, writing to the *Review of Gas and Water Engineering*, gives the following as the cause of the burning of the Vienna theatre. The facts were communicated by the machinist of the theatre. It appears that an electric apparatus was employed for lighting a row of gas-burners running across the stage at the top of the scenes, and that the spark for lighting the gas was applied at one of the end burners only. It was necessary, therefore, to turn the gas full on before the burners would ignite, and as sometimes happened, the failure of the spark to ignite the gas resulted in an accumulation of gas in the upper part of the scenes, which, when the lighting of the burners succeeded, produced a sheet of flame. This state of things had existed for some time, but on the night of the fire either the accumulation of gas was larger than usual, or for some other cause, the flames ignited the scenery, which naturally is very combustible material. Efforts were made to extinguish the fire before lowering the iron curtain, and when at last it became evident that these efforts were useless and the order was given to lower the curtain, it was found that the heat had rendered it immovable, and before anything further could be done the flames had extended to the auditorium. The attention of the theatre authorities had been called to these defective arrangements, but nothing had been done to improve them. So far as one may judge from this statement the authorities were clearly responsible for the terrible loss of life which attended the burning of the building. The accident, however, does not form any argument against the use of electricity in lighting gas-burners. Like everything else, it is capable of abuse, and, as in the present instance, what should have formed an additional means of safety and convenience, was in reality the cause of the burning of the theatre. — *Sanitary Engineer.*

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.*]

255,110. SAFETY ATTACHMENT FOR ELEVATORS.—Pembroke D. Harton, Philadelphia, Pa.

255,118. HASP-LOCK. — Joseph F. Robinson, Verona, Pa.

255,130. CONTOUR GAGE AND TOOL. — Henry C. Barker, Sedalia, Mo.

255,162. FAUCET.—John Gielow, Chicago, Ill.

255,182. WRENCH.—Milton H. McNair, Meadville, Pa.

255,189. BRICK-KILN.—Clark D. Page, Rochester, N. Y.

255,191. SASH-FASTENER.—Herbert L. Robertson, Brookfield, Mass.

255,210. ILLUMINATED TILE. — Louis C. Tiffany, New York, N. Y.

255,226. DOOR-CHECK.—Jerome W. Wetmore, Erie, Pa.

255,231. STANCHION.—Stephen J. Adams, Willett, N. Y.

255,237. ROCK-DRILL.—William J. Barber, Covington, Ind.

255,251. EAVES-TROUGH HANGER. — Charles Burdick, Cleveland, O.

255,257. SPRING-HINGE. — Ira S. Davis, Detroit, Mich.

255,281. COMPOSITION FOR SEWER, DRAIN AND WATER PIPES, ETC.—Jeremiah D. Green, Troy, N.Y.

255,282. SASH FASTENER AND HOLDER. — Harry Greenfield, Harrison, N. J.

255,351. HOISTING APPARATUS.—Edgar L. Stocking, Buffalo, N.Y.

255,356. ALARM AND DOOR-BELL.—Michael Truby, Elkhart, Ind.

255,379. FIRE-ESCAPE. — Thomas Darby, Buffalo, N. Y.

255,385. BRICK-MACHINE.—Walter E. Gard, Baltimore, Md.

SUMMARY OF THE WEEK.

Baltimore.

CAR-STABLES. — Mr. E. F. Baldwin, architect, has prepared drawings for the stable and car-house of the Cross Town line of the North Baltimore Railway Company. The buildings are to be erected on Edmonson Ave., near Fulton Ave., and will be constructed of pressed brick, with terra-cotta ornaments. The car-house, 30′ x 140′, and the stable, 56′ 7″ x 140′, will be two-st'y, and contain, in addition to offices, storage-rooms, etc., accommodation for 112 horses and 20 cars.

BUILDING PERMITS. — Since our last report forty-five permits, embracing eighty new structures, besides numerous alterations, additions, etc., have been granted, the more important of which are as follows: —

Jacob Saum, 10 three-st'y brick buildings, Pennsylvania Ave., n of Baker St.

F. Rudolph, three-st'y brick building, Union Alley, between Central Ave. and Eden St.

Jas. S. Forbes, three-st'y brick building, Arlington Ave., s of Harlem Ave.

Jas. C. Lacy & Co., two st'y brick building, s e cor. Willis and Block Sts.

J. S. Tucker, 20 three-st'y brick buildings, Lanvale St., between Gilmor and Mount Sts.

W. L. Stork, 3 three-st'y brick buildings, Roberts St., e of Madison Ave.

Dr. Theo. Cooke, 4 two-st'y brick buildings, Charles St., s of Randall St.

Adam Otterbein, three-st'y brick building, Fort Ave., e of Jackson St.

John H. Geigan and Philip S. McLaughlin, two-st'y brick workshop, two-st'y brick office, and two-st'y brick stable, n e cor. Front and Low Sts.

J. M. Cone, 2 three-st'y brick buildings, Franklin St., between Pearl and Pine Sts.

John Glenn Estate, 5 three-st'y brick buildings, 19′ x 66′ each, Carey St., commencing at s e cor. of Mulberry St.; cost, $4,000 each; to be built by, and from plans of, Mr. William Ferguson, builder.

P. Walsh & Sons, three-st'y brick front building, No. 453 Eutaw St., n e cor. McMechen St.

M. Myers, three-st'y brick building, Fremont St., s of Clark St.

Thomas Kensett & Co., two-st'y brick building, West Falls Ave., s of Eastern Ave.

W. H. Thompson & Co., two-st'y brick saw-mill, n w cor. Aliceanna and Chester Sts.

E. W. Horstmeyer, three-st'y brick building, Fawn St., between Exeter and High Sts.

Henry Westphal, 16 two-st'y brick buildings, Byrd St., between Heath and Bloomsberry Sts.

John J. Pentz, 2 two-st'y brick buildings, Wall St., n of Ostend St.

Francis McCann, 6 two-st'y brick buildings, Cannon St., between Eastern and Canton Aves.

Boston.

BUILDING PERMITS.—*Brick.*—131-137 *Columbus Ave.*, Ward 11, for Andrew G. Weeks and Warren B. Potter, mercantile, 50′ x 60′, five-st'y; J. H. Kelley, builder.

Wood.—27 *Alpine St.*, Ward 21, for Charles Gillett, dwell., 21′ x 33′, three-st'y hip; George J. Bicknell, builder.

378 *West First St.*, Ward 14, for G. W. Bail, dwell. and office, 15′ x 27′, two-st'y; Wm. V. Bail, builder.

Walnut Ave., cor. Elmore St., Ward 21, for E. A. Francis Fitch, 2 dwells., 25′ and 33′ x 54′ 6″, two-st'y hip; Henry F. Ross, builder.

Clarence St., near Dudley St., Ward 20, for Albert B. Tebbitts, dwell., 26′ and 20′ x 40′, three-st'y.

Hyde Park Ave., near Richards Ave., Ward 23, for Peter Anderson, dwell., 16′ x 28′; Peter Anderson, builder.

East First St., rear, cor. O St., Ward 14, for Walworth Manufacturing Co., storage, 23′ x 75′; Walworth Manufacturing Co., builders.

East Seventh St., near M St., Ward 14, for Wm. T. Eaton, dwell., 19′ x 32′; two-st'y mansard; Wm. T. Eaton, builder.

Unnamed St., off Jamaica St., Ward 23, for Edw. Lyons, dwell., 22′ x 28′, two-st'y, Michael Mahan, builder.

Wayne St., near Blue Hill Ave., Ward 21, for Henry A. Wood, dwell., 26′ and 31′ x 31′ 4″, two-st'y; Henry A. Wood, builder.

East Fifth St., near P St., Ward 14, for Eugene McSweeney, dwell., 21′ x 34′, one-st'y and mansard.

42-44 *Lambert St.*, Ward 21, Theoda D. Bush, 2 dwells., 19′ 9″ x 28′, two-st'y hip; Thomas Merriman, builder.

Brooklyn.

PRINTING-HOUSE.—The "Brooklyn Eagle," building is to be enlarged by an addition, 59′ x 67′ It is to be of fire-proof construction.

CHURCH. – Ground will shortly be broken for the Memorial Presbyterian Church, to be built at the cor. of Seventh Ave. and St. John's Place, at a cost of $38,750.

HOSPITAL.—Nine of the buildings for the Seney Hospital have been designed by Mr. J. Mumford, Jr. The main building will be 130′ x 160′. The materials used will be brick with brownstone finish.

BUILDING PERMITS.—*Myrtle Ave.*, s e cor. Central Ave., 2 two-st'y frame buildings; cost, $5,000; owner, Henry Hoffmann, on premises; builder, John Rueger.

Richards St., n w cor. Seabring St., one-st'y shop; cost, $9,000; owners and architects, H. R. Worthington & Co., Hydraulic Works; builder, Eli Osborn.

Kent Ave., w s, 68′ s Clymer St., two-st'y brick shop; cost, $3,500; owner, R. Taylor, 111 Clymer St.; architect and builder, J H. Devoe.

Hancock St., s s, 320′ w Nostrand Ave., 3 three-st'y brownstone dwells.; cost, $8,000; owner and builder, John S. Frost; architect, R. Dixon.

Howard St., s s, 160′ w Broadway, three-st'y brick shop; owner, John Schnell, 319 Rutledge St.; architect, J. Platte; builder, J. Auer.

Seventh Ave., s w cor. St. John's Pl., one-st'y Gray Rock Belleville stone church; cost, $38,750; owner, Memorial Presbyterian Church; architects, Pugin & Walter; builders, P. J. Carlin and E. Snedeker.

Elizabeth Pl., n e cor. Doughty St., three-st'y brick printing office; owner, The Brooklyn Daily Eagle, 34 Fulton St.; architect, G. L. Morse, builder, P. McGuinn.

Lincoln Pl., s s, 110′ w Seventh Ave., 2 three-st'y brownstone dwells.; owner and builder, John Monas; architect, J. J. Gilligan.

Luquer St., s e cor. Columbia St., four-st'y brick tenement; cost, $7,000; owner, Danl. McCarthy, 13 Luquer St.; architect, J. Lewis; builders, Peter Kelly & Son.

Oakland Ave., w s, 75′ n Eagle St., three-st'y brick tenement; cost, $4,900; owner, — Rickers, 486 Manhattan Ave.; architect, F. Weber; builders, M. Vogel and J. Eggers.

ALTERATIONS.—*Walworth St.*, n w cor. Willoughby Ave., two-st'y brick extension, gravel roof; cost, $2,300; owners, Doty & McFarland, Walworth St., near Willoughby Ave.; builders, J. Lock and Mr. Hough.

South Third St., s s, bet. Third and Fourth Sts., two-and-one-half-st'y brick extension, two wings, each; cost, $20,000; owner, Brooklyn, E. D., Hospital; builders, Thos Gibbons and C. L. Johnson.

Chicago.

STORES. — The new Mauntauk Block which is in course of erection and will be completed by July 1st, is to be the highest business building west of New York. It is 70′ x 90′, and will be ten stories, all of red pressed and moulded brick, with ornamental iron anchors. The cost will be $200,000; Messrs. Burnham & Root, architects.

On State St., between Madison and Monroe Sts., is to be erected a very fine six-st'y building of Philadelphia pressed brick and stone finish. The first three stories will be entirely of light iron and plate glass; Mr. John C. Cochran, architect.

RAILROAD OFFICES. — The C. B. & Q. Railroad offices, on the corner of Adams and Franklin Sts., is by Burnham & Root, architects, and very similar in design to the Mauntauk block, six stories, 180′ x 220′, and will cost $250,000.

IN GENERAL. — There is considerable work on the boards in architects' offices, but all are waiting for new material, and are very reticent about having it published.

BUILDING PERMITS. — John Hearson, two-st'y store and dwell., 28′ x 125′, Western Ave. and Lexington St.; cost, $8,000.

A. Knopel, two-st'y and basement dwell., 22′ x 36′. 305 Twenty-third St.; cost, $2,800.

P. McDonald, two st'y dwell., 22′ x 56′, 2855 Dearing St.; cost, $3,400.

Miss Durkin, two-st'y dwell., 23′ x 43′, 3759 Forrest Ave.; cost, $3,000.

Joseph Barter, two-st'y and basement dwell., 22′ x 34′, 259 Park Ave.; cost, $3,000.

R. Wolfe, two-st'y and basement dwell., 23′ x 36′, Loomis and McAllister Pl.; cost, $5,800.

D. J. Hogan, 5 two-st'y stores and dwells., 44′ x 65′, Wentworth Ave. and Thirty-first St.; cost, $13,000.

H. P. Klein, two-st'y dwell., 24′ x 52′, 83 Lincoln Ave.; cost, $7,000.

G. A. Jammrick, two-st'y addition to store, 41′ x 43′, 448 and 450 State St.; cost, $5,000.

Joseph Zima, two-st'y dwell., 20′ x 50′, Twentieth St., near Throop; cost, $3,700.

James Krosa, two-st'y and basement dwell., 20′ x 50′, 216 Maxwell St.; cost, $3,900.

C. H. Gottig, two st'y storeroom and barn, 40′ x 48′, Fourteenth St., near Johnson; cost, $5,500.

John Mulveil, two-st'y store and dwell., 23′ x 70′, 20 Quincy St.; cost, $4,500.

S. Williams, two-st'y flats, 20′ x 46′, Oakley and Harrison Sts.; cost, $3,500.

Cincinnati.

HOUSE.—Mr. Geo. W. Rapp, architect, has in hands plans for residence of Mr. Francis Lampe on Zigzag Ave., Clifton Heights, costing $10,000.

STORE.—A four-st'y stone front store, for Mrs. M. Hambo, to be erected on north side of Fourth St. near Elm St.; cost, $13,000; Mr. G. W. Rapp, architect.

BREWERY.— For Albert Schwill & Co., plans for remodeling their malt-house, to have new improved malt kiln, elevators, etc.; cost, $11,000; Mr. G. W. Rapp, architect.

APARTMENT-HOUSE.— Mr. James W. McLaughlin has in hand a French-flat hotel, cor. of Ninth and Vine Sts., for Mr. Allen W. Gazlay, four-st'y, 5 rooms on each floor, pressed brick fronts; cost about $15,000.

STORE.—A store is to be built for Mr. L. B. Harrison on Third St., bet. Elm and Plum Sts., pressed brick fronts, five-st'y; cost, $16,000. The building is 24′ x 108′; Mr. J. W. McLaughlin, architect.

HOUSE.—For Mr. Albert Levy, a first-class dwelling-house is to be built on the cor. of Eighth and Cutter Sts. The building is parallelogram, 45′ x 74′, freestone fronts, costing about $30,000; Mr. J. W. McLaughlin, architect.

BUILDING PERMITS.—J. Bluden, four-st'y brick, Abigail St., near Broadway; cost, $5,000.

J. and F. Stein, three-st'y brick, n e cor. Central Ave. and Stores St.; cost, $5,000.

Jacob Fort, two st'y brick, Brown St., near Ravine St.; cost, $4,500.

H. Rodhe, addition to dwell., Barr St., bet. Baymiller and Freeman Sts.; cost, $3,000.

T. A. Grieve, addition to four-st'y brick, s e cor. of Smith and John Sts.; cost, $3,000.

Jas. L. Haven, four-st'y brick, n e cor. of Plum and Commerce Sts.; cost, $8,000.

F. G. Huntington, three-st'y brick, n e cor. Saunders and Locust Sts.; cost, $4,000.

Windish, Muhlhausen & Bro., three-st'y brick, Canal St., bet. Liberty and Wade Sts., cost, $4,000.

16 permits for repairs, costing $8,000.

Total permits, 26.

L. Anderson, two-st'y frame, No. 492 Front St.; cost, $3,000.

C. Moerlein, two-st'y brick, Ohio Ave. and Parker Sts.; cost, $10,000.

F. Tilley, three-st'y brick, No. 29 Pleasant St.; cost, $5,000.

W. S. Brown, two-st'y frame, Church Ave., near Gilbert Ave.; cost, $2,000.

Geo. A. Richards, five-st'y brick factory, Pearl St. bet. Lawrence and Butler Sts.; cost, $16,000.

Chatfield & Woods, four-st'y brick factory, cor. of Egleston Ave. and Bedinger St.; cost, $20,000.

Detroit.

BUILDING PERMITS. — One hundred and ten permits have been granted since our last report. The following are those costing $2,000 or more: —

W. J. Pepper, frame dwell., 390 Fourth St.; cost, $3,000.

McEnhill & Moore, 3 frame dwells. on Fourteenth Ave.; cost, $6,000.

Nuppenan & Clark, brick store, 138 Michigan Ave.; cost, $8,000.

Henry Carew, brick shop, Adair St.; cost, $2,500.

Candler Bros., 2 frame dwells., 627 and 629 East Congress St.; cost, $4,000.

H. W. Holcomb, 2 frame dwells, Fourth St.; cost, $4,200.

R. H. Hall, brick dwell., 116 East Larned St.; cost, $2,000.

C. Cole, frame dwell., 800 Second St.; cost, $3,600.

Geo. H. Hammond, frame dwell., Twenty-first St.; cost, $3,000.

Sarah J. Green, frame dwell. on Cass Ave.; cost, $2,000.

Wm. Scott & Co., frame dwell., 95 Alexandrine Ave.; cost, $2,800.

Louise Meyer, frame dwell., Grand River Ave.; cost, $3,500.

Spetzley Bros., frame dwell., Pitcher St.; cost, $3,000.

W. W. Petherick, alterations to brick building on Atwater St., to cost $3,000.

New York.

LABOR MARKET is in a very unsettled condition and a change may occur at any moment. Masons will ask for $4.50 per diem, and possibly for $5.00. The proposed movement has of course a depressing influence on anticipated building projects.

MATERIAL MARKET. — No unusual change has taken place in the price of building materials. Bricks are not quite so high and it is hoped will soon reach the proper level. Lath is firm. Rosendale cement opened at $1.15 at Rondout; $1.25 in New York by the cargo.

BANK BUILDING. — On Forty-second St., facing the Grand Central Depot, a building is to be erected for the Lincoln National Bank; Mr. J. B. Snook is to draw the plans.

CHURCH. — Ground has been broken for the new Roman Catholic Church of All Saints which is to be erected at the cor. of Madison Ave. and One Hundred and Twenty-ninth St.

OPERA-HOUSE. — Work on the Metropolitan Opera-House on Broadway, between Thirty-ninth and Fortieth Sts., is to be resumed.

WAREHOUSE. — Mr Geo. Martin Huss has commenced on plans for a warehouse, 50′ x 90′, five-st'y, to be built "down town." The first st'y is to have an iron front; above will be brick with bluestone finish. The building is to be fire-proof, but the girders and columns will be wood.

STORAGE WAREHOUSE. — In the competition for the Manhattan Storage and Warehouse Co.'s building, to be erected on Lexington Ave., between Forty-first and Forty-second Sts., the plans of Mr. Jas. E. Ware carried off the palm. The building will be 125′ x 200′, seven-st'y with basement and sub-cellar. The building will be fire-proof, and built of brick; Mr. Rd. Deeves is the builder.

APARTMENT-HOUSES. — At the cor. of Charlton and Hudson Sts. 3 apartment-houses are to be erected for the Trinity Church Corporation from designs of Mr. Chas. C. Haight.

On Carmine St. an apartment-house, 25′ x 65′, to

The American Architect and Building News

ADVERTISERS' TRADE SUPPLEMENT.

No. 3.] SATURDAY, APRIL 1, 1882.

ASPHALT.

THE subject of asphalt is now becoming a matter of much interest to architects, being used as it now is in the construction of buildings from the sub-cellar to the roof. It is only quite recently that the subject of asphalt has been thoroughly investigated in regard to general usage.

In New York to-day, it is to be found in the cellars where it forms a moisture, vermin-proof, and sanitary floor, on the upper floors of stables, breweries and warehouses where a durable, cleanly, water-proof surface is required, and on the roofs of fire-proof buildings where a cement-concrete base is laid on clay block or brick arches. It is also used for coating the outside of the walls below the grade level, and for areas, court-yards, and sidewalks.

The great trouble that has been experienced in introducing this valuable article has been the discredit brought on the material through the vulgar habit of calling coal-tar-poultice pavements asphalt walks, and coal-tar work asphalt work. Another drawback has been found in the poor work, cheap material, and excessive use of gravel in mixing, found necessary adjuncts by contractors who have undertaken work at figures which precluded honest work. Asphalt, or, as on the Continent it is written, *asphalte* is either a bituminous limestone or a bituminous pitch; the source of supply of the former is from mines in France, Switzerland and Hanover, and of the latter a lake in the island of Trinidad.

The bituminous limestone is known as rock asphalt, and the best quality is considered the Seyssel which obtained the only gold medal awarded at the Paris Exhibition of 1878 "for superiority over all other asphaltes;" this is obtained from quarries near Geneva. Rock asphalt has been laid for streets in a powder, heated and compressed, but it has not been found to suit this climate.

The Seyssel rock is now imported in blocks of mastic, and after heating and the additions of some pine bitumen is laid for floors or sidewalks, and immediately on becoming cold is perfectly hard and stone-like. It has been found especially serviceable in stables where its sanitary benefits are obvious. The material after a lapse of ten years shows no perceptible signs of wear, and as it contains (unlike coal-tar products) no volatile oils, there is no reason why it should not prove as durable as granite.

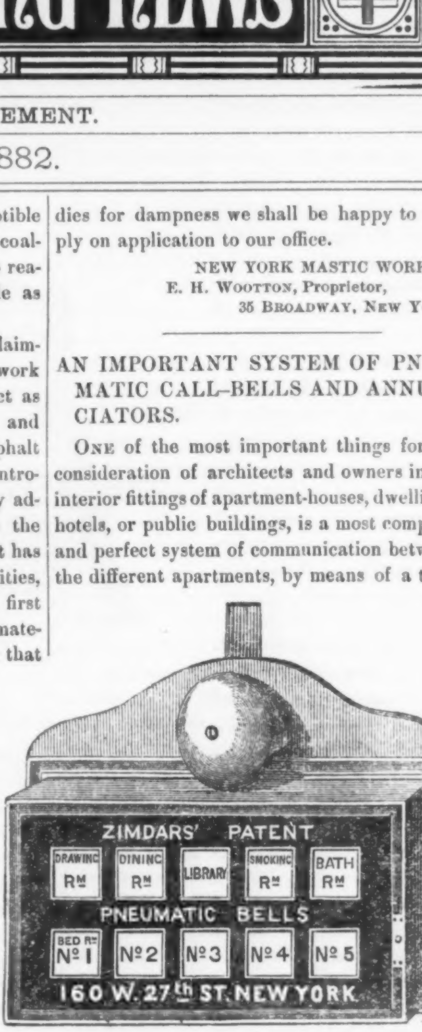
Difference in climate precludes our claiming facts proved abroad, but we have work laid by our men ten years ago as perfect as when done. Breweries, sugar-houses and factories have been floored with rock asphalt with complete success, and when once introduced it has invariably been used in any additions to the buildings. Referring to the Bituminous Pitch or Trinidad Asphalt, it has been deemed by the Washington authorities, after most careful investigation by the first government engineers, to be the best material for roads, and we therefore use it for that purpose in preference to rock asphalt. Washington nas now over forty-four miles of asphalt streets, and though a perfect trial has been made of every kind, that now known as the "Trinidad" or "Coming Pavement" is declared to be far preferable, and the last contract awarded was for that pavement. We laid the "Trinidad" pavement this year on Fifteenth Street in front of the New York Hospital, and the absence of noise is a great relief to the patients.

In the course of investigation on asphalt we found that the Metropolitan Board of Works of the City of London advised the use of "Pure Bitumen Damp Course" for foundation-walls. We therefore commenced importing it and have found its merits thoroughly appreciated by our architects here, and they have used it extensively. At the same time we met with an article which we are also importing, "Damp-Resisting Solution," which is used in England by the Trinity Board for the interior of light-houses. It resembles a black varnish and is applied to the walls cold with a brush; we advocate its use for inside dampness only. For coating the exterior of walls below the grade level we use an asphaltic cement, manufactured by ourselves, which we can supply to "out-of-town" customers if desired. Any information on asphalt or remedies for dampness we shall be happy to supply on application to our office.

NEW YORK MASTIC WORKS,
E. H. WOOTTON, Proprietor,
35 BROADWAY, NEW YORK.

AN IMPORTANT SYSTEM OF PNEUMATIC CALL-BELLS AND ANNUNCIATORS.

ONE of the most important things for the consideration of architects and owners in the interior fittings of apartment-houses, dwellings, hotels, or public buildings, is a most complete and perfect system of communication between the different apartments, by means of a thoroughly reliable system of call-bells and annunciators.



The liability of the old system of crank-and-wire bells to get out of order is so well known as to need little or no comment. To obviate these disadvantages electricity has to a considerable extent been introduced, but this is also attended with many objections. The trouble of maintaining a battery which is liable to derangement at any time, renders this method unsuitable for general adoption, more especially in the case of a building several miles from any large town, where it might be necessary to call in the services of an experienced electrician, whose time and travelling expenses would considerably swell the cost of maintenance.

A perfect solution of the problem appears to have been found in the system of the Pneumatic Bells patented by the firm of C. E. Zimdars, of London, and New York, which for a number of years has been in extensive use in Great Britain and upon the Continent of Europe.

In June last this system was first introduced in the United States, and a manufactory established in New York, under the management of Mr. J. Hunt, resident partner of the firm in this country.

The advantages of this system are numerous and easily demonstrated.

The only agent used to ring the bell, and to indicate in which room a call is made, is the direct action of air in its normal condition, conveyed through a tube one-eighth of an inch in diameter, the air being compressed by the act of pushing the button to ring the bell.

There are no wires, springs, or cranks to break and get out of order, and no battery to be maintained.

One great feature of this system is its perfect practicability, the simplicity of the apparatus being such that it might be fitted up by any person of ordinary intelligence, and should the tubes by any accident become damaged, they can be easily repaired by any plumber or gas-fitter at a trifling cost.

The bell is rung by simply pressing upon a small push or button (similar to that used in the electric system), when a tablet bearing the name of the room instantly appears upon the annunciator.

The pushes may be plain or ornamental, either of wood, porcelain, marble, bronze, silver or nickel plated, polished brass, etc., and are designed to suit the general finish of the apartment.

In sleeping chambers bedhead pulls are used instead of pushes, and a cord and tassel made to correspond with the drapery of the room.

The annunciators are large or small according to the number of the rooms.

The manufacturers guarantee the perfect working of their apparatus for at least two years.

Prize medals were awarded C. E. Zimdars at the great International Exhibition at London, Paris and Melbourne. Their Exhibit at the Semi-Centennial attracted a great deal of attention and also gained another prize medal. These bells have been universally adopted by the English government and are in use in their principal offices both at home and abroad, amongst which may be mentioned the Home, Colonial, Foreign, War, Post, Telegraph, and Patent Offices, the Houses of Parliament, the Royal Palaces, Royal Courts of Justice (alone over two thousand bells), Bank of England, South Kensington Museum, Natural History Museum, Mercantile Marine College, Indian Civil Engineering College, besides many other public institutions, banks, offices, hotels, manufactories, club-houses and private residences.

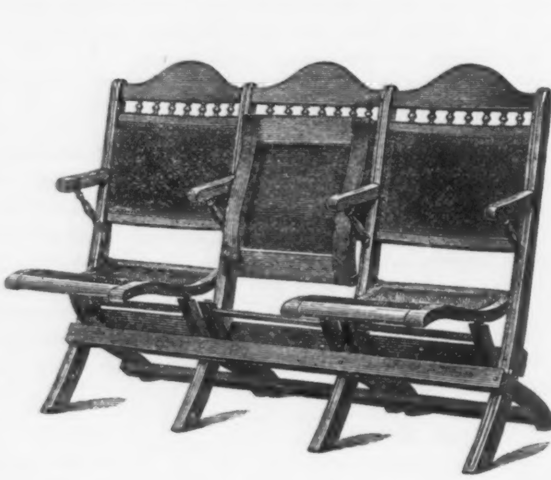
In the Queen Anne's Mansions, London, an immense apartment-dwelling, fourteen stories high, there are more than a thousand of these bells.

They are also fitted in the government offices and in the residence of Sir Willian V. Whiteway, Premier of Newfoundland at St. Johns.

This system has been extensively adopted by the Steamship companies. Many ocean steamers running to New York and other ports have been fitted up throughout, the principal of which are the "Servia," "Catalonia," "Furnessia," and "State of Nebraska" (370 bells in all.)

It will be sufficient to mention that in New York two of the largest apartment-houses now being completed are fitted with Zimdars's Patent Pneumatic Bell. They have also been in use some considerable time at the Department of Docks, the Delameter Iron Works, and several other public and private buildings in New York, Boston, Philadelphia, St. Louis, Cincinnati, Buffalo, etc., where the firm have established agencies.

C. E. ZIMDARS,
160 WEST TWENTY SEVENTH ST., NEW YORK.



THE HARWOOD CHAIR SEAT CO.

THE business of this firm, as its name indicates, was originally confined to the manufacture and sale of their patent fibre chair seat, but of late it has been found desirable to enlarge the scope of the business by carrying a line of standard patterns of dining and office chairs covered by the fibre seat, and also by the manufacture of specialties in the way of folding chairs and seats of various kinds from their own designs for the use of halls, vestries, theatres, depots and other public buildings.

The seating material, to begin with, needs a word of description. It very closely resembles upholstery leather, as it is made in the same deep, rich colors by a process similar to that used for leather, and has a pebbled or grained surface; it is, however, stronger and stiffer than leather, and does not require the support of stuffing or webbing, but is simply fastened to the chair frame with brass headed nails. It is slightly yielding, and easy to sit on, and is clean, cool, and perfectly strong and durable.

The name "fibre" conveys as accurate an idea of what the material is made of as it is desirable to give; suffice it to say that the fibres are of Manilla jutê and similar substances, put together by a process similar to the manufacture of paper. When the material has gone through all the processes of making and finishing, it possesses all the requisites of a perfect seat, viz.: strength, durability, ease, beauty, cleanliness, cheapness, and freedom from moths.

Of the variety of folding chairs manufactured by this firm, we will mention only the No. 6, Queen Anne pattern, very pretty, and stout and strong enough for hotel or steamboat use. Great numbers of them have been sold.

For the use of halls and assembly rooms which require to be cleared of seats on various occasions, the Harwood Chair Seat Co. have produced in their No. 11 a combined settee and opera-chair which answers all the requirements better than anything else in the market. It is built in sets of three, four or more seats, so arranged that each seat lifts like an opera-chair seat, independently of its neighbor while the whole settee, seats, legs and all, will fold to a thickness of only three inches or thereabouts.

Wesleyan Hall, Boston, The Associates Hall, Milton, and the Union League Club Hall, of Philadelphia, are all furnished with this opera-settee. For the latter it was selected by the committee after a careful examination of a great variety of seats made in New York, Boston and Philadelphia, and given the preference over all.

A very handsome and easy-sitting depot-settee made by this firm is in use in all the stations of the Mass. Central Railroad, and also in stations on the Boston and Maine, Fitchburg, Concord, Central Vermont, Old Colony and other roads, and has received the approval of the Mass. Board of Railroad Commissioners.

New styles of folding arm and reclining rocking chairs which will be seen on the piazzas of the best-furnished country houses the coming summer are shown on the catalogue of the firm, together with many other styles, which as the auctioneers say, are "too numerous to mention."

HARWOOD CHAIR SEAT CO.,
24 WASHINGTON ST., BOSTON.

The American Architect and Building News.

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15 cents per copy; $7.50 per year; $6.00 in advance; 12 Monthly Numbers with Detail Sheet, $1.75.

The "Advertisers' Trade Supplement" is maintained in the interest of advertisers in the *American Architect and Building News.*

JACKSON'S HEAT-SAVING AND VENTILATING GRATE.

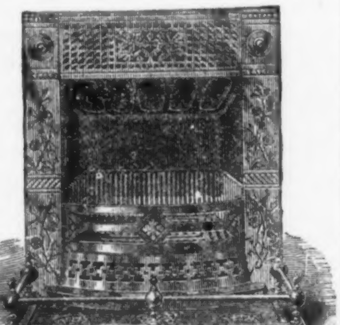
PURE air is admitted from outside the building through a pipe-hole into a chamber directly under the fire, from which it passes into chambers which surround the back and sides of the fire, and from these into a chamber directly over the fire. This chamber has conical flues or tubes passing through it, through which tubes the products of combustion must pass before reaching the chimney.

From this chamber the now thoroughly heated air flows through openings, as shown in front of frame at top, into the apartment as from a register.

It will be seen, by an inspection of the illustrations that in construction the Heat-Saving and Ventilating Grate essentially consists of an inner shell, against which the fire rests, or is in close contiguity, and an outer shell, which lines the brickwork of the fireplace. The inner shell has projecting from its back a great number of spurs or spikes, which increase the extent of its radiating surface, and serve as conductors in conveying the heat rapidly into the surrounding fresh-air chambers. These chambers are included between the shells described and they are entirely protected from the noxious gases of the fire, there being no joints or openings in the shells. The heating surfaces facing the air-chambers, and upon which the inflowing current of pure air circulates, amount in the smallest-sized grate to about 15⅔ superficial feet, and in the largest-sized grate to 23½ feet. A valuable feature in these grates is that, in consequence of the circulation of a current of air over the inner surface of the iron shell which forms the back and the sides of the basket in which the fire rests, these surfaces cannot become overheated or warped and broken by the action of the fire, and the grate thus is practically indestructible and will last a lifetime.

"CONCORD" PATTERN.

This form of the Heat-Saving and Ventilating Grate is constructed for uniformly heating and ventilating large rooms, and those that are in exposed situations, as are those in most country or village houses, and which the common form of grate, with an equal consumption



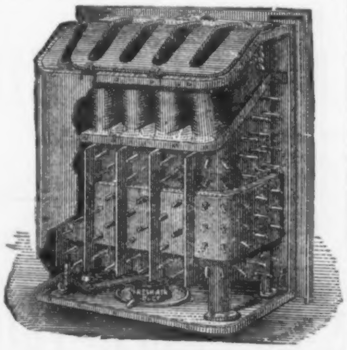
of fuel, would be entirely inadequate to heat. It is adapted for burning hard or soft coal, or wood. It has the full open front or fireplace, and the beauty, cheerful effect and full radiating power of the ordinary grate, combined with three-fold the heating capacity of the common grate.

The construction of the grate is such that it is a constant ventilator in all seasons. In winter, with a full fire and with the doors and windows effectually closed, the whole atmospheric contents of large rooms are replaced by pure warm air every fifteen or twenty minutes. For bedrooms or for rooms communicating with bedrooms, these grates provide the most perfect automatic ventilation, maintaining a purity of atmosphere in them not sensibly less than that of the open air, with the entire absence of the unpleasant and unhealthful draughts that accompany the usual modes of ventilation.

In a word, by the Heat-Saving and Ventilating Grate there is secured the full heating power of the stove or fireplace-heater, devoid of all the noxious effects of those forms of heating-apparatus.

"OLIVER" PATTERN.

This form of the Heat-Saving and Ventilating Grate is so arranged that the heat conserved in the chambers surrounding the fire can at pleasure be turned, in whole or part, into a room on the floor above that in which the grate is placed, or may be added to the full radiant heat of the open fire to rapidly



and thoroughly heat the room containing the grate. It will thus comfortably heat two ordinary rooms in the most severe winter weather, or will thoroughly heat a large room below, and comfortably warm a chamber above, thus doing the work of two or more ordinary grates with the fuel expenditure and care of one. All grates are adapted for the use of an ash-pit when so ordered.

Plates of designs will be sent on application.

E. A. JACKSON & BRO.,
No. 77 BEEKMAN STREET, NEW YORK.

SEWER-PIPE.

SOME ten years ago the Akron Sewer-Pipe Co. commenced sending its Salt-Glazed Sewer-Pipe into New England, the Boston Sewer Department being among the first to use it. Since that time the demand has steadily increased, until New England is now looking to the West for its sewer-pipe, as dependently as it does for its flour and grain.

The superiority of this pipe is explained by two facts: one being the enormous pressure which is brought to bear upon it by the steam-press while in process of manufacture, and which gives it a very dense and strong body, and the other, that after the pipe is moulded and pressed and placed in the kilns, while the fires are at their height, salt is thrown on, which being suddenly melted and blown into the kilns unites chemically with the clay, completely covering the pipes inside and out with what is called "salt glaze."

This salt glaze renders the pipe impervious to the action of all gases or acids, and nothing has yet been discovered which is equal to it for producing an indestructible sewer-pipe. The Scotch and English pipe which years ago used to come largely into this market were salt glazed, and it was not then supposed that we could produce the same thing in this country. The discovery of the Summit County Clays of Ohio, however, dispelled this illusion, and now very little of the foreign pipe comes here, as the Akron can be had in quantities at lower prices. The fact that Eastern clays will not "take the salt" explains the fact that we must depend upon the West for salt-glazed pipe.

The undersigned manage the New England business of this Company, and will be pleased to furnish all needed information upon matters of sewerage and sewerage-pipes.

FISKE & COLEMAN,
62 CONGRESS ST., BOSTON.

TERRA-COTTA.

THE use of terra-cotta for architectural purposes is rapidly increasing in the United States, and several new works are now in process of erection in different parts of the country, to meet the demand.

The Boston Terra-Cotta Company, whose works are located at No. 394 Federal Street, Boston, have lately doubled their capacity, and are pushing work on a number of large orders, mostly to designs of New York architects.

This company has been unusually successful — with a contract for *brown terra-cotta* for a building at the corner of Broadway and Astor Place, New York City, producing so perfect an imitation of brownstone that it is well nigh impossible to distinguish the difference. The *brown* terra-cotta *seems* specially well adapted to church architecture, also for halls, and other public buildings, and where the designs are often repeated it is unquestionably much cheaper than stone.

Architects, and real estate owners will do well to examine this class of work, and to inquire carefully whether or not terra-cotta as a standard building material, does not cover a much wider range of *practical* possibilities than they have ever supposed. Mr. James Taylor, Superintendent of the Boston Terra-Cotta Company, spends a part of nearly every week in New York city for consultation with patrons there, but all communications should be addressed to the home office of

THE BOSTON TERRA-COTTA CO.,
394 FEDERAL ST., BOSTON.

THE most perfect little apparatus, the one which combines the greatest amount of Yankee ingenuity and practical simplicity, that we have seen of late is the Pocket Photographic Camera which is manufactured by Messrs. W. H. Walker & Co., of Rochester, N. Y. It is more than a plaything: it can become an invaluable companion to any one, but especially to the architect or draughtsman who is making a hurried trip through Europe, and has not time to hunt through the shops for just the view he wishes, but can easily find the *three seconds'* time which would be necessary to take his own negative of the building he desires. As the apparatus is cheap, compact, and simple, we shall feel surprised if a large percentage of architects about to visit Europe do not procure it before they start.

THE floor of the new Fulton Market is now being laid with Val de Travers asphalte by the Neuchatel Asphalte Co. of New York City.

(*Continued from page* xi.)

four-st'y, Seventh St., between D and E Sts., n w; cost, $30,000.

D. T. Dunnigan, 2 brick dwells., 18′ x 33′, two-st'y, cor. of Fourth and R Sts., n w; cost, $3,300.

W. Z. Partello, 4 brick dwells., 16′ x 35′, two-st'y and basement, Pierce St., between Fourteenth and Fifteenth Sts., n w; cost, $14,000.

E. Dahle, brick dwell., 23′ x 42′, two-st'y, cor. North Capitol and P Sts., n w; cost, $3,000.

General Notes.

AMHERST, MASS.—The cost of the proposed new gymnasium, is placed at $50,000. The plans provide for one st'y, with a basement, the first floor to be 70′ x 100′.

BUFFALO, N. Y.—The Merchants' Exchange has purchased a plot of land on which it will erect a building, costing bet. $150,000 and $200,000.

BEDFORD, ILL.—Another Chicago Company is busily engaged in preparing to open a large quarry a short distance south of this place. This will make the third quarry here operated by capital and men from that city.

RIVERDALE, N. Y.—Alterations and decorations for Mrs. Meeker's residence are proposed from designs of Mr. H. Edwards Ficken, of New York.

MOUNT CLEMENS, MICH. — A Catholic church is to be erected at a cost of $25,000; Wm. Scott & Co., architects, Detroit.

NEW HAVEN, CONN.—Messrs. Brown & Stilson, architects, have plans for the following buildings in hand:—

Brick dormitory for New Haven Hospital; cost, $13,000.

Brick store for ex-Governor English; cost, $20,000.
Brick block for ex-Governor English; cost, $18,000.
Brick house for Mrs. Daggett; cost, $6,500.
Brick block for Dr. Sage; cost, $12,000.
Brick house for F. S. Bradley; cost, $7,000.
Brick block for Paul Beck; cost, $5,000.
Frame house for W. Witte; cost, $4,000.
Alterations to frame house, R. Easterbrook; cost, $7,000.
Frame block for H. Warner; cost, $15,000.

Gov. English is to build a block on Chapel St., to be occupied in the fall by a branch establishment of Jordan, Marsh & Co., of Boston.

A house, the first story to be brick, above slated and a tile roof, is to be built at a cost of about $30,000, from designs of Mr. Carl Pfeiffer, of New York.

Industrial.

CHICOPEE FALLS, MASS. — The 4 new paper-mills that John H. Southworth is to build on the road from Chicopee Falls to Indian Orchard will give an addition to the business of this town.

HOLYOKE, MASS. — Graves & Kinney, the Main Street brass founders, are to build at once a new foundry building, 40′ x 80′, and one-st'y, on the east side of Park St., below Cabot. The contract has been awarded to Thorpe Bros., and Lynch Bros. will do the brickwork.

LOWELL, MASS. — Jeremiah Clarke & Co. are building a wooden storehouse. The new building is built of wood, three-st'y, and will have a floor-space of 20,000 square feet.

MERIDEN, CONN. — A four-st'y brick factory, 40′ x 200′ is to be built on Pratt St. for the Wilcox Silver Plate Co.; cost, $25,000; Messrs. Morehouse & Brown, architects; Messrs. H. W. Lines & Co., contractors; work begun March 1.

A four-st'y brick factory, 40′ x 100′, is to be built on Hanover St. for Messrs. Bradley & Hubbard; cost, $18,000; Messrs. Morehouse & Brown, architects; H. W. Lines & Co., contractors; work has already commenced.

A four-st'y brick factory, 40′ x 80′, is to be built for Meriden Malleable Iron Co.; cost, $10,000; Morehouse & Brown, architects; H. W. Lines & Co., contractors; work begins at once.

A four st'y brick factory, 36′ x 72′, is being built for the Rogers Bros.

A brick block is to be built on State St., for Mr. Joseph Morse; H. W. Lines & Co., contractors; work to begin at once.

Bids and Contracts.

HARRISBURG, PA. — The contracts for frescoing the walls and ceilings of the hall of the House of Representatives and the connecting rooms have been awarded to C. Day Rudy of this city, at $1,450.

PITTSBURGH, PA. — Bids have been received at the office of the supervising architect for the granite for basement walls of the court-house at Pittsburgh, Pa. There were 12 bidders. The lowest bid was that of the Bodwell Granite Company, of Rockland, Me., $11 760.