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CONTENTS.

SUMMARY: —
The Death of Herr Strack. — The Dangers of the Electric-Light Wires. — Lighting the Paris Opera-House by Electricity. — The Edison Electric-Light. — Force converted into Light. — Carpenters' Strike at Paris. — Salt Water for the New York Fire Department. — Inconsiderate Act of a Boston Hotel-Keeper. 213
BUILDING SUPERINTENDENCE. — XI. 215
BUILDING STONES. — I. 217
THE ILLUSTRATIONS: —
St. Stephen's Church, Lynn, Mass. — Details of the Same. . . 218
LEGAL NOTES AND CASES. 219
IRON ROOFS. 220
CHIMNEYS ANCIENT AND MODERN. 220
COMMUNICATIONS: —
Balloon-Frames. 221
NOTES AND CLIPPINGS. 223

By the death of the distinguished architect, Strack, of Berlin, a vacancy is made in the list of foreign members of the Institute of France, in the division of Fine Arts, and a commission has been appointed to present names of new candidates. The number of foreign members in this division is limited to ten, and an election to the vacant chair would perhaps be the highest professional distinction that Europe can afford. No mention is made of any particular architect as being likely to receive the nomination, and we can only form the merest conjectures, but it seems altogether probable that another German will be selected, possibly the young but distinguished designer of the new Town-Hall at Vienna. The practice of the French in associating the Academies of Science, Fine Arts, Ethics and Letters in one body is unquestionably valuable, not only to the members of each division, but to the interest of knowledge as a whole. It is an honor, certainly, to be a member of the most distinguished body of artists in the world, but the dignity of membership in a society composed of the most renowned individuals in every branch of knowledge is still greater, and each Academy gains by being able to offer it in addition to the compliment which an election into its own ranks confers.

THE discussion in regard to the danger of fire from electric-light wires continues, and new instances are frequently brought forward. A telephone was recently destroyed in Boston by the accidental contact of its wire with that of an electric light, some wood-work about the entrance of the Germania Theatre was set on fire a few days ago, and one of the signal boxes of the New York Fire Department was almost entirely consumed, and the pole charred, by a similar occurrence. The great distance at which such fires may be set, and the impossibility, under present circumstances, of guarding against them in any city building or office furnished with a telephone, makes some change in the mode of conveying the wires for powerful currents particularly desirable. The New York Board of Fire Underwriters, not content with the regulations adopted a few months ago in regard to the inspection of electric wires in buildings, recently appointed a committee to study a different aspect of the case, and on its recommendation has resolved to notify the owners and occupants of all buildings in which are found uncovered electric-light wires, or lamps without globes, or placed in globes with open bottoms, to cover the wires, or alter such lamps, within ten days from the date of the notice, and to request the parties to refrain from using the lights until the alterations are made; and if the notice is not complied with, to advise the companies insuring the property to proceed, after a reasonable time, to cancel their policies. The Fire Commissioners of New York regard the matter as a very important one. The insulating coating of gutta-percha over such wires would be immediately removed by a moderate heat, and firemen who might come in contact with them while in that condition would run great danger of serious or fatal shocks.

ANOTHER example of the danger which attends the unrestricted stringing over city buildings of wires for the conveyance of electric currents of all kinds is reported from Chicago. The manager of the telephone exchange in that city a few days ago observed smoke proceeding from the "answering board," on which is arranged a series of brass strips about one-eighth of an inch apart, which serves to make connections between the different lines. In a few minutes little flames were seen to jump from one strip to another across the board, and the manager, suspecting that one of the wires had come in contact with an electric-light wire, disconnected the board. Returning to his place, he found that the transmitter, a wooden box containing the rubber diaphragm which serves to receive the vibrations communicated by the voice, was burning, and he was obliged to disconnect this also, and throw water on it to extinguish the fire. For a time no further disturbance took place, but the powerful current from the electric-light wire, shut off from its more direct course, finally made its way to the connections of another answering-board, some eight feet distant from the first, which in its turn began to emit smoke and flames. The ground wire was then cut off, and the current could no longer pass to the earth through any of the instruments in the exchange. It was still possible, however, for it to gain an earth connection by means of the ground-wire of some telephone at a distance, provided it could reach the switch-board which connected the exchange with the other main lines, and this in the course of half an hour it succeeded in doing, although the switch-board was ten feet away from the wire by which the electric-light current had entered the building. As in the other cases, the board began to smoke, and lines of flame ran over it, but it was at last disconnected and the fire extinguished. A telephone in the office of the Chicago Music Company, by which the current had apparently made its way to the earth after the cutting off of the ground-wire at the exchange, was however destroyed, the induction coils being melted, and one of the wires running over the roof of the exchange was also melted. On examination it proved that an electric lamp in McVicker's Theatre had been for some days previously operated by the current from a generator at a distance, and on its use being discontinued, the wire had been simply cut, and the end left hanging loose in such a position as to allow it to fall upon the telephone wire.

THE Grand Opera at Paris is to be illuminated by a combination of nearly all the known forms of electric light, under the charge of M. Garnier, the architect of the building, who has obtained a grant of public money for the purpose. The great *foyer* or vestibule is to be furnished with twenty of the so-called "sun-lamps," such as are used to light the picture-gallery at the Electrical Exhibition, but arranged in such a way as to be concealed from the spectators by bronze ornaments, which will throw the direct rays upon the ceiling, to be returned again in an agreeable diffused brilliancy through the room. Nothing could well be conceived more noble than such an illumination as this, reflected from the pictures and mosaics of the most gorgeous apartment of modern times, and the effect will be rather heightened by the clusters of Edison incandescent lamps which are to take the place of the present gas-burners. The little parlors which open from each end of the great *foyer* are to be lighted by a hundred and fifty Maxim incandescent lights, and the auditorium is to have five hundred of the English incandescent lights, under Swan's system, attached to the great chandelier. The loggia which forms so picturesque a feature of the exterior is to be furnished with twenty Jablochkoff candles, and the grand staircase with thirty-five Brush lights, while the low hall under the auditorium is to be lighted with a central sun-burner by the Werdermann system, and the neighboring passage-way by the reflecting Jaspard lamps. For fear of accidents the gas will for a few evenings be lighted at all the burners, and turned down to a feeble flame, so that if a wire should break, or any other occurrence should make it necessary to interrupt the electric current, the building may not be left in darkness.

THE report presented to the stockholders of the Edison Electric Light Company at their annual meeting is full of interesting matter. The company has proceeded so quietly in perfecting its extensive schemes that few persons know how much work has been done within the past year. In January, 1881, just after the successful illumination at Menlo Park, Mr. Edison announced that his system was perfected, and experiments were discontinued, and preparations made for introducing the light on a large scale in the city of New York. Some difficulty was found in obtaining permission to lay the main wires under the streets, and a new corporation, the Edison Electric Illuminating Company, was formed in accordance with the statutes regulating the management of gas companies, which secured the desired privilege, and entered into a contract with the original association for carrying out the work. In the same manner, a special company was formed for the development of the electric railway, which we heard so much about a year ago, and under its auspices experiments are still going on. After the preparations now making in the first city district have been completed, and the lights are in successful operation, it is intended to devote more attention to placing the apparatus in private houses and public conveyances. Already the steamer City of Worcester, belonging to the Norwich line on Long Island Sound, and one or two more, are regularly lighted by the Edison lamps, and a few hotels, private mansions, and factories have introduced them, but no great attention has been paid to the development of this branch of the business. It must be remembered that the Edison Company devotes itself for the present wholly to lighting by means of incandescent lamps, in which the illuminating agent is a loop of slender fibre heated by the passage of the current, and giving a light of about the intensity, and of very much the same aspect at a distance, as that of an ordinary gas-burner. The powerful arc lights, whose white and blue radiance has become so familiar to us, are not employed at all under its system.

A DISINTERESTED calculation has been made by M. Hospitalier of the relative efficiency in converting force into light which is shown by the various forms of electric lamp, and with some unimportant modifications the same figures will express the relative cost of illumination by the several systems. Taking as a standard the carcel gas-burner, which has to a great extent replaced the candle flame as a unit of measurement for light, it is found that the lamps which employ as the source of their rays the simple voltaic arc between carbon points may in theory be made to maintain a light equal to that of one hundred and fifty carcel burners for each effective horse-power in the engine which generates the current. In practice, the lamps fall far short of their possible limit, but some have furnished light at the rate of one hundred carcel burners to each horse-power. The Jablochkoff candles, which occupy a place intermediate between the incandescent lamps and the pure arc lights, supply an illumination equal to about fifty carcel burners per horse-power. In the incandescent lamps, as is well known, a great part of the force is lost in transforming it into light, so that measured by the same standard a single horse-power acting through a Swan, a Maxim, or an Edison lamp, will furnish on an average only the value of ten carcel burners, giving thus in return for the power expended only one-tenth of the result attained by the Brush, the United States, or other arc lights.

A DESPERATE strike has held the journeymen carpenters of Paris and their employers apart for many weeks, and it is sad to see that some of the French workmen, once the most sensible and prudent in the world, have fallen so low as to imitate the inhuman treachery and cowardice of the worst of their English and American fellows. As must happen in all strikes, a large part of the workmen have already regained their common-sense, and are endeavoring to return to their work at the market price, and await a more convenient opportunity and more available means for bettering their condition; but in this they are fiercely opposed by those who find profit or savage pleasure in protracting the misery of their comrades. Not content with threats and promises, the irreconcilables have proceeded to malicious violence against those who ventured to irritate them by an appearance of prudence and industry. A short time ago the workmen engaged in the reconstruction of a bridge discovered that a portion of the framing on which they were employed had been placed in such a way as to tilt slightly by any movement over it, and on examination a loaded percussion shell was found under the free portion, with the point turned upward, so that the plank, if trodden upon, would fall upon the cap. This attempt of assassins to indulge their tastes under the pretence of advancing the interests of the working classes has, we are glad to see, engaged the careful attention of the police, and the perpetrators will probably be made an example of. So great, however, is the terror excited by the rulers of the Union that the poor members who have starved long enough resort to all kinds of subterfuges to elude the imaginary bonds which they have imposed upon themselves. Many of them, skilful, as French workmen often are, in a variety of ways, have joined a different trade, and under its protection can labor peacefully; many more have forsaken Paris and returned to the practice of their own art in the provinces, while the others, unable to find the means for leaving the city, and forced to remain idle by the violence of the worst of their class, are reduced to pitiable straits. In this distress, as *La Semaine des Constructeurs* truly says, none sympathize more deeply with them than their late employers, but the latter have good reason to feel that the strike was unnecessary, wanton and treacherous, and that the future of their business depends upon the thoroughness with which the lesson is now enforced that those who wish for consideration and favor at the hands of others must show the same in return.

THE idea of providing a supply of salt water in New York for extinguishing fires meets with more favor from fire-engineers than from the insurance companies, who fear that in case of partial loss the salvage on goods soaked with salt water will be less than would be the case if pure water only were poured upon them. Considering the comparatively small amount of salt contained in the water of the Hudson at New York this objection seems rather trivial, especially as whatever might be lost from the injurious effect of the saline matter upon goods would be more than made up by its superior efficacy in subduing a conflagration. A suggestion has been made that the Forty-second Street reservoir, now pronounced useless as an element in the Croton system, should be utilized for storing salt water, so as to afford direct pressure at the street hydrants. The enormous force of the tides, either in the North or East River, could be employed, by means of hydraulic rams or other devices, to keep the reservoir constantly full without pumping or other expense, and the great advantages of a large and quickly available supply at every hydrant would be easily secured. The *Spectator*, one of the leading insurance journals, warmly endorses the proposition, and it seems very likely that it will be acted upon. The opponents of the scheme argue that even at the Morrell fire but three and a quarter million gallons of water, — less than an hour's average supply from the aqueduct, were poured into the burning buildings, and that it is unnecessary to make separate provision for a consumption so small relatively to the total supply; but it does not follow that more might not have been used to advantage, while it is certain that if an unlimited quantity under high pressure had been available at every hydrant at the beginning of the fire, the loss would have been much less than was actually the case. The other argument in favor of a salt-water service should, moreover, not be lost sight of: that by its means the streets could be regularly washed, to the great advantage both of them and of the sewers, which would in that way receive a much-needed flushing. Every one who has walked about Paris in the early morning will recollect the rivers of water which at that hour pour through the Boulevards, and although it will be long before New York can boast of asphalt pavements, even the cobble-stones of West Street would be none the worse for an occasional washing.

IN view of the unpleasant taste and smell of the city water-supply in Boston, it appears that certain of the proprietors of hotels and restaurants have taken unusual pains to secure a purer liquid for the consumption of their guests. One or two have arranged to have drinking water brought from the country every morning, together with the milk for the day, while others procure supplies from the so-called "mineral springs" of remarkably pure, soft water, of which several exist near the city. One individual, however, more fortunate than the rest, has, it is said, discovered and reopened an abandoned well on his own premises, and serves his patrons with the cool and refreshing beverage drawn from his own back yard. It is many years since all the wells in the city proper were closed by municipal ordinance, and it is, to say the least, unlikely that the water in them has improved in quality during the interval, so that persons who value their lives should be on their guard against incautiously partaking of it. The city Board of Health, if the story is substantiated, might do well to make an example of a proprietor so ignorant and reckless, however well-meaning he might be, and thus enforce a lesson upon the public mind which is much needed.

BUILDING SUPERINTENDENCE.—XI.

Furring. Even before the chimneys are started, the cross-furring of the ceilings will begin. For this planed strips are used 12 inches apart from centres, two inches wide, and ⅞ or 1¼ inches thick, the latter for three coat plastering. It is of great importance to get these truly level, to prevent inequalities in the finished ceiling. Ordinary carpenters try the strips with a straight edge as they nail them to the beams, hacking away a little from one beam and filling up a deficiency in another by means of a chip, until an approximately even surface is obtained; but a much better way is to notch all the beams for the furring strips before putting them on, gauging from the upper side in the same way as in sizing upon the partition boards or girts. After cross-furring, the setting of the partitions is finished, those that need it are trussed, so as to throw the weight upon firm points of support, and small trusses are put over all openings in the partitions.

The trussing of partitions should be studied beforehand, and indicated on the framing plans, so that doors can be arranged without cutting off the braces. Trusses over openings should be framed like (Fig. 121.) The dimensions and position of all the doors and partitions should now be thoroughly verified. No dependence whatever can be placed on the care of workmen in these respects, and the proportions of the plan are very likely to be hopelessly mangled unless a rigid watch is kept. The door openings must be framed about 5 inches wider and two inches higher than the finished door, to allow of proper blocking; and the distance from the angles of the room to the openings must be verified to insure symmetry, if that is intended; and sufficient space should be allowed for the architraves.

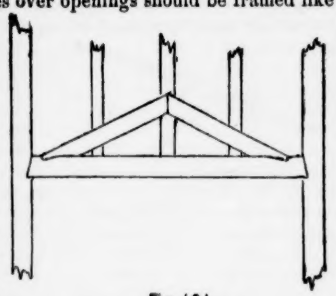


Fig. 121.

Bridging Partitions. After all is made correct, the partitions may be bridged. This is often done by nailing in short horizontal pieces between the studs; a process which has its use, but is valueless for the present purpose. The proper way is to cut in diagonal pieces (Fig. 122), which present a considerable resistance to the sagging of the partition. The final operation will be to try the partitions on each side with a straight edge, and correct the crooked studs by sawing half through them on the concave side, forcing them into place, and driving wedges into the incision. The chimneys are next enclosed with furring, consisting of a cage of studs, supported by posts at the angles of the breast. These furrings should be measured to see that they are accurately placed in the room, that they are of the proper dimensions, and that the fireplace comes accurately in the middle of them; such details being little regarded by the average framer. Nothing now remains but the fixing of the grounds to prepare the inside of the house for lathing and plastering. Meanwhile, however, various other mechanics have been busy inside the building, and the work of finishing the outside has gone continuously on. Every hot-air pipe, gas, drain and waterpipe, bell-tube, speaking-tube and electric wire which is not intended to appear outside the plastering must be fixed in place during the short interval which elapses between the completion of the studding and the commencement of the lathing.

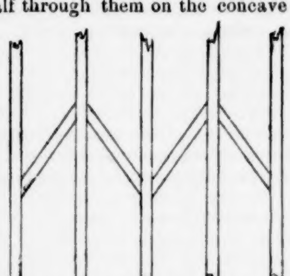


Fig. 122.

Hot-Air Pipes. If the plans are prepared with any care, the position and size of all hot-air pipes will be indicated on them, but so much thought is required in arranging them to the best advantage that the superintendent should study the plans for himself, in season to suggest changes if circumstances render them desirable.

The proper size of the pipes depends upon the form of heating-apparatus employed, and this should therefore be selected as early as possible. Most persons make contracts for furnace pipes and registers complete, but if the pipes are put in separately it must be remembered that heaters with small radiating surface, like most of the wrought-iron furnaces, deliver air at a very high temperature, but can deal only with a small current, and therefore work better with few and small pipes and registers, while the best cast-iron furnaces as well as a few forms in wrought-iron, and all indirect steam and hot-water heating apparatus, possess a large radiating surface, and therefore warm a much greater volume of air in a given time, but to a lower temperature, so that larger pipes are necessary to convey an adequate supply of heat to the rooms. As the only fresh air supply in winter is derived from the registers, it follows that better ventilation is obtained by the introduction of a copious, but moderately warm current than from a small admixture of very hot air, but the latter is the cheaper mode, in consumption of coal as well as in the first cost of the apparatus.

With heaters of large radiating surface, the pipes to the principal first-story rooms should not be less than 12 inches in diameter, and 9 or 10 inch pipes should supply the larger chambers; but for those consisting of a mere cylinder of wrought or cast iron, 9-inch pipes are large enough for the ground-floor, and 6 or 7 inch for upper rooms. Inexperienced architects and house-owners often make the mistake of putting in too many pipes and registers. Every unnecessary one, by the leakage at the dampers and the chilling of the exposed pipe, interferes with the working of all the others, and many houses are almost uninhabitable in cold weather, with a register in every room, which would be quite comfortable with half the number judiciously arranged.

Wherever possible, the hot-air pipes should run through closets or inferior rooms, exposed to view, but it is usually necessary to carry up some behind the furring of chimney-breasts, or even in partitions. This involves danger of fire, which must be guarded against. Where the pipes pass through the floors, a tin ring, flanged over floor and ceiling, is usually inserted, through which the hot-air pipe runs, leaving half an inch air-space all around; and through the whole of its course, all wood-work exposed to the radiation from it should be covered with pieces of *bright* tin. Specifications for furnace-work generally require all wood within two inches of the pipe to be so protected, but this will rarely be faithfully done in contract work unless the supervision is very close. A much better way is to have all the pipes which are to be concealed behind wood-work made double, a space of half an inch or so being left between the outer and inner cylinders, through which air circulates freely. Where the pipes are carried up in partitions without such protection, heavy wire lath should replace wood over them.

Plumber's Work. Of the plumber's work, only a small part will generally need to be done before plastering. Although supply-pipes are now generally planned to run outside the walls, in positions where they can be easily reached, iron waste and ventilation pipes are often best carried up in partitions, and these must be set in place in time to avoid subsequent cutting of the plaster, so that the plumber should be notified in season.

Gas-Piping. Gas-piping must be all completed before the lathing can commence, and will need vigilant watching. Careless and stupid in regard to the work of others as plumbers are apt to be, the cheap gas-fitters far surpass them in capacity for botching their own work and destroying that of others. If the plan shows two or three rooms *en suite*, with a centre light in the ceiling of each, the workman will generally, if the superintendent is out of sight, proceed to take up a board through the middle of the floor above, and notch the entire tier of beams from one to six inches deep in the middle of their span, weakening the floor dangerously and irreparably; or short cuts will be taken in a similar manner across girders, braces, or anything else that may happen to be in the way. All good specifications stipulate that no beam shall be notched at a greater distance than two feet from the bearing, where the cutting down does not materially affect the strength, and that all centre-lights shall be supplied by branch pipes at the proper points, but irresponsible journeymen, unless watched, pay little regard to such documents.

Care must also be taken to see that all pipes are laid with a continuous fall toward the meter, as otherwise they may be choked by liquid condensed from the gas; and the position of all centre-lights and brackets should be verified. No pains will generally be taken to have them accurately placed, so long as they come within a few inches of their proper position, unless the men are strictly looked after, and annoying difficulties are likely to be encountered in consequence when the ceiling is decorated. The height of the bracket outlets from the floor will also generally be varied to save the workman the trouble of cutting his pipe, rather than with a view to their appearance or use. The proper height for bracket outlets in chambers is 4 feet 6 inches from the top of the under floor; in halls and first-story rooms, 5 feet 6 inches is the rule. Mirror lights should have outlets 8 feet from the floor.

Even if the outlets are properly placed, it is usually too much trouble for the workman to cut the nipples of the right length, or to make their direction normal to the surface from which they project, and consequently the fixtures, after the house is completed and paid for, will be found to take all sorts of unexpected angles with walls and ceilings, which can only be remedied by hanging the chandeliers with ball-and-socket joints, or bending the nipples, at the imminent risk of causing a bad leak. The proper time to make sure of this point is while the work is going on. A straight piece of pipe, a foot or more in length, and of the proper calibre, should be screwed upon each nipple, as soon as set, and carefully levelled and plumbed, and tested with a carpenter's square. If any deviation from the true position is observed, it should be rectified before the inspection of the pipes by the mercury gauge, so that any leaks caused by the correction may be detected. All bends, tees, and other fittings for gas-pipe under two inches in diameter should be specified to be of malleable iron, which admits of a little bending, and this is often the easiest way to bring the pipes back to place. The nipples, or short pieces of pipe which project through the plastering and receive the fixtures, should all be cut to the right length, so that they may project not more than 1¼ or less than ¾ of an inch beyond the finished plastering, allowing for the projection of the "bud," or middle portion of the plaster centre-piece. It saves trouble — to the gas-fitter, — to utilize waste bits of miscellaneous lengths for the purpose, so that it is generally necessary, after the house is done, to dig some of the nipples out of the plaster in which they are buried, and to replace others of inordinate length by pieces of proper size; at the risk in both cases of detaching the centre-pieces or causing leaks within the walls or ceilings.

After the pipes are all in place, their whole extent should be examined, to make sure that no split or defective pipe, made temporarily tight with putty or red lead, forms a portion of the system. This once ascertained, the caps are to be screwed on, and the pipes inspected by the mercury gauge, which will always be done on a request left at the office of the company which will supply gas to the house. To one of the outlets is attached a manometer tube, or inverted siphon, with the short leg closed, filled with mercury. Air is then pumped into the pipes until the mercury stands at a given height in the tube, and the whole left over night. The next morning, if the mercury column remains at the same height, the piping is pronounced tight. The superintendent should witness this process, and satisfy himself of the result, instead of taking the word of the gas-fitter in regard to it.

Bell-Wires.

Bell-wires should always run in zinc tubes, which are sometimes fastened to the outside of the laths, and buried in the plastering, but are much better run between the studs. Their position should be verified, or, if not marked on the plans, determined with reference to the furniture which will occupy the rooms. Nothing, in a layman's eyes, does more discredit to an architect than to find gas outlets situated behind doors, or bell-pulls so placed that a bed or dressing-case must inevitably come in front of them.

Electric bells, which are very generally used instead of the ordinary kind, require only wires, which need not run through tubing, but are simply fixed to the studs by means of staples. With them should be put any other wires which may subsequently be needed to conduct electrical currents, such as those for burglar alarms, electric gas-lighting, or the electric light itself.

Gutters.

While these operations are going on inside, the outside finish has been rapidly advancing, so that the whole building may be so far as possible tight against rain by the time the interior is given up to the plasterers. The gutters are first put on, and the shingling or slating, beginning at the eaves, is carried to the top. Care should be taken that the gutter is so placed as to catch rainwater, but allow snow to slide over it. (Fig. 123.) Young architects often find their detail drawings for cornices defective in this particular. For additional protection against snow-water backing up under the shingles, or the overflow of the gutter dribbling through behind the cornice, the gutter should be ploughed at top and bottom, and "facias" inserted as shown in the figure.

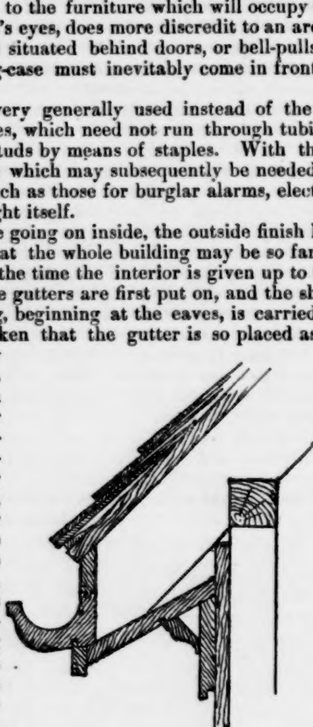


Fig. 123.

Shingles.

The shingling or slating begins with a double course, and the gauge is then marked off regularly to the top. Ordinary shingles, sixteen inches long, should not show more than four-and-a-half inches to the weather, unless on very steep roofs. The thick Michigan pine shingles, eighteen and twenty inches long, can be laid with much more projection without fear of breaking or curling. Each must be nailed with two nails, which should be galvanized if a very permanent roof is desired. Common nails rust out long before good shingles, well-painted, become unserviceable.

It is easy to judge of the quality of shingles. Freedom from knots and cross grain, and an approximation to uniform width, are the principal requisites. Spruce shingles, which are unfit to use in any but inferior buildings, are easily distinguished by their appearance and smell, which differ completely from the aromatic odor and silky grain of the "white cedar," or arbor vitæ wood, from which those in ordinary use are made. Pine shingles are of a special size, and those of the Virginia cypress, which have the reputation of being everlasting, are somewhat costly, and have but a limited market. The choice between sawed and shaved shingles

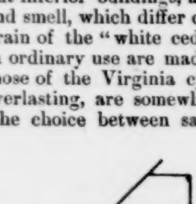


Fig. 124.

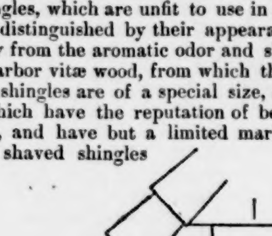


Fig. 125.

depends upon circumstances. The latter allow water to run off more freely, and are to be preferred if unpainted, while the former hold paint better, and are therefore generally used by architects.

In laying, the widest shingles are selected for the hips and valleys, where cutting is necessary, in order to give room for two nails. (Fig. 124.) Many of the best carpenters lay hips like Fig. 125, so that the cut shingle will not come at the extreme edge, and the effect is picturesque, while the durability of the roof is improved.

Painting Shingles.

The painting of a shingle roof is important. Many architects specify that each shingle shall be dipped in paint, some even requiring the paint to be hot; but this is tedious and expensive. A simpler and very good way is to paint each course as it is laid; and the cheapest is to do it all at once after the roofers are out of the way. The last process rather hastens the decay of the shingles, by forming little dams of paint which hold back the rain-water against the unprotected portions, but is generally adopted.

Slating.

Where shingles are to be used, the roof boarding is generally of hemlock or inferior spruce, planed to an even thickness, and one or two "plies" of tarred felt are laid under the shingles, to prevent fine snow in heavy storms from finding its way into the rooms. With slates still greater precaution is necessary, and the tarred felt should not only be double with all joints well broken, but matched pine boards should be used underneath. The "lap" of the slates will vary according to the size. Ten inches by twenty, or eight by sixteen are generally used, and for the best work should be laid with "three-inch lap"; that is, each slate should lap three inches beyond the head of the second slate below, (Fig. 126), and the length of the exposed portion will be found by deducting the lap from the whole length of the slate, and dividing the remainder by two. Two inches lap, is however, common. The slates should be put on with galvanized nails, not driven too hard, for fear of breaking them, nor too little, lest they should rattle and blow off in high winds, and the cut slates at the hips should be watched to see that they are not hung by one nail. Patent slating nails, which have a circle of japanned tin around the head, are useful. The flashings should last be looked after, and the roof will then be complete.

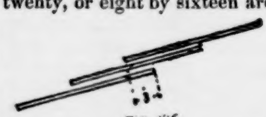


Fig. 126.

Leaks in Roofs.

If the young architect is ambitious of being able to say that no roof built under his superintendence ever leaked, he will need to exercise both thoroughness in inspection and skill in providing for various contingencies. The worst leaks come from improper position of the gutters, by which wet snow sliding from the roof is caught and held back. It soon freezes to the roof along the lower edge, the upper portion remaining free, and the water subsequently running down the slope is caught as in a long, deep pocket, in which it rises rapidly until its level reaches that of the upper edge of a course of slates or shingles, over which it pours in a sheet, to find its way into the rooms below. Next to this defect insufficient flashing in valleys is perhaps the worst. As metal is expensive, the roofer's interest is to save as much of it as possible, and the superintendent must consider the circumstances of pitch and extent of roof surface draining into the valley, and the slope of the valley itself which should determine the depth which the water will probably obtain in it. In certain cases, where the roofs are large, this may be eighteen inches or more in summer showers, and the only security is to make the valley flashings of corresponding size.

A very common place for a small leak is around the chimneys, where rain or snow often blow through between the bricks and the flaps of a "stepped flashing." The remedy is a liberal application of elastic or "Boston" cement between the brickwork and the metal. The same cement is also needed to prevent water from getting in at the angle of a hip in a slated roof, unless the hip is protected by flashings (See Vol. IX, page 271.) This should always be the case where a permanent construction is intended, since the cement soon "burns out" and crumbles by the heat of the sun on the slates. Shingles fit much more closely, and will generally make a tight hip without cement or metal.

Window Frames.

While the roofers are at work, the window frames are being rapidly set in place. These, in wooden houses, are mere fronts, in plan like Fig. 127, A being the "pulley-style," grooved for the parting head, while B is the outside casing. When this is put in place and nailed to the rough-boarding, the space X, between the pulley-style and the stud, forms the pocket for the weights.

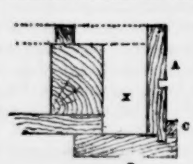


Fig. 127.

The casing B is often moulded or ornamented. If plain, it should be $1\frac{1}{4}$ inches thick, to prevent curling under the heat of the sun. Its inner edge, projecting half an inch beyond the face of the pulley-style, is usually made to form one side of the channel in which the upper sash slides, but it is much better to increase the depth of the reveal by inserting a slip *C*, some five-eighths or three-quarters of an inch wide, changing the position of the parting-bead to correspond. Independent of the improved appearance of such a frame, room is thus given for mosquito-nets and blinds. The shingles or clapboards are laid close up to the other edge of the casing, but when this shrinks a vertical opening is left, through which rain penetrates, and tarred felt, or still better, strips of zinc must be laid in behind the casing and the adjacent work. The junction of the clapboards or shingles with the top of the casing must also be protected. Some carpenters do this by tacking a strip of lead to the boards just over the casing, and turning it down over the edge (Fig. 128), but it is neater and tighter to rebate the top of the casing. (Fig.

129.) If this is done, and the vertical sides of the casing are grooved into the head (Fig. 130), the sills set to a sharp pitch, one and a half inches or so, and grooved underneath for inserting the shingles or clapboards which come below them, the superintendent may be tolerably sure that his building will not show that most annoying of defects, leakage around the edges of the openings, and the shingling or clapboarding may be commenced at once.


Fig. 128.

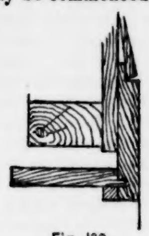


Fig. 129.


Fig. 130.

Back-Plastering.

Before this, however, the back-plastering, if any is specified, should have been completed, in order that its drying may be favored by the circulation of air through the open joints of the boarding; and notice must be given to the plasterers in ample season. The mode usually considered best is to nail fillets to the sides of the studs, and to lath on these, so that in theory a double air-space is formed by the outside boarding, the sheet of back-plastering, and the inner plaster; but in practice, it is inconvenient to nail fillets in the narrow space between the ledge boards and the outer boarding of a balloon frame, or just above the dropped-girt of a braced frame, and still more so to nail laths to them, so that these spaces are usually neglected, and the wind which blows in under the clapboards and paper of even the best built house finds an issue at such points into the interior. The real object should be to spread a continuous sheet of mortar from sill to plate, and this can be much better accomplished by omitting the fillets, and nailing two lines of laths vertically between each pair of studs, then lathing on these, and plastering with a thick coat of mortar, well pressed on, so as to fill in between the laths and the boarding. By this method room is left for the mason to insert his trowel and hand behind the ledger-boards or flooring-strips and reach every inch of the space between the studs, closing it against the wind, if care is taken to bring the mortar well up on the studs, with almost the imperviousness of a solid brick wall.

The meaner contractors, not in consequence of scientific deduction, but from desire of gain, often caricature this mode, by lathing vertically directly on the boarding, without the interposition of the first laths, which are essential to give a key to the mortar, and prevent it from cracking off. Some even content themselves, if not observed, with simply spreading the mortar on the boards, without any lathing whatever. It stays in place just about long enough for the contractor to get his pay.

Fire-Stops.

As soon as the back-plastering is done, it is usual in good houses to apply some precautions against the spread of fire and the passage of rats and mice from room to room. In the cellar, the whole space between the beams, from the sill to the inner surface of the wall, should be filled in solid with brickwork and mortar (Fig. 131), up to the under side of the floor-boards. This not only keeps out the cold wind which would otherwise blow freely through the chinks about the sill and the base-mouldings of the house, but renders it impossible for rats and mice to climb on top of the wall and gnaw their way through the floor above. If the cellar-ceiling is not plastered, the space above the girders should be bricked up, for the same reason; and in any case a brick partition, at least four inches thick, should be built, in mortar, on top of every girder, between the studs of the partition which rest on it, and on the heads of all partitions above which cross the beams, to a height of two or three inches above the floor. By this means the hollow spaces between the ceilings and floors are divided up into compartments, effectually cutting off the circulation of cold air through the floors, which is so much to be feared in country houses, while fire is prevented from spreading laterally between the beams. It is very desirable also to fill in with brickbats and mortar between the studs of all partitions, at about half the height of the room. This "fire-stop" belt may be laid on top of the bridging, and will check the upward course of fire, forcing it to burn out into the open room, where it will be discovered and means applied for extinguishing it. The principle should never be lost sight of, that the chief danger from fire in dwelling-houses comes from allowing it to find its way into the wooden tubes, lined with bristling splinters, nearly as inflammable as tinder, which are formed by the interior surfaces of the laths, studs, beams and flooring-boards. In these the flames creep, undiscovered and inaccessible, through and through a house in which no device is adopted for intercepting the communication between such air-spaces, until they gain strength enough to burst out fiercely in a dozen places at once, and the building, already permeated in all directions by the fire, is quickly destroyed.

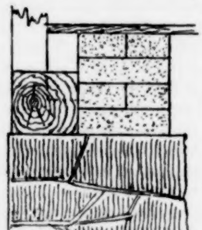


Fig. 131.

To carry out the system of protection with any thoroughness, the spaces between the outside studs must also be divided into sections by incombustible material. With braced frames this can very well be done by means of brickwork laid upon the girts, but for balloon frames it is necessary to nail in short pieces of timber between the studs at the level of the ledger boards, to build upon. A good body of masonry should then be formed on top of the plate, filling the whole space between the rafters to the under side of the roof-boards. This is an invaluable defence against cold air as well as fire, both of which usually find the cornice a very vulnerable feature.

Wire-Lath.

One other point remains to be guarded, the hollow space around the chimneys, behind the furring of the breasts. The easiest way of obtaining a partial protection is to lath and plaster the ceiling from the chimney outward as far as the breast will extend, before setting the furrings. A single rough coat only need be used, and it can be put on at the same time as the back-plastering, so as not to cause any delay. If stout wire-lathing is used instead of the ordinary kind, and especially if the mortar is "gauged" with a liberal dose of plaster of Paris, a very efficient protection is obtained for the portion of the building most exposed to danger.

Where the owner is disposed to incur a small extra expense for the sake of additional safety, wire-lath will be found generally of great service. Only the heaviest kind should be used, as the numerous furrings necessary to secure the more flexible varieties detract very much from its value as a protection against fire. By applying it to the surface of chimney-breasts and the under side of the stairs, great security is gained for the building, at a trifling expense, and it may be employed also in the ceilings and walls about furnaces and stoves. Where it is necessary, as it will sometimes be, to carry hot-air pipes in partitions, the lathing over them should always be of wire, unless the pipes are made double, or a casing of bright tin put all around them on the wood-work and under the laths before plastering. By first nailing laths vertically on the studs, the wire can be brought to the same plane as the wooden laths on each side, and the plastering will form an unbroken surface. Even the cost of using wire-lath throughout a dwelling-house is in many ways repaid. Its power of holding the mortar so firmly that no amount of force will detach it, to which, far more than to its incombustible material, it owes its efficiency in resisting fire, is equally valuable in maintaining a perfect surface for walls and ceilings. Such plastering does not crack or sag; no violence can shake it down, and the most prolonged water-soaking fails to detach it from the lathing.

BUILDING STONES.[1] — I.

Their Variety, Characteristics, Capabilities and Peculiarities.

Building-stones, in their variety and worth, present to all engaged in the construction of various substantial works, as well as buildings, great fields for investigation and important subjects for thought. Yet important as research is in every branch of scientific industry, comparatively little work or thought has ever been bestowed upon rocks used for building purposes. Dana says, "such rocks are made up of minerals either singly or in combination, and that they may be divided into two classes, Siliceous and Calcareous." But the limits or differences between kinds of rock are ill defined. They are usually not definite compounds, but indefinite mixtures, and even the line of demarcation is ill defined. As an illustration, granite passes gradually but insensibly into gneiss, and gneiss just as insensibly into mica schist and quartzite, mica schist into hornblende schist, and so of almost all of our so-called varieties; and our names even admit of such latitude in definition that different geologists draw different lines of demarcation, and by an irregularity of description convey various opinions as to the nature, worth, and durability of different stones.

To the architect as well as the capitalist who furnishes the means of construction, the actual worth and durability of the various kinds of stone used is a great subject for thought and discussion; yet there are no fixed rules of determination of their durability, and people interested in quarries are very ready to show that their quarry is ahead of all competitors, and such a variety of expressed opinions show the want of a standard of estimation that may be at once comprehensive and valuable. All can see that the durability of a rock made up of equally valuable material must be greatly dependent upon its compactness and fineness of texture, and further to the absence of any substance liable to oxidation. It is an admitted fact that as far as air and water can penetrate within a rock, thus far degeneration will be continually going on, and that that change is injurious to the qualities of such stone for building or architectural purposes. The alternate melting and freezing in our climate, as well as the direct chemical action of moisture, and the carbonic acid derived from the atmosphere, are among the continuous means of destruction, and though insidious, are none the less certain in their results. To illustrate: as carbonic acid thus derived may take out the alkali from the feldspar of a granite rock, and at length cause it to crumble in decay, so the narrated causes might alone ultimately crush in powder many of our hardest rocks. In consequence of this knowledge came the usual practice of testing the durability of stone under exposure, by putting the same in water and weighing both

[1] By Hiram A. Cutting, Ph. D., State Geologist, Vermont.

before and after soaking, thus noting the ratio of absorption. This, while it shows us the comparative value of stone from the same quarry, or of the same kind, is of no value when applied to different materials, or even to different varieties of the same stone. Yet such tests as I shall show have their significance. Fineness of grain, excellent polishing, and various artificial dressings in use, may aid, in fact do aid their durability, and yet not alike in all varieties. The great aid is of course in keeping out water, the universal destroyer; but destruction in another direction is aided, as the temperature from the heat of the sun is greater by day, and the cooling goes further by night, so there is loss in one direction while we make a gain in another.

In face of all the difficulties of investigation of this subject, and the dearth of literature in this direction, I have instituted and carried forward a multitude of experiments tending to throw light upon this important subject. It is the results and manner of investigation, together with the description of the stones and quarries, that I am to endeavor to put before the readers of this paper. As many of my experiments are as yet incomplete, time will be required for their completion, and it was for the same reason that delay in the commencement of these articles has been unavoidable if I would do it any measure of justice.

The experiments have been in part the following. Building-stones carefully selected from the quarries have been, as far as possible, reduced to blocks of uniform size. One block has been crushed to ascertain its strength; one block has been dried and carefully weighed, then the amount of moisture it would absorb has been noted, and finally it has been tested in a furnace constructed for the purpose, at various degrees of heat, from 500° to 1200° Fah., as noted by a standard pyrometer. Other specimens have been subjected to the same heat when dry; others still have been heated and suddenly cooled by water. The specific gravity of each has been carefully ascertained, and the damage from heat and water noted. Other blocks have been exposed to frost both when wet and dry, at varying temperatures, to thirty degrees below zero, and, by means of magnifying power, the effect carefully noted.

Thin sections have also been made of each for microscopic examination, and all peculiarities in structure will be specially described. The nature and effect of any foreign ingredients as far as observed will also be stated, and such descriptions of the quarries as in my opinion would aid in determining the value of the stone and the capabilities of furnishing. The facilities at the quarries for working the same will be stated.

While I shall respect the opinions of all scientists, though contradictory in themselves often, I shall fully give the results of the experiments as they appear to me; not withholding or changing evident facts to favor quarry, dealer, or previous opinions. While I describe some experiments in detail, I shall in the end tabulate results so they will be as available as possible.

While I cannot hope to reach absolute conclusions, I shall hope to give some new facts in relation to building-stones not before worked up, hoping that others may correct errors and improve on my investigations until the world becomes fully acquainted with the capabilities and durability of our various building materials, so that architects and others may know what is best for a given purpose, and not be disappointed in results. Examples of durability of material will be given as far as possible from actual results as seen in buildings and monuments. For example, the decomposition of the Aquia Creek, Va., sandstone in St. Paul's Church, Boston, compared with the same stone better protected in the Capitol at Washington shows its easy decomposition, and the special worth of protective applications. The uncertain data derived from drift scratches that have always been protected by soil, and which really tell us nothing of what we desire to know about durability, will be received with caution, as it is very different from the exposure of a building or monument to the heat of the sun, the frosts of winter, the dampness of our climate, and the gases of the atmosphere. When weathered otherwise, they are in reality of little worth to us in determining their true value as used in works of art. We can never know how many feet of rock have been decomposed by the hand of time from the face of our quarries, leaving no history of its whereabouts or manner of its decomposition. Various artificial stones will also receive attention; when they are of any special worth, their capability will be noted, and a description of their manufacture, if obtainable, given. Such quarries as have not already furnished the necessary material for tests, as well as manufacturers of artificial stone, are requested to communicate with me, that such material may be obtained and the investigations thus become more general. It is now expected that reports will be published at least once a month until the same be completed.

THE ILLUSTRATIONS.

ST. STEPHEN'S MEMORIAL CHURCH, LYNN, MASS. MESSRS. WARE & VAN BRUNT, ARCHITECTS, BOSTON, MASS.

On Wednesday, November 2, St. Stephen's Memorial Church in Lynn was consecrated. The edifice was erected by the late Hon. Enoch Redington Mudge as a memorial to two of his children — Charles Redington, who was killed at Gettysburg, and Fanny Olive, who died about two years ago — the entire expense being borne by him.

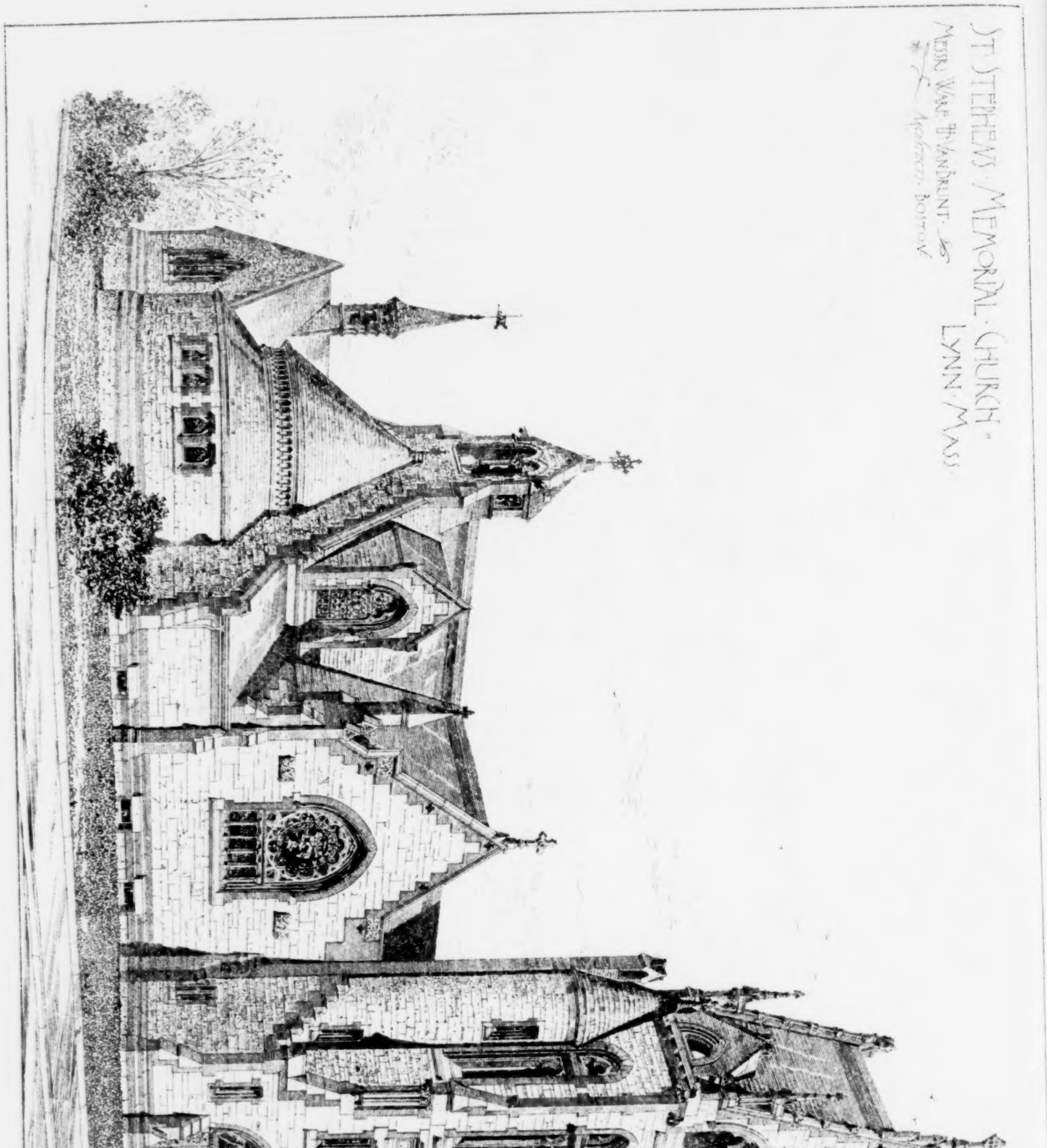
The walls of St. Stephen's Memorial Church on the south side of the Common at Lynn, Mass., are built of a reddish granite rubble, quarried on the estate of Hon. E. R. Mudge at Swampscott, with facings and angles of red brick, and weatherings and carvings of Nova Scotia freestone. The plan of the church proper is in the form of a Latin cross, the apse facing the east; but the spaces in the angles of this cross are covered by aisle roofs, so that the whole area is included in the body of the building, thus presenting a rectangular auditorium sixty-eight feet from north to south, and ninety feet from the west wall to the arch of the apse. The nave and transepts are severally forty feet wide, and the latter are twelve and a half feet deep, the angles of the central crossing being marked by four clustered stone piers, from the capitals of which spring open-timber trusses of Georgia pine, across nave and transepts, and diagonally, supporting the roof, which is visible in its structure to the apex. The two aisle spaces on the west are occupied, the one as a baptistery and the other as a memorial to the children of Mr. Mudge; in the corresponding spaces on the east are the organ and the sacristy. The tower, which is twenty-two feet square and one hundred and thirty feet high, without a spire, stands on the northwest corner, the lower story serving as the principal porch of the church, the second as a chamber, furnished as a study for the rector, and the upper two-thirds as a belfry with open windows. These chambers are accessible by stairs winding in a circular turret attached to the east side of the tower. The tower is finished with steep gables on the north and south sides, enriched with pinnacles and crockets, and surmounted on the north gable by a cross.

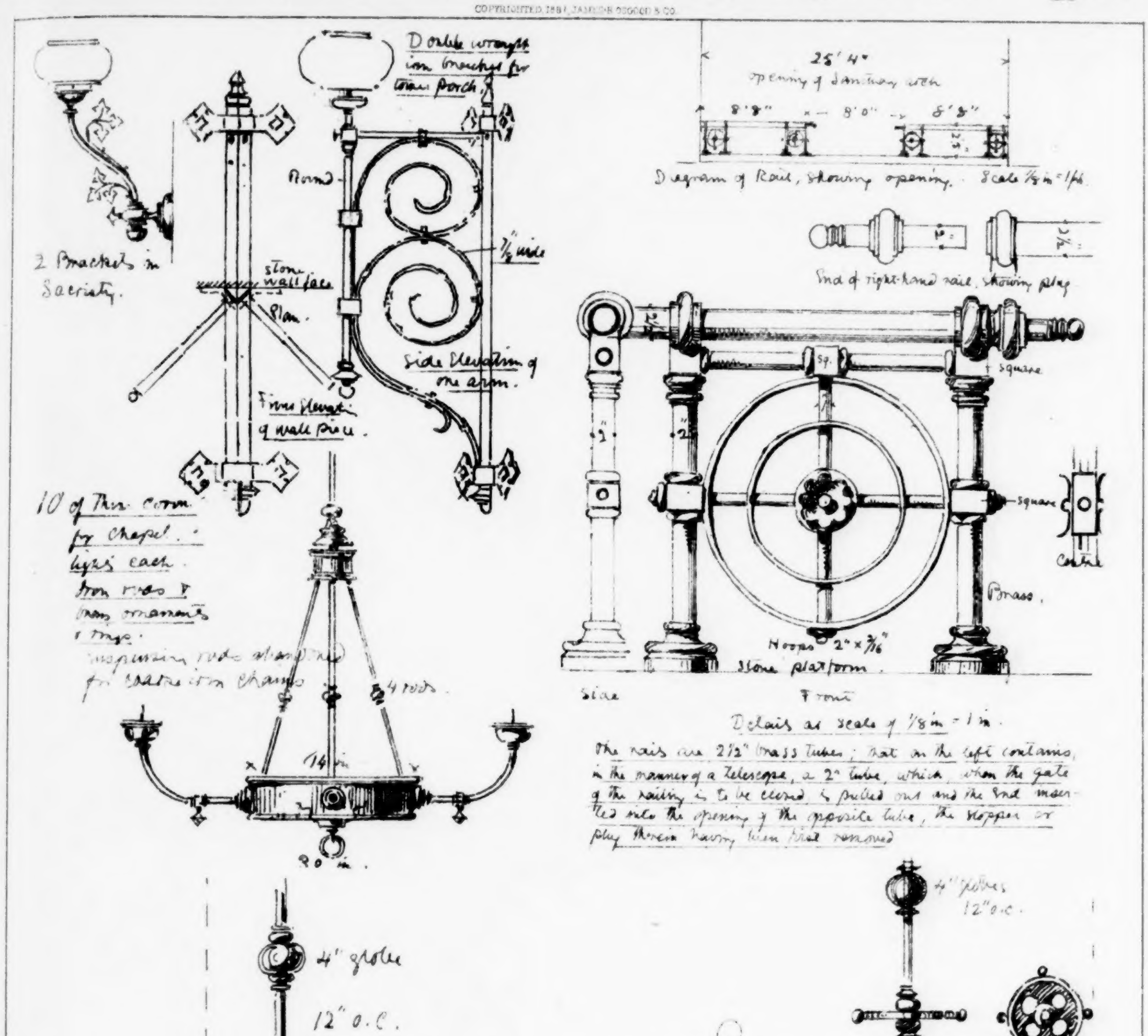
From the tower porch the main approach to the interior is by an arch opening into an ambulatory running along the west wall and separated from the church proper by an ash panelled screen, eight feet high, glazed with white glass and jewels, and pierced by three doorways, opening into the central and the two side aisles. This ambulatory is paved with tiles. The nave alone is occupied by pews, the two transepts being furnished with chairs; the floors are finished with polished parquetry, and the pews are of simple design with carved heads. They will accommodate six hundred worshippers, all having full view of the service at the altar. The choir occupies the space in the east arm of the cross; it is forty-four feet wide and twenty feet deep, and is raised eighteen inches above the floor of the nave, from which it is separated by a low rood-wall of stone, pierced in the centre, and by the great stone arch of the choir; this latter is flanked on either side by half-arches, covering the organ-screen on one side and the sacristy screen on the other, the whole visible east wall of the church being thus occupied by a great trefoil arch the entire width of the building. The furniture of the choir is composed of canopied clergy stalls, and choir stalls with accommodation for thirty-six choristers. These stalls, together with the buffet of the organ in two faces, the sacristy screens, and the pulpit, are of dark oak, richly carved. The lectern is of wrought brass. The apse is semi-circular, is separated from the choir by a stone arch, and is surrounded by an aisle, which is divided from the sanctuary by a screen of seven stone arches, supported by polished New Brunswick red granite columns. This aisle is paved with slabs of freestone, and the sanctuary with tiles and a Roman mosaic pavement in front of the altar. The altar rests upon a broad stone foot-pace approached by three stone steps, and is of Caen stone, enriched with the *Agnus Dei* and adoring seraphim in the three front panels, and with other sculptured emblems. In front is a kneeling-rail of wrought brass. The dome of the sanctuary is of gilded wood; the roof-frame throughout is of Georgia pine, and visible; it is sheathed with stained and decorated pine, and covered with an embroidery of heavily cusped and moulded ribs. The trusses are hammer-beam trusses coupled, the timber-heads being carved as angels, and from each hangs a lamp of antique brass. In the choir are two massive coronas of the same material. The extreme height of the nave within is forty-nine feet.

On the south side of the church, and approached from it by two cloisters, enclosing an open garth or area, is the chapel building, one hundred and two feet by thirty-four feet, with infant school and library, and the other usual appointments. There is a large parish parlor over the infant school, and in the basement a series of furnished apartments, mainly for the charitable offices of the society, with a separate entrance from the rear.

In the garth lies interred the body of Mr. Mudge, to whom alone the church is indebted for the unencumbered gift of these sacred buildings, and whose sudden death on the 1st of October last, while directing their final adornment, in itself furnished their most touching and effective consecration. By his side repose the remains of his son and daughter, in whose memory this devout gift was conceived and executed, and whose names are carved upon the tower walls and engraved upon memorial brasses in the south aisle.

The windows of the main church are filled with a double glazing of very brilliant opalescent and jewelled glass, forming pictures of transparent mosaic without the touch of the painter's brush. The south window is decorated with "The Annunciation," and the north with "The Ascension" — the beginning and close of the life of Christ. The west window is emblazoned with the story of St. Stephen; the other windows are occupied with conventional decorative forms of the same material. This glass, which is by the "Associated Artists" of New York, combined under the style of Louis C. Tiffany & Co., marks distinctly the beginning of a new era in decorative glass; it is the most monumental example of the art yet attempted in this country.


St Stephens Memorial Church · Lynn · Mass ·
Messrs Ware & Van Brunt ·
Boston



St. Stephen's Memorial Church Lynn Mass. Messrs. Ware & Van Brunt Archts. Boston. Architects' Original Sketches for Brass-Work.

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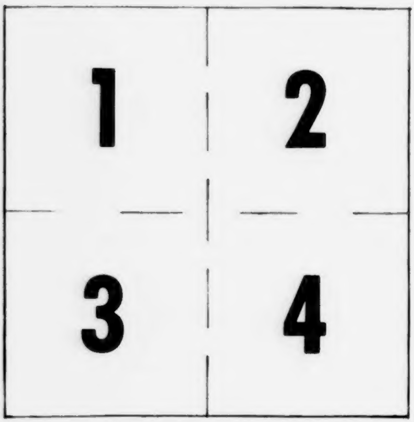

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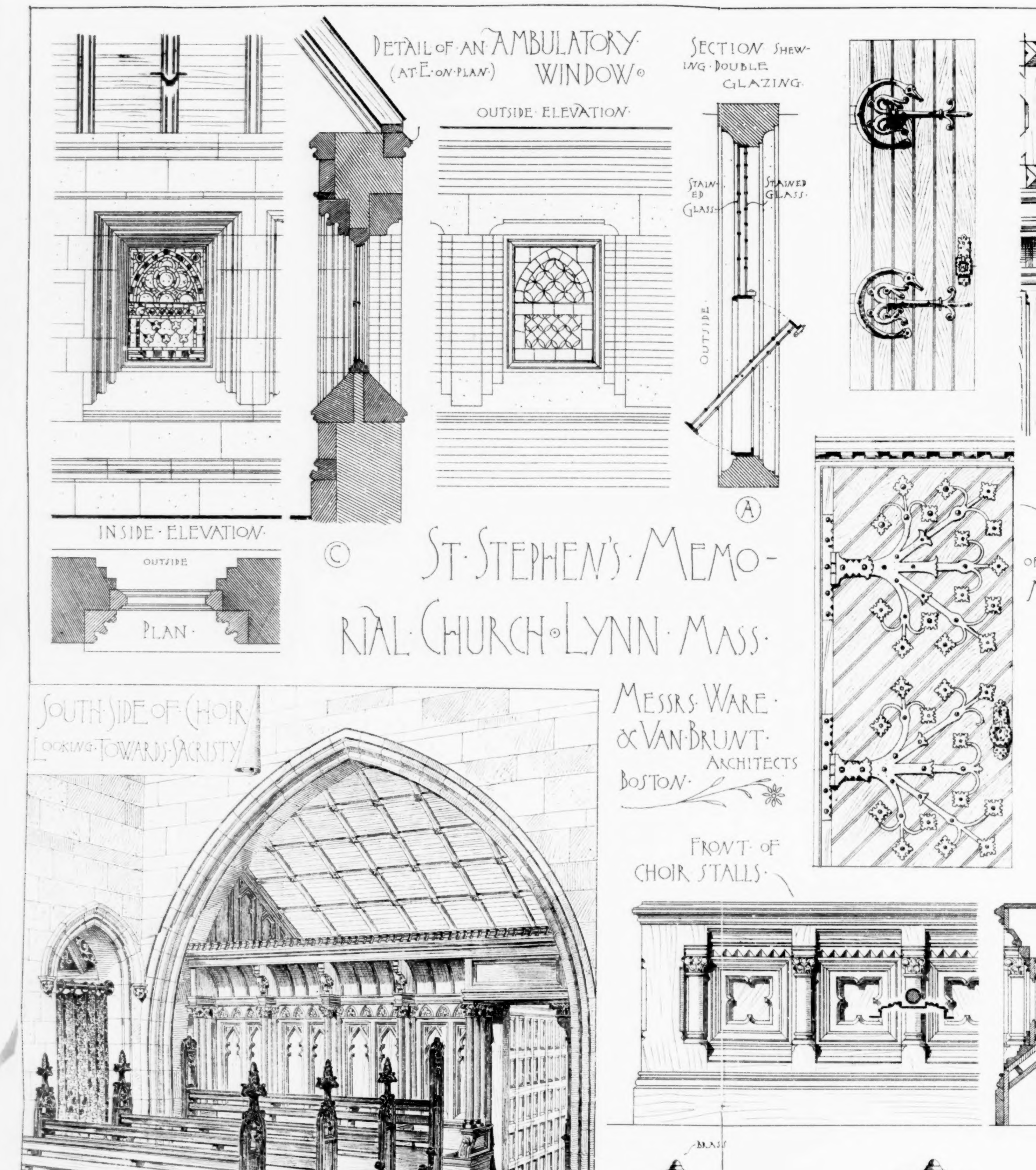
DETAIL OF AN AMBULATORY WINDOW
(AT E ON PLAN)
OUTSIDE ELEVATION
SECTION SHEWING DOUBLE GLAZING
STAINED GLASS
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A
INSIDE ELEVATION
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C
ST. STEPHEN'S MEMORIAL CHURCH LYNN MASS.
MESSRS. WARE & VAN BRUNT ARCHITECTS
BOSTON
SOUTH SIDE OF CHOIR LOOKING TOWARDS SACRISTY
FRONT OF CHOIR STALLS
ROOD WALL
BRASS
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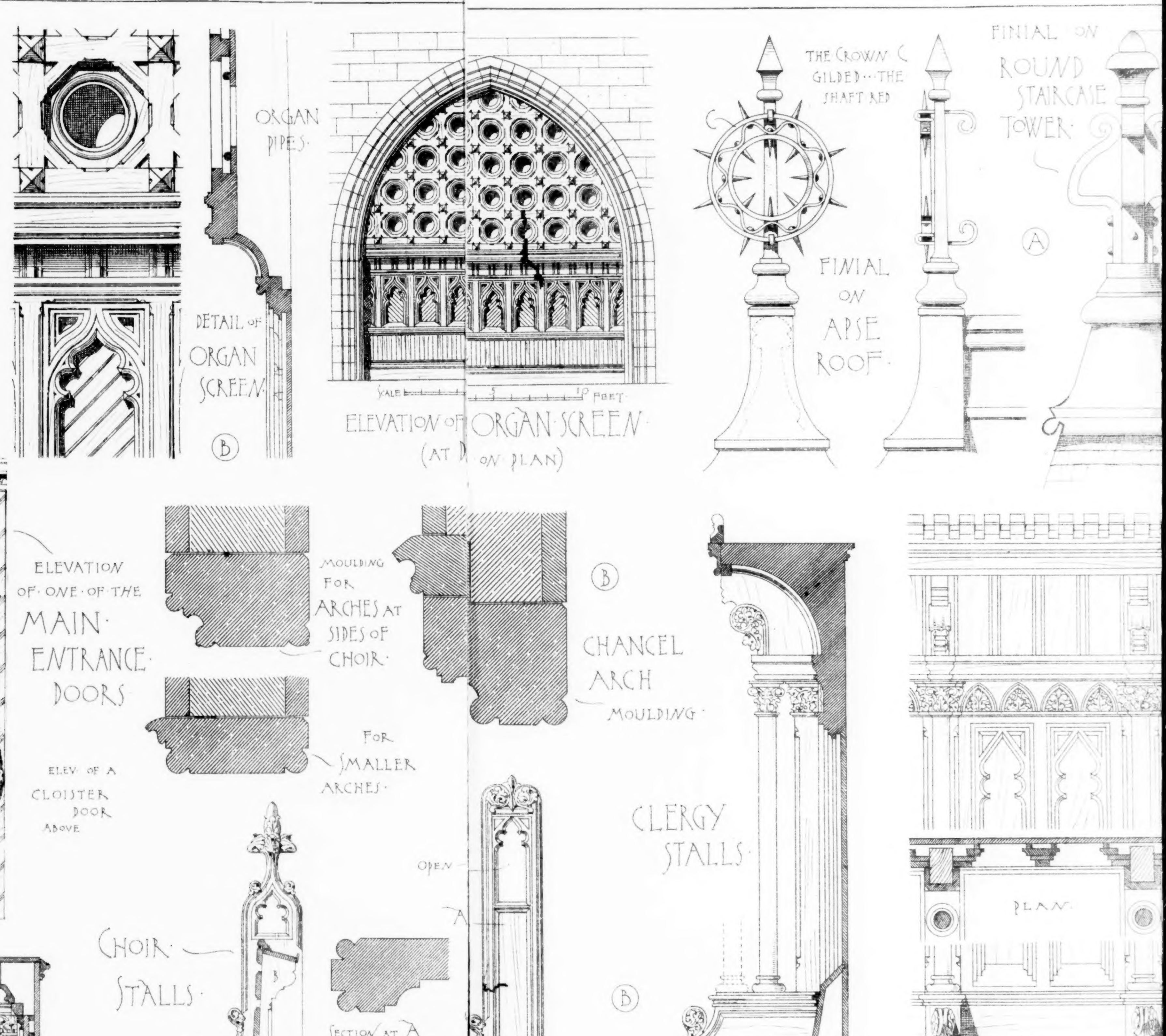
J. A. GREGG DEL.


ORGAN PIPES·
DETAIL OF ORGAN SCREEN
B
ELEVATION OF ORGAN SCREEN (AT D ON PLAN)
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10 FEET
THE CROWN C GILDED··· THE SHAFT RED
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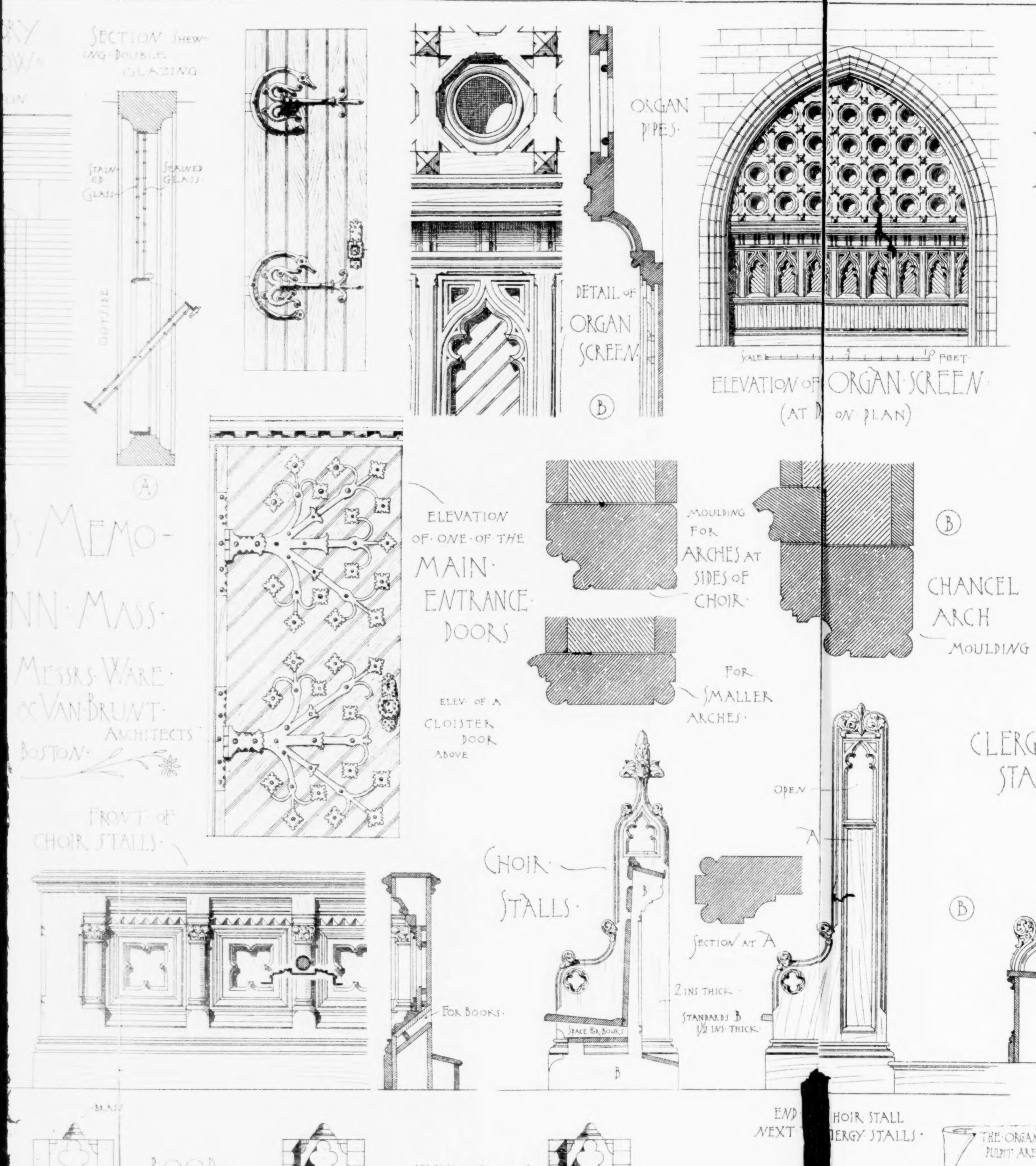
MOULDING FOR ARCHES AT SIDES OF CHOIR·
FOR SMALLER ARCHES·
CHANCEL ARCH MOULDING·
CLERGY STALLS·
PLAN·
CHOIR· STALLS·
OPEN
SECTION AT A
2 INS THICK
STANDARDS B 1/2 INS· THICK
SPACE FOR BOOKS
FOR BOOKS·
SECTION·
ELEVATION OF CLERGY· STALLS·
END ... HOIR STALL NEXT ... ERGY· STALLS·
THE ORGAN SCREEN STALLS FRONT AND PULPIT ARE OF OAK THE PEWS OF ASH·
SECTION THRO' STEPS·
END AND BACK ELEVATION OF PEWS·


SECTION SHEWING DOUBLE GLAZING
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MESSRS WARE & VAN BRUNT ARCHITECTS BOSTON
ELEVATION OF ONE OF THE MAIN ENTRANCE DOORS
ELEV. OF A CLOISTER DOOR ABOVE
MOULDING FOR ARCHES AT SIDES OF CHOIR
FOR SMALLER ARCHES
B
CHANCEL ARCH MOULDING
CLERG... STA...
FRONT OF CHOIR STALLS
FOR BOOKS
CHOIR STALLS
SPACE FOR BOOKS
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2 INS THICK
STANDARDS B 1/2 INS THICK
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ROOD WALL
BRASS
BRASS
SECTION THRO' STEPS
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END ... HOIR STALL NEXT ... ERGY STALLS
THE ORGAN ... PULPIT ARE ...
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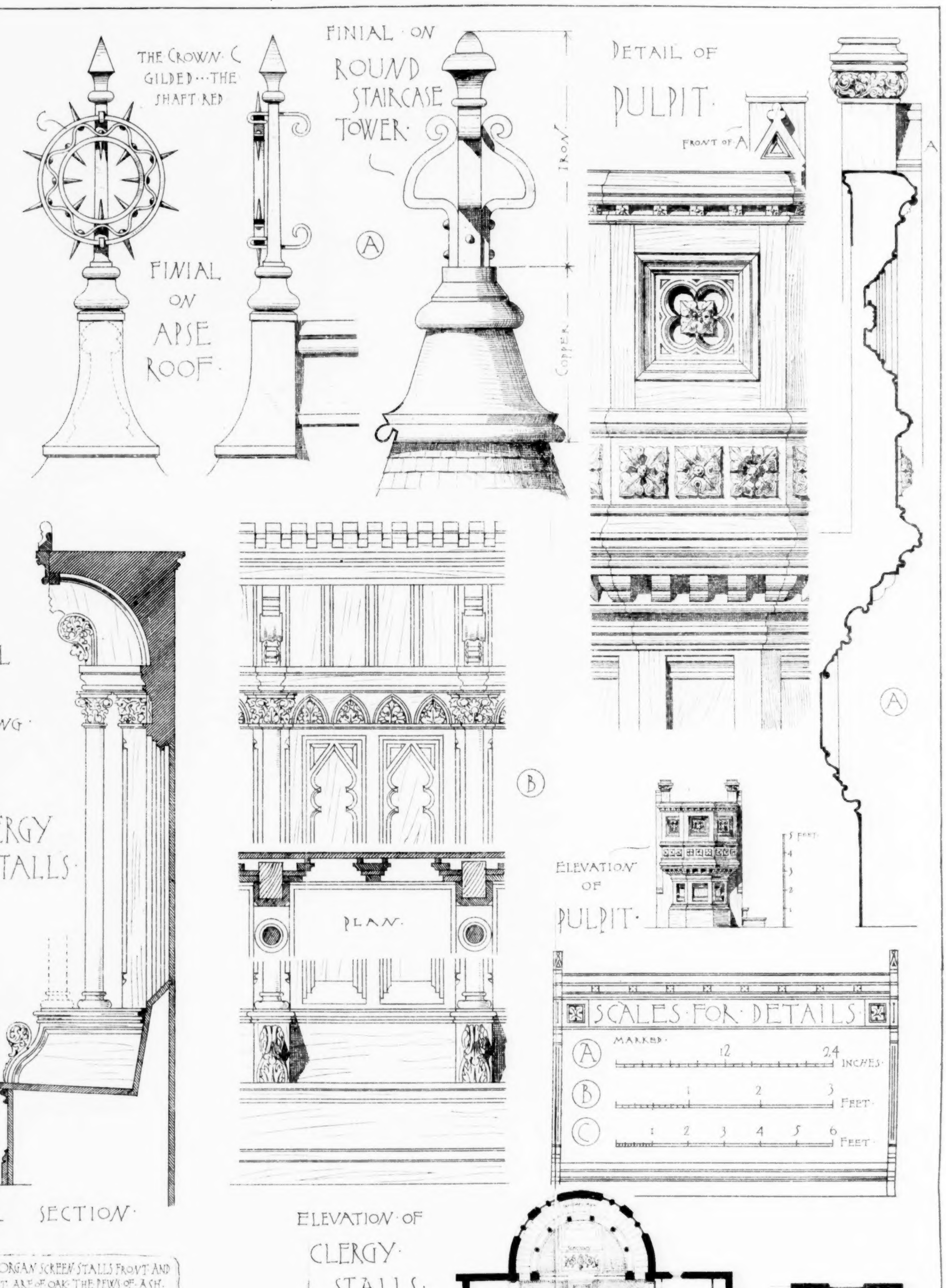

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The interior facing of the church walls is of dressed freestone, buff and red, from Nova Scotia quarries.

The whole was built after the designs and under the superintendence of Messrs. Ware & Van Brunt (now Van Brunt & Howe) of Boston, architects. The contractors for masonry were Messrs. Woodbury & Leighton; for freestone, E. F. Meany, all of Boston; the carpenters were Messrs. J. W. Tewksbury & Co., of Lynn; the brass-work was furnished from the architects' designs by Messrs. Stillman & Nicoll, agents for Mitchell, Vance & Co., of New York. The decorative painting was by Mr. W. J. McPherson, the tiling by Messrs. Wellington & Burrage, the roofing by Messrs. Burns & Bee, of Lynn, the heating apparatus by G. C. Dunklee & Co., and the organ by Messrs. E. & G. G. Hook & Hastings.

The altar and font (the font being designed by Messrs. Rotch & Tilden, architects), which were gifts of members of Mr. Mudge's family, were furnished and sculptured by Messrs. Evans & Tombs of Boston, who also carved the timber heads.

LEGAL NOTES AND CASES.

Fixtures. — Purpose and Use of Building.

In *Frost vs. Whittier*, decided by the Supreme Court of California, on August 25, 1881, there was considered the question of what were to pass as fixtures under the agreement of the parties to a sale of a building. The action was brought to recover certain gas-fixtures, consisting of chandeliers, globes, brackets, burners, pendants, etc., a kitchen range with boiler attached, a patent water-filter, tanks and mosquito-screens. The property was attached to a building known as the "Orleans Hotel," situate on a lot of land fronting on Second Street, in the city of Sacramento. As owner of the hotel, the plaintiff, on October 15, 1879, contracted in writing to sell the same to the defendant, by the following description, viz.: "Lot No. 6 in the square between J and K and Front and Second Streets, in the city of Sacramento, and the appurtenances and improvements thereunto belonging." The sale was made for $28,000 gold coin, payable after an examination and approval of the title, upon receiving from the plaintiff possession of the property and of a deed of grant of the same, on or before the first day of November, 1879, reserving to the plaintiff, among other things, the right, within ten days after delivery of possession, to remove from the upper rooms of the hotel "his furniture, carpets and pictures, but none of the permanent fixtures or appurtenances to said property shall be removed." On the 25th of October, the defendants, having satisfied themselves about the plaintiff's title, paid the full amount of the purchase money and received from the plaintiff possession and a deed of grant of the property. The deed described the property in the same way that it had been described in the contract of sale, and it also contained the recital that the deed had been made in pursuance of the contract of sale, and subject to the terms, conditions and reservations therein contained. Within ten days after the delivery of possession plaintiff demanded of the defendants the privilege of removing the articles in controversy from the hotel, which, being refused, this action was instituted, and the question arises whether the articles are personalty, or fixtures which passed as appurtenances of the realty by the deed of grant.

If the question arose out of the deed alone it might not be difficult of solution, for the weight of authority seems to be in favor of the proposition that they are to be regarded as movable property, capable of being severed from the building; yet the authorities upon the subject are conflicting. In *McKeag vs. Hanover Fire Ins. Co.*, 81 N. Y. 38, the Supreme Court of New York held that gas-pipes which run through the walls and under the floors of a house are permanent parts of the building; but fixtures attached to such pipes, where they are simply screwed on projections of the pipes from the walls, which can be detached by unscrewing them, are not appurtenances, and so do not pass by deed or under a mortgage of the premises, and the mere declaration of the owner that he intends that such articles shall go with the house does not make them realty. In *Guthrie vs. Jones*, 108 Mass. 193, it was held that, as between landlord and tenant, gas-fixtures, though fastened to the walls, were not annexed to the realty so as to become part of it. They are, says the court, in their nature, articles of furniture, and the fact that they were fastened to the walls for safety or convenience does not deprive them of their character as personal chattels and make them a part of the realty. In *Vaughen vs. Halderman*, 33 Penn. St. 523, the court says: "Lamps, chandeliers, candlesticks, candelabras, screens, and the various contrivances for lighting houses by means of candles, oil or other fluids, have never been considered as fixtures and as forming a part of the freehold. There is no trace of a contrary doctrine in the English decisions, nor does it appear that the ordinary apparatus for lighting has ever been classed among fixtures." In *Jarechi vs. Philharmonic Society*, 79 Penn. St. 403, the case of *Vaughen vs. Halderman* was reviewed and approved. Says Sharswood, J.: "Houses are considered as finished by the builders when the gas-fittings are completed. The fixtures are put up in more or less expensive style, according to the tastes and means of the persons who mean to occupy them, whether as tenants or owners. If the tenant puts them in, it is not denied that, as between him and the landlord, they are his, and he may remove them or they may be sold as personal property on an execution by the sheriff. No doubt the owner, if they belong to him, often sells them with the house. They add more to the value of the house than they would be worth if removed. But if there is no agreement to sell the house as it is — fixtures and all — the purchaser is not entitled to them. We see, then, no reason for departing from the judgment in *Vaughen vs. Halderman*." To the same effect are *Shaw vs. Locke*, 1 Daly, 487; *Montague vs. Dent*, 10 Rich. 138; *Rogers vs. Crow*, 40 Mo. 91; *Lawrence vs. Kemp*, 1 Duer. 363; *Towne vs. Fiske*, 127 Mass. 125. On the other hand, it has been held by the Supreme Court of Kentucky, in the case of *Johnson vs. Wiseman*, 4 Metc., 357, that where a vendee of a house in possession purchased and put into it gas-fixtures, chandeliers, etc., which were affixed by means of screws to iron pipes let into the walls of the house for the purpose of conducting gas to the burners, such chandeliers, etc., became fixtures which passed by a deed of the realty, in the absence of any express provision to the contrary, although they may be removable without injury to the walls or the ceiling of the house, or to the pipes to which they are attached. The same doctrine was enunciated in *Smith vs. Commonwealth*, 14 Bush. 31, as one about which there was no question. Whatever, indeed, is accessory to a building for the more convenient use and improvement of the building, is considered to pass by a deed of the premises. Thus, articles placed in a mill by the owner to carry out the obvious purpose for which it was erected, are generally part of the realty, notwithstanding the fact that they could be removed and used elsewhere: *Parsons vs. Copeland*, 38 Maine, 537. In a building erected as a factory, the steam-works relied on to furnish the motive power, and the works to be driven by it, are essential parts of the factory, adapted to be used with it, and would pass by a conveyance of the real estate; 4 Metc. 306. Apparatus for the manufacture of gas are fixtures. *Hayes vs. Doane*, 3 Stockt. 84. Gas-burners are of the same character. They are in no sense furniture, but are mere accessories to the building: *Keeler vs. Keeler*, 31 N. J., 191. What is accessory to real estate is, according to the rule of the common law, part of it, and passes with it by alienation. That rule has been, in the growth of the law, greatly modified as between landlord and tenant, for the encouragement of trade, manufacture, agriculture, and domestic convenience; and courts recognize and enforce the right of removal by a tenant of chattels annexed to the freehold for such purposes. But the rule which is applicable to persons in that relation does not apply as between heir and executor, vendor and vendee. As between the latter the rule of the common law is still applicable, except so far as it may be modified by statutory regulations upon the subject. So that chattels attached to the freehold by the owner, and contributing to its value and enjoyment, pass by the grant of the freehold, if the grantor had power to convey. *Tourtellotte vs. Phelps*, 44 Gray 378, and after conveyance they cannot be severed by the vendor or any one else than the owner.

As between vendor and vendee, therefore, the rule for determining what is a fixture is always construed strongly against the seller. Many things pass by a deed of a house, being put there by the owner and seller, which a tenant who had put them there might have removed; and they will be regarded as fixtures, which pass to the vendee, although annexed and used for purposes of trade, manufacture, or for ornament or domestic use. Thus, potash kettles appertaining to a building for manufacturing ashes (6 Cowen, 665); a cotton gin fixed in its place (2 Strob., 478); a steam engine to drive a bark mill (7 Watts, 106); kettles set in brick, in dyeing and print works (12 N. H., 207); iron stoves fixed to the brickwork of chimneys (7 Mass., 432); wainscot work, fixed and dormant tables, engines and boilers used in a flour mill and attached to it (*Sands vs. Pfeiffer*, 10 Cal., 259); a steam engine and boiler fastened to a frame of timber, and bedded in a quartz ledge, and used for the purpose of working the ledge (*Merritt vs. Judd*, 14 Cal., 59); a conduit or water-pipe to conduct water to a house (*Philbrick vs. Emry*, 97 Mass., 134); hop-poles in use on a hop-farm (*Bishop vs. Bishop*, 11 New York, 123); statues erected for ornament, though only kept in place by their own weight (*Snedeker vs. Warring*, 2 Kern., 170). In fact, whatever the vendor has annexed to a building, for the more convenient use and improvement of the premises, passes by his deed. The true rule deduced from all the authorities, say the Supreme Court of Virginia, seems to be this: That when the machinery is permanent in its character, and essential to the purpose for which the building is occupied, it must be regarded as realty, and passes with the building; and that whatever is essential for the purposes for which the building is used will be considered as a fixture, although the connection between them may be such that it may be severed without physical or lasting injury to either. *Green vs. Phillips*, 26 Gratt., 752; *Shelton vs. Finklin*, 32 Ibid, 735. Judged by these rules, it would seem as if there were no room for doubt as to the character of the articles in controversy. Taking into consideration their nature, the circumstances under which they were placed in the building, the mode of their connection with it, and the relation which they bear to its use and enjoyment, they must be regarded as essential for the purposes for which the building was used. The plaintiff himself, by his testimony, shows that the globes were lettered "Orleans Hotel," and that they, with the chandeliers, etc., were necessary for furnishing light to the building; that the range rested on a foundation of brick, and that it and its attachments were annexed to the building by pipes, which connected them with the tanks and filters on the roof of the building, and by a waste-pipe which ran through the wall of the building and connected with a sewer in an alley outside, and that the range and its attachments were necessary for cooking; that the tanks and filters were attached to the building by a system of pipes which connected them with the main, or pipes of the City Water Company, and with various parts of the hotel, and were necessary to supply the hotel with clear water; that the mosquito transoms and window screens were fitted to the windows and transoms of the hotel — each window and transom frame being fitted to its particular window, and shoved up and down in it on grooves, and all of them were as necessary to the hotel as its windows, its blinds and shutters. All of the articles were therefore essential to the use and enjoyment of the hotel; in fact, as the plaintiff testified, "it would not have been a hotel without them." They were, therefore, fixtures which passed by the deed of grant to the defendant, unless they were specially reserved by the deed. But the deed reserved none of the articles. It was made, according to its recitals, in pursuance of the agreement of the fifteenth of October, and subject to the terms, conditions and reservations therein contained and expressed.

As already stated, the agreement reserved only the furniture, pictures and carpets of the upper rooms of the building, and none of the "permanent fixtures or appurtenances to the property." In the absence from the deed of any special reservation of the articles, it must be presumed that the parties, by their agreement, considered them as permanent fixtures and appurtenances of the hotel which were to pass by the deed. It is a well-settled rule of law that parties themselves may, by express agreement, fix upon chattels annexed to realty whatever character they may have agreed upon. Property which the law regards as fixtures may be by them considered as personalty, and that which is considered in law as personalty they may regard as a fixture. Whatever may be their agreement, courts will enforce it. *Smith vs. Waggoner*, 50 Wisc., 155; 97 Mass., 279; 20 N. Y., 344; 53 Ibid, 377; 24 Wendell, 359; 1 Hill, 176; 52 N. Y., 146. So that the plaintiff, when he contracted to sell the hotel property with its appurtenances and improvements, reserving from the sale only the carpets, furniture and pictures of the upper rooms of the building, fixed upon all the chattels which he had annexed to the hotel, and which were necessary to its use and enjoyment, the character of appurtenances and improvements of the hotel. None of them, by any possibility of construction, could fall within the reservation of "furniture, carpets or pictures in the upper rooms of the hotel." The plaintiff, therefore, sold the articles in question as fixtures with the hotel, and as such they passed by his subsequent deed of the premises to the defendants.

Judgment and order affirmed. H. E.

IRON ROOFS.

AT the first ordinary meeting of the Society of Engineers for the session of 1881–82, held on Monday last in the Society's hall, Victoria Street, Westminster, a paper was read by Mr. Arthur T. Walmisley, on "Iron Roofs." The president, Mr. Charles Horsley, occupied the chair. The author commenced by observing that the subject of iron roofs was a very extensive one, and that the general use of iron in works of construction rendered it desirable to arrive at the best form to adopt in different cases consistent with efficiency and economy, and much might be learned by comparing different systems that had been adopted. The earliest examples resembled timber constructions, the only alteration being in their section and detail of attachment at the joints. The best way to examine different systems of trussed roofs was to compare the bracing. Those in which the struts were shortest were the best forms, while those with vertical members were best adapted for roofs with hipped ends. The trussed principals to the roofs at Euston Station of the London and Northwestern Railway contained inclined struts braced as in a queen-rod-roof, while at the Victoria Station of the London, Brighton and South Coast Railway, the struts were at right-angles to the rafters, and better adapted to resist compression. The adoption of roofs of large span was comparatively of recent date, and there was still much difference of opinion as to the advisability of single or multiple spans. St. Pancras Station, of 240 feet span, was the largest clear span yet constructed. The main ribs consisted of arches struck from four centres. The Central Station, Manchester, of 210 feet span, and the St. Enoch's Station, Glasgow, were built after the same type of construction. The York Station was nearly as wide as St. Pancras Station, but at York the roof was divided into four spans of arch form, one of 81 feet, two of 55 feet, and one of 43 feet. These roofs were all glazed on the ridge-and-furrow system, but it is open to argument whether this was the best way of glazing or not. The ridge-and-furrow system was easy of repair, but it is evident that when the ridge and gutter follow the curve or slope of the roof one side of the sash-bar suffers more from the weather than the other, and the putty wears away. The author considered that the systems of glazing without putty ought universally to be adopted, and that a glazier's tool should never be used on a roof, as it was easy in the design to ascertain the usual sizes of glass manufactured and work them in accordingly. Various patents had been taken out in connection with glazing. That by the late Mr. Rendle, who was the originator of the system, had been largely used in many roofs, both of small and great dimensions, and its merits were well known, while that by Mr. Helliwell, of Brighouse, Yorkshire, was also worthy of notice. Both systems could be used on circular, or segmental types of roofs, which were better adapted for large spans than straight rafters. The advantages of clear spans were (1), freedom from all intermediate supports, giving facilities in laying out the space to the greatest advantage, or in subsequently altering the arrangements, and this freedom is especially valuable, when it is required to transfer the traffic of the station from one line to another diagonally at the shortest possible intervals; (2), getting rid of annoyance of snow lodging in the valleys; (3), the grander architectural effect of the structure, whether trussed or arched. In the form adopted at New Street Station, Birmingham, of 212 feet span, the Charing Cross Station of 166 feet span, and the Cannon Street Station of 190 feet span, the verticals are constructed to act in compression, and the inclined braces in tension only. It was a roof of this type, in three spans of 100 feet each, that received the first prize in the recent competition for the proposed Liverpool Exchange Station. The Blackfriars Passenger Station of the London, Chatham, and Dover Railway, 87 feet in span, the New Lime Street Station, Liverpool, of 212 feet span, and the Woodside Station, Birkenhead, of over 90 feet span, are good examples of trussed roofs, with curved ribs. A useful and economical form of rigid arch is to be found in the Bristol Joint Line Station, of 125 feet span, and a good example of a roof forming a continuous girder may be seen at the Liverpool Street Terminus of the Great Eastern Railway, which is divided into two spans of 109 feet each, with two side spans of about 45 feet each. The tied arch, with the tie bar suspended, was another excellent form of roof. This type has been adopted at Victoria Station (London, Chatham, and Dover Railway) in two spans of 127 feet, and 129 feet respectively; also at the Central Station, Liverpool, of 160 feet span, and at Queen Street Station, Glasgow, of 170 feet span. While the latter was the largest span of this class, the Central Station, Liverpool, was the boldest design, the principals being at the unusually great distance of 55 feet apart. In both these roofs the tie-rods are of steel, which commends itself for large spans as lighter in appearance than iron of equal strength. The Bridge Street Station and the Central Station, Glasgow, are recent examples of ridge-and-furrow roofs, running longitudinally, and carried on transverse girders. The former is divided into two spans of 114 feet and 49 feet respectively, and the latter of 213 feet 6 inches clear span. It is evident that deep girders of this span need longitudinal bracing, and in the Carlisle Station, consisting of two spans of 128 feet 3 inches and 154 feet 6 inches respectively, the slope of the roofs are carried by cantilevers, which connect the transverse supporting girders longitudinally, the ridge being placed on the top flange of these girders and the gutter carried midway between them. The author proceeded to describe sliding roofs, noticing the Canterbury Hall, where a roof 36 feet by 18 feet was made to open laterally for purposes of ventilation, and the Paris Circus, where a roof, 177 feet by 57 feet, divided in the centre, opened longitudinally by the half portions sliding in opposite directions. The roof over the Royal Observatory of Vienna was alluded to as an example of a revolving dome of 42 feet diameter. The Albert Hall was interesting as elliptical in plan, dome-shaped, and producing no horizontal thrust, the feet of the ribs radiating from the centre of the figure, and being tied in at the wall-plate, which is continuous all round. The roof is 219 feet by 185 feet across.

The proper way to calculate wind-force was to estimate the effective normal pressure on the various bays in a roof. In providing for expansion, it is more economical to fix the roof on the leeward side, and leave it free to expand on the windward side. In the Cannon Street Station roof the connection over the rollers is hinged, to obviate the effect of vertical wind-pressure depressing the roof, and producing unequal strain on the rollers. The merit of rollers may be much disputed, as they are often found to rust in their bearings. In the Earl's Court Station roof, which consists of two inverted queen-post trusses, with vertical members braced together, the wind bracing is confined to the two end bays, the lateral stiffness of the intermediate bay being secured by their purlin connections, which are here placed vertical, it being considered that the dead load and weight of snow act vertically. It was unnecessary to spread the wind ties in all directions over a roof if certain bays at intervals are secured. The author proceeded to describe the best means to prevent corrosion, and the importance of all parts of a roof being accessible to the painter's brush. — *The Building News.*

SOME OBSERVATIONS ON CHIMNEYS, ANCIENT AND MODERN.

IN view of the present increasing agitation on the serious subject of smoke — that sea-coal canopy which specially marks the overgrown metropolis, and is, as Byron says, —

> "A huge, dun cupola, like a foolscap crown
> On a fool's head — and there is London town! —"

some observations on the chimney, ancient and mediæval, may be acceptable to many of our readers.

At starting we have begun with a kind of bull, or, at all events, a solecism, for of chimneys, as we understand them, the ancient world, so far as research can ascertain, had none.

It is, indeed, a curious reflection that notwithstanding the gorgeousness of the later imperial architecture of Rome, it is pretty certain that the ordinary dwelling-houses, like the splendid palaces of the Cæsars, were entirely destitute of proper channels to carry off the smoke from the fireplaces, or stoves, which were highly necessary during the severity of a Roman winter.

Some authorities, indeed, have questioned the accuracy of the dictum that the ancients did not build or even understand chimneys, but it is quite certain that no traces remain of these remains, — no, not among the fairly well-preserved ruins of Herculaneum.

We have thus good reason for believing that the chimney in its present sense, as a hollow passage for the escape of the smoke, is altogether a modern invention. The Latin word *caminus*, indeed, is decidedly not to be understood as implying a chimney, and is really in significance a stove. Curiously enough, however, it is known that the Romans heated their chambers occasionally with hot air, through the agency of pipes, and the wonder seems to be that these pipes did not naturally suggest to them the chimney.

Some have relied on certain passages in classic writers as indicating the use of chimneys. Thus Homer tells us that Ulysses, when in Calypso's grotto, ardently desired to see the smoke ascending from his beloved Ithaca, and hence some have rushed to the conclusions that Homer indicated that Ithaca was fitted up with chimneys!

But smoke can rise without the intervention of the chimney, and again, in the *vespæ* of Aristophanes, one of the characters wishes to escape through the kitchen, when some one asks, "What makes a noise in the chimney?" "I am the smoke, and am trying to get out of the chimney," is the answer. But the word chimney as used here means unquestionably a simple orifice in the roof, and this appears the more clear when we find in another place mention made of a kind of cover designed to close the orifice when, we presume, the fire was out.

One famous passage often adduced to disprove the assertion that the classic world had not the convenience of chimneys, is a passage in the civil war of Appian, in which, relative to the endeavors of the proscribed to escape the soldiery, he writes: — "*In fumaria sub tecto, qua scilicet fumos e tecto evolvitur.*" The meaning, however, really is not that fugitives sought concealment in chimneys, but that they lurked amid the smoke in the upper chambers, and an impartial criticism serves to show that the ancients must have suffered seriously in their houses from the smoke, which was no doubt popularly regarded as a necessary evil. Then, again, one of the oldest classics advises that kitchen roofs be made so high that they may not catch fire. Now if there were proper funnels for carrying over the smoke, such a precaution would be useless. Yet it is evident that this kind of accident was far from uncommon in Roman houses. In one of these satires of Horace the following passage occurs: —

> "Ubi sedulus hospes
> Pæne arsit, macros dum turdos vesat in igne:
> Nam vaga per veterem dilapso flamma calinam
> Vulcano summum properabat lambere tectum."

Here Horace, in his familiar way, gives a gossiping circumstantial account of how at Beneventum, the landlord of an inn, while entertaining Mecænas and his friends, was almost burned through the fire in the old kitchen catching the top of the roof. Clearly there was no chimney here, but merely a hearth and a hole of some kind in the roof. Then, again, had there been chimneys in Roman houses would not Vitruvius have been certain to give us full particulars as to their building — surely a matter of consequence to the plan of the whole edifice.

It is undoubtedly a popular error to construe *caminus* as a chimney. The word originally meant a furnace, a smith's forge, and a hearth, and subsequently a stove or even a firepan, but certainly never a chimney in the modern sense.

It is still more conclusive, too, when we find that Vitruvius remarks that there should be no carved work in rooms where fires are made, because such will soon be covered and spoiled by soot. Carvings are commended for apartments only where the effects of smoke are not likely to be felt, and clearly this distinctly implies that the smoke of the Roman household had to escape as it best could, and that the nearest approach to the chimney, as we understand it, was by a hole in the roof or ceiling. There can be no doubt that the habitations of the poor in the eternal city were in a fearful state from the effects of soot deposits of years' duration, and this extended to the entire world then, so that the abodes of the poor were often spoken of as black houses. Even in these days in many Neapolitan houses chimneys do not exist, and the fires are confined to one room, and as little smoke is engendered as well can be.

So much for the ancient world. As to the Middle Ages, it appears pretty clear that during the earlier centuries chimneys did not exist. The curfew, coming to England, is of course the *couvre-feu*, and alludes directly to the fires made on the hearth, and having a vent in the roof which was to be shut in when the embers were extinguished and the family went to bed.

According to the ingenious Beckmann, the oldest credible account of chimneys occurs in the year 1347, and relates to an historic fact — viz., that about then an earthquake at or near Venice threw down many chimneys. Later on we are told that Francesco da Carraro, Lord of Padua, came to Rome in 1368, and finding his hotel had no chimneys, built two for his convenience, and affixed his armorial bearings over them.

These early chimneys were built of enormous size, and were cleaned at ease by means of wisps of straw, and sometimes a ladder or contrivance to get up them, formed by projections in the masonry or brickwork when they were very high; but afterwards the flues were contracted, and in due course boys were employed in the dangerous business of chimney-sweeping. The first of these unlucky urchins came almost exclusively from Savoy and Piedmont, and this lends some color to the assertion that chimneys were invented in Italy.

In England we have no trustworthy evidence that chimneys date further back than 1130. At all events, in Rochester Castle, there are complete fireplaces which belong to this period, and thus the question whether chimneys originated first in England or Italy remains in obscurity.

It may be safely said that the entire action of a chimney depends entirely on the very simple principle that a column of heated air is lighter than a cooler column of the same volume. It follows, then, that when a flue full of heated air can communicate freely with the colder air around it, the greater density of the latter thrusts the warm and light air upwards, and thus establishes an ascending current or draught.

Now, other conditions being equal, the draught of any chimney is thus proportional to its perpendicular height, and of course the difference in temperature within and without the flue. The straighter and the higher the chimney, the more powerful will necessarily be the ascending current. Obviously the maximum effect or power of a chimney is obtained when the entire mass of air passing up it enters by the bottom of the fire itself. In such a case the temperature of the air is raised to the utmost possible degree, and at the same time the fire itself is stimulated to intensity. This, in effect, gives us the blast-furnace. In the case of a fireplace or grate thus shut in there can be no tendency for the air currents to descend, and the "smoky chimney" is practically unknown, and this, too, if even the flue should have a somewhat irregular or tortuous course. Our present consideration, however, is with the more or less open fireplaces, and it is here that that destructive defect, a smoky chimney, is so frequently found. Beyond all question the means for obviating this are of moment to every one who may have such chimneys under his control. Most smoky chimneys are such consequent on the error of the builder; they are in reality the result of constructive mistakes. In general, chimneys ought to be prevented from smoking by taking care to have the opening of the actual flue as nearly as possible exactly over the fire, and by judiciously contracting the open parts above the fire as much as practicable. In this case, at all events, downward smoking may generally be prevented.

Sometimes chimneys, otherwise fairly well built, smoke in consequence of their exits being in the immediate vicinity of walls and buildings so situated as to create at times strong eddies and complicated air-currents. In towns and cities, indeed, this is very common, and it has given rise to the use of many curious and occasionally useful contrivances for preventing the cold air from blowing down the chimney. Thus we have all kinds of revolving cowls, and many ingenious mechanical arrangements of this kind. That famous practical philosopher, Count Rumford, paid great attention to the subject of smoky chimneys. He says, writing on this head: "Those who will take the trouble to consider the motion and properties of elastic fluids of air, smoke, and vapor, and to examine the laws of their motions, and the necessary consequences of their being purified by heat, will perceive that it would be as much a miracle if smoke should not rise in a chimney — all hindrances to its ascent being removed — as that water should refuse to run in a siphon or to descend in a river. The whole mystery, therefore, of curing smoky chimneys is comprised in this simple direction: find out and remove those local hindrances which forcibly prevent the smoke from following its natural tendency to go up the chimney, or rather, to speak more accurately, which prevent its being forced up by the pressure of the heavier air of the room."

The Count, we believe, took in hand, and thoroughly cured himself, no less than five hundred chimneys. Unquestionably one common cause for smoky chimneys that seem to defy all ordinary treatment, is the absence of provision for sufficient inlet of colder air within the room. Thus, sand-bags and other draught-preventing arrangements may, and often do, make chimneys smoke. It is absolutely necessary that the inlet of air to the fireplace be in a certain proportion to the capacity of the grate and the chimney. When, as sometimes happens, the air enters the apartment chiefly, or perhaps solely, on the same side as that on which the fireplace itself is situated, the draught produced is likely to make the chimney smoke. The air inlet should always be opposite the fireplace. This is, indeed, a matter really belonging to the science of ventilation — a matter of first-rate importance, and is even now but imperfectly understood in the construction of very many of our contemporary dwelling-houses.

Before, for the present, leaving the subject of chimneys, it is best to remind the reader that chimneys ought never to be allowed to remain foul, as is sometimes the case after fires are for a time left off. It is, of course, desirable that chimneys should never be allowed to become choked with soot, but the present caution is given in relation to the risk from lightning, which is increased by chimneys being permitted to remain in a sooty state. — *The Building World.*

BALLOON FRAMES.

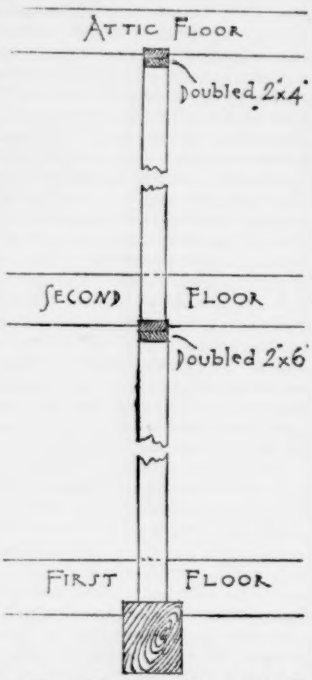
CLEVELAND, O., October 10, 1881.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

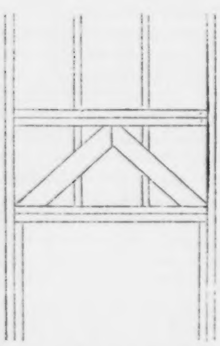
Dear Sirs, — In reading over the article upon Building Superintendence in the October 1st number of your paper, I was much surprised at the description there given of a balloon frame. Having been accustomed to that class of framing, and never having seen any done in the manner described, I would like to give the method to which I am used.

In the first place, every piece in the frame is cut, excepting the rafters, before even the sills are laid. In raising the studding, the wall-plates are first spiked to the line of studding to be raised (occasional studs being omitted), and the whole line is raised at once. Of course an exceedingly long line would have to be raised in parts. The ribbon, or "false girt," as it is called in the article on the subject, is also inserted before raising. The "fishing on" of a piece to complete a stud, I think may be classed among jerry-builders' work.

Interior bearing partitions in the first story rest on the girder in the cellar, and are capped on top by a doubled 2″ x 4″ or 2″ x 6″ plate, according to the size of the stuff used in the partition. The second-story bearing partition rests directly on this doubled plate, and the second-story joists are "notched in" an inch to tie the partition in place. This system gives four inches difference in shrinkage material between the interior and exterior partitions, but the cross-partitions, in which a door might be displaced, according to Figure 109, rest on the joists, and the joists at their outer ends rest upon the 1″ x 4″ "ribbon," thus giving the same amount of shrinkage as in the interior partition.



As to the bracing of exterior angles, the building is entirely sheathed on the outside so as to grip the corners, with one-inch surfaced or seven-eighths-inch matched-and-dressed stuff. It does not seem possible that any wind would shear off or twist all the nails in the side of a building.



If openings not centred over each other are trussed over in the manner here shown, I see no trouble from them.

All joists and studding are sized, and no furring is used.

In one place farther on, the writer speaks of using a wrought-iron bar to support the brickwork over fireplace openings. I have seen this used and by the expansion and contraction of the rod from grate-fires the front of the chimney was full of cracks. I see no reason why an eight-inch arch will not hold a four-inch wall for an opening three feet or three-and-a-half-feet wide.

Very respectfully, X.

["X's" letter is a very interesting one, and the balloon system of framing is certainly entitled to have the merits which it undoubtedly possesses insisted upon as much as possible. The particular mode of putting together and raising such a frame which your correspondent describes seems to be one of the many improvements which have been made by good builders in various places upon the earlier methods. As to the equalizing of the shrinkage between the outer and inner ends of the beams which rest upon the ribbon, or false girt, and on interior partitions, this mode appears to offer no material advantage. According to "X's" description, there will be under the inner ends of his second-story joists two thicknesses of 2″ x 4″ partition capping, and a ten or twelve inch girder; in all fourteen or sixteen inches of horizontal and shrinkable timber, while under the outer ends there will be only the sill, perhaps six inches, and the four-inch ribbon, making ten inches, and giving a difference in level of the two ends of the joists, after the seasoning of the building, of about one-fourth of an inch. The question would be somewhat complicated by the nailing of the ribbon, which would reduce the effect of shrinkage in some ways, but that need not now be discussed.

As to the framing of second-story windows where they come nearly but not quite vertically over those below it is evident that the window stud on one side of the upper opening must be a short one, and rest over the head of the opening below, either directly or with an interposed truss; while one stud of the lower opening is cut off under the window above. Moreover, if every window is to have an extra thick stud at each side, as it should, an irregular disposition of openings in different stories necessitates an excessive number of thick studs extending from sill to plate.

The bracing of angles by means of the sheathing boards, after these have shrunk a little apart, is, notwithstanding the nailings, a fallacy, as an inspection of old barns and sheds will show.

The use of cross-furrings for ceilings is a refinement, but a useful one, as the effect of the twisting of a beam upon the plastering is thereby rendered much less than where the laths are nailed directly to the joists.

About iron chimney-bars, it seems quite possible that the variation in length of the metal by expansion and contraction may occasionally open a joint, but arc[illegible]es over fireplaces, with the insignificant abutments generally provided, are hazardous affairs, and even where the abutments are firm, it sometimes occurs that the settlement of the chimney is followed by the slipping of the brickwork above the arch down its sloping sides, opening a wide fissure above its crown; so that the use of iron is considered by many of the best masons to be safer. — T. M. Clark.]

BALLOON FRAMING.

St. Louis, Oct. 14, 1881.

To the Editors of the American Architect: —

Observing that the methods of construction set forth in the papers on Building Superintendence now being published in your columns often differ materially from those commonly practised in this part of the country, I have thought a brief account of the latter might be interesting, especially to your Northern and Eastern readers. Could similar accounts be obtained from other sections of this broad land they would doubtless prove suggestive and valuable to all. I will take paper No. X, of the series published in your issue of the 1st inst. as a sort of text from which to proceed.

The number of frame houses in this region built after the manner here described, is so very small that the writer has yet to learn of the first one. The wall studs or wall strips are usually all of a size, 2″ x 4″ scantling most frequently, doubled at the corners and sometimes at the sides of doors and windows, and toe-nailed, not mortised, on the plate or sill, which may rest on a brick or stone wall, or, where there is no cellar, on piers or posts. The doubling of the studs at the corners and around openings is chiefly to obtain a nailing for the corner-boards and siding, and for the outside casings. Sometimes outside casings are omitted and in other cases the studs are set wider apart than the frames by the width of the casings, and blocks are inserted between frames and studs. The difficulty in respect to fenestration described in this paper is avoided by making the additional stud at the sides of the openings a short one, only "story high." This leaves the owner free to place openings in other stories where he chooses, regardless of the openings below.

The upper joists rest on a 1″ x 6″ "ribbon" let flush into the face of the stud, and sometimes care is taken to spike every joist firmly to the adjacent stud. This obviates the danger of the fall of the upper floors in the case of fire burning through the ribbon; and where there are not too many openings it makes a strong frame, especially when aided by the customary 1″ x 4″ or 1″ x 6″ "long brace." 2″ x 4″ scantlings are not often used for long braces because when let flush into the face of the 2″ x 4″ wall studs they would weaken the frame too much.

The vertical timbers are all light, nothing heavier than 2″ x 4″ being used if it can be avoided. No regard is paid to inside partitions in framing the outside walls. The additional nailing, if any, required for base at cross partitions and to fasten such partitions to the outer walls is obtained by inserting blocks where they are needed.

Sheathing on the walls is the exception with all but the more expensive houses, and when any considerable expense is intended people are apt to eschew frame altogether in favor of brick or stone. The siding is generally applied directly to the studding outside, and lath and plaster directly to the same inside. Perhaps the comparatively high price of lumber here, with the relatively mild and brief winters of this climate will explain and justify this measure of economy, which to Northern readers would seem to be saving at the spigot once in the original cost of the house to spend at the bung every year in the cost of fuel.

The joists are dressed on their upper edges and taken to a uniform width. Then when they are properly set and bridged, their under sides are sufficiently level to lath and plaster to directly without the interposition of furring. Framing lumber is generally white pine, a timber which is naturally straight and is less disposed than spruce or hemlock to warp and twist after being placed in a building.

Fireplaces for soft coal are about two feet wide flanked by eighteen-inch brick piers, making a total width when finished and plastered of about five feet. This width may vary several inches from differences in the size of brick, and in the thickness of the joists. A segmental arch is turned over the fireplace, starting ten to thirteen courses above the floor. No iron bars are used under the arch, and there is no complaint of the piers spreading or the breasts above settling in consequence of the unrelieved thrust of the arch. The usual depth of fireplace is nine inches, and the size of flues 9″ x 9″ for both grates and stoves. Chimney-breasts are not furred at the sides, as shown in the illustrations accompanying paper No. X, nor across their face, and no regard is paid to the size of mantel in setting out the brickwork, unless in special cases. In marble and iron mantels as now made there is provision for adjustment to the parts below the shelf which will accommodate considerable differences in the widths of breasts. Moreover, the setting of the mantel is usually one of the last things to be done, and there is time enough after the plastering is done to take the exact measurement of each breast as finished, and to make a mantel to correspond.

The method described of equalizing the shrinkage of timbers supporting floor joists by varying the thickness of the plates on the outer walls and on the partitions is inapplicable to houses of brick or stone whose bearing partitions inside are of wood; yet such are the majority of the better-class houses in this vicinity, — the houses where such shrinkage will be the most remarked in its effects. A sheet-iron plate might be used, perhaps, for this purpose as well as for protection against fire, but there are practical difficulties in the way of its general adoption. Even this would leave the end shrinkage of the timber from seasoning and from the compression of the freshly cut fibres unprovided for. C. E. Illsley.

[Mr. Illsley's letter is interesting and valuable. In placing second-story windows elsewhere than vertically over those below, he says that the studs on each side the opening are made only "story high." In that case, what do the feet of the upper studs rest on? Is a short "inter-tie" inserted, or do they only stand on the "ribbon"? This is, to my mind, one of the principal difficulties about balloon-framing for picturesque houses, and I have never seen it met quite successfully, except by incurring some extra expense.

It is curious to see how the value of materials influences building methods. In the East, where although bricks are cheap lumber is still cheaper, a brick pier eighteen inches wide on each side of a fireplace, unless needed for flues, would be an unusual extravagance. Scores of such fireplaces, three feet wide, are built in the rough with only four inches of brick on each side. Obviously, no real arch is possible over such piers, and the resource of the cheap mason is to insert a piece of studding over the opening, and put a row of bricks standing on end, which he calls a "flat arch," over it. Occasionally, from a just apprehension as to the resistance of his "arch," he omits to remove the stick when the chimney is completed, and the house sooner or later takes fire in consequence; so that the part of safety in such cases is to insist on the wrought-iron bars. — T. M. CLARK.]

PRINCETON, ILL., October 19th, 1881.

TO THE EDITORS OF THE AMERICAN ARCHITECT:

I have seen a number of times in your paper mention made of Western balloon frames as though they were something adapted only to the flimsiest and most unsubstantial kind of buildings.

Knowing as I do that the majority of braced frames for barns and dwellings are planned with as little judgment and as poorly put together as balloon frames, I have been at loss to understand why you should have so poor an opinion of the latter. Since reading in your last article on Building Superintendence the description given of your Eastern method of building balloon frames, I am no longer surprised at your opinion. The author of the article referred to, it seems to me, cannot be very well informed about the Western way of building, or he would not have described so unworkmanlike and awkward a way of putting up a balloon frame.

Here the studs are all cut to a length, sized to even widths, and the notch for the "running board" or "ledger board" made on the ground; *never* put up as the author says. Often one side is put together and raised like a "bent" in a braced frame.

The joists are *notched* onto the "running board" and also well spiked to the studs, and there is no danger of the floors falling until the walls are burned away. I have never seen even the poorest buildings lean for lack of bracing. In my own practice I usually have the main partitions that carry the joists made like the outside walls, and to run the full height of the building, so that there is no trouble about uneven shrinkage in the walls. I see no trouble in making as strong and durable a frame for a building by the balloon method as by a braced frame, and with less expense. Any builder that will make a poor job of the one will make a poor one of the other.

There is one other point I wish to make: Where a stud runs full height of the building it makes a stiffer wall than when cut off at each story. At the same time I think we use wider studs here than are used in the East for the same height of stories. On the whole I feel very positive the average "full frame" or braced frame has about as many weak points as the average balloon frame, and I also feel very positive that the average builder of either knows very little about using timber to the best advantage. J. P. B.

[THE writer of "Building Superintendence" is by no means unmindful of the good points about balloon-frames, which certainly employ material with scientific economy, and acknowledges that some of the improvements which he finds from the letters of correspondents are practised in the West are new to him. Nevertheless, after having himself advocated the principle of balloon-framing for years, and practised it, with such modifications as he thought advisable, almost to the exclusion of the old-fashioned way, he has concluded, in part for reasons which will appear in a future number of "Building Superintendence," that the ancient braced framing presents on the whole a preponderance of advantages, particularly as viewed from the standpoint of an architect, to whom security against the spread of fire, and facility of picturesque treatment, are items quite as important as economy and rapidity in building. He may be wrong, and is quite open to conviction, but although he admires sincerely the way in which the efforts of architects have modified for the better the early style of balloon-frame in those States where it has become popular, his opinion as to the main merits and demerits of each system is not yet changed. Very possibly the Western architects may yet invent improvements which will place the balloon-frame far in advance of any other. J. P. B.'s device of running interior partition studs through the whole height of the house to equalize the shrinkage is one of these, and we may hear of similar ones, if others will be as kind in making criticisms and suggestions as he. The practice of spiking the joists to the studs, which several correspondents have mentioned, is good as far as it goes, but in the writer's experience it is by no means always possible, even with the light beams, to make them come conveniently near a stud, and each joist which depends wholly on the ledger board for support is a source of danger in case of fire. Besides that, the spiking of a four or six inch trimmer-beam to a stud is a rather unsatisfactory process, and yet these are the very ones whose fall would be the most disastrous. — T. M. CLARK.]

NOTES AND CLIPPINGS.

PLANTING FORESTS. — The sowing of forest-pine seeds has been begun by the Shakers at Enfield, Conn., and the State authorities are considering plans for encouraging this needed industry.

A WARNING TO MONUMENT COMMITTEES. — Soon after the death of the Duke of Wellington, in 1852, the people of Toronto held a great mass-meeting, resolved to erect a monument to the memory of the illustrious "peace-maker of Europe," and subscriptions were collected. The matter grew cold, however, and now, at the end of nearly thirty years, it is proposed to refund all the money on hand to those who originally gave it and are still alive to receive it. — *New York Evening Post.*

THEATRICAL TELEPHONES AND DIOSCOPES. — Wonders will never cease. By aid of the dioscope, an ingenious instrument brought for the first time to public notice during the Parisian Electrical Congress, patrons of the drama who are reluctant to leave their comfortable firesides and temporarily revolutionize their domestic arrangements in order to attend theatrical performances *in loco*, will henceforth be enabled to see as well as hear their favorite operatic and histrionic artists without stirring a yard from home. The apparatus consists of a small "objective" lens, fixed up in a position commanding the stage of no matter what theatre, and connected by an electric wire with a diminutive white glass plate, which may be framed and set in the panel of a private drawing-room, however distant from the playhouse in question. Total darkness having been obtained in the room furnished with a dioscope, a perfect picture of the stage, its scenery, actors, etc., faithful in color and absolutely reproducing the whole performance, will become visible upon the surface of the glass plate. Supplemented by a telephone communicating with the theatre, the dioscope will therefore enable its owner to spend his evening at the opera in dressing-gown and slippers, if such be his ideal of comfort, seated in an easy chair within hail of his "*lait de poule et bonnet de nuit.*" To those, and their name is legion, who detest premature dinner, hurried dressing, and a couple of hours' cabbing "there and back," as the hitherto inevitable concomitants of a visit to the play, the condition of things rendered feasible by the invention of the dioscope will present itself as a truly blissful addition to their pleasure resources. — *London Daily Telegraph.*

CANAL BUILDING ON PAPER. — One striking feature of the Chagres Canal has been the vast reduction which M. de Lesseps was able to effect in the course of its construction, by the simple process of revising its figures. Beginning with an estimate of $150,000,000, he succeeded by industrious calculations in bringing down the expense of the work to $130,000,000, to $120,000,000, to $110,000,000, and at last to less than $100,000,000, thus showing the enormous economical value of arithmetic. It is, perhaps, not surprising to learn that in the practical digging a slight reaction has taken place. Two Brussels excavators, which were to work economically, worked instead with shameless extravagance. Six hospitals have been planned to accommodate the expected number of invalid workmen in that region whose sanitary advantages had been so eloquently dwelt on by M. de Lesseps. Finally, the preliminary excavation, which was reckoned to cost three cents per cubic yard, has actually cost $1.25 per cubic yard. However, as the hypothetical arithmetic of M. de Lesseps sufficiently played its part while the stock was being subscribed, he will doubtless face the actual facts of construction with entire good humor. — *San Francisco Bulletin.*

CHEAP ANTISEPTIC AND DISINFECTANT. — Prof. Beilstein has made comparative experiments with disinfectants, to determine their relative value as such. He arrives at the conclusion that aluminum sulphate is an effective and at the same time the cheapest substance arresting putrefaction. If sufficient time is given for its action (two to three days), a four per cent solution will effect more than a fifteen per cent solution of ferrous sulphate, thereby counterbalancing any difference in price in favor of the latter. Besides, a very crude article might be manufactured from clay and sulphuric acid, which would be very cheap indeed. A four per cent solution of aluminum sulphate will kill all infusorial life, no matter how tenacious. However, this substance has no power of destroying putrid odors, and for this carbolic acid seems to be the only available article. The author inclines to the belief that this disinfectant does not merely supplant foul odors by its own, but that the phenol enters into actual combination with the skatol of the fæcal effluvia. He therefore recommends aluminum sulphate, combined with a little phenol, as the most effectual as well as economical for rendering decaying organic substances both odorless and innocuous. — *Pharm. Centralh. from Deutsche Viertelj.*

RUSSIAN ANTIQUITIES. — A valuable archæological discovery, which will probably equal that of the celebrated Kertch antiquities at the Hermitage of St. Petersburg, has recently been made near the Cossack village of Sewersk in the Sakuban district, in one of the *kurdans, i. e.*, the old tombs, in the steppes of Southern Russia. A number of objects were found, but special attention was drawn to two glass vessels, unfortunately broken, but the pieces of which still give evidence of their remarkable ornamentation. They are profusely covered with gold, the hoops containing large rubies and bearing golden chains, by which heart-shaped pearls are suspended. Another object of cylindrical shape, evidently a cupholder, consists of pure gold, and shows two griffins in bas-relief. Another article is a gold plate six inches in diameter, with a fine bas-relief representing a whole episode. M. Felizin, an eminent Russian archæologist, is of opinion that the tomb in question must have been that of an important personage of the Bosphorean kingdom, and that its origin dates back as far as the period of King Perisad II, who began to reign in the year 284 B. C. A gold coin which was found confirms this view. — *New York Tribune.*

THE AREA OF LOUISIANA. — The United States Land Office makes the area of Louisiana to be 41,346 square miles. Prof. Hilgard, in a census report lately published, puts the figures at 45,430 square miles. The difference is one of 2,607,300 acres. It is more than the combined area of Rhode Island and Delaware. An examination of the State by parishes shows a considerable extent in land over that reported by the Land Office. There are 1,242 complete townships in the State, amounting to 44,712 square miles, besides fractions of others, showing an excess of 3,500 square miles on the lowest calculation. Prof. Hilgard, of the Census Bureau, writes to the New Orleans *Democrat* that he has gone over the figures carefully with the geographer of the Bureau, Mr. Gannert, and both are convinced that the Land Office report is wrong. They imagine that the first United States survey found 44,346 square miles; that the second "4" was transcribed as a "1," and that the error has been carried down from year to year, and from book to book, until the erroneous figures have found their way into all the standard authorities. — *Chicago Tribune.*

BUILDING INTELLIGENCE.

(Reported for The American Architect and Building News.)

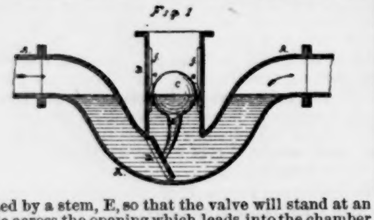
[*Although a large portion of the building intelligence is provided by their regular correspondents, the editors greatly desire to receive voluntary information, especially from the smaller and outlying towns.*]

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.*]

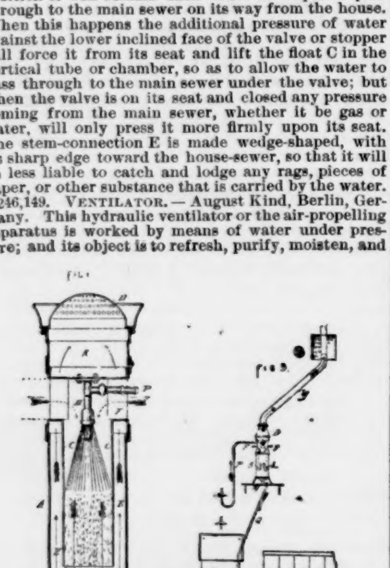
245,674. TRAP.—John T. Titus, San Francisco, Cal. This invention relates to an improved trap valve for preventing the foul gases from passing through house sewers and waste-pipes into the rooms of houses. It also prevents water from passing from the main sewer into the cellars of the houses, with which the side sewers connect, in case the main sewer should become choked or where the tide-water rises up into the main sewer. It consists of an arrangement by which a valve, connected with a float, is made to automatically drop down and close the passage through the sewer when no water is passing through it. This valve stands at such an angle across the passage that water passing through the pipe or sewer from the house to the main sewer opens it: but any pressure on its opposite side, either gas or water, presses it more firmly upon its seat. A represents a branch sewer which leads the sewage from a house to the main sewer. At some convenient point in the length of this pipe is made a downward bend, K, so as to form a trap. Above the lowest part of this bend is a vertical pipe, B, which extends up to the surface of the ground and is closed at its upper end by any suitable device. In this vertical chamber is a ball-float, C, to the lower side of which an angular valve with a proper seat, D, is con-

Fig 1



nected by a stem, E, so that the valve will stand at an angle across the opening which leads into the chamber on the house side. The float C is guided in its movement in the chamber B either by projecting flanges *e e* on each side entering vertical grooves *f* in the side of the chamber, as shown, or by other equivalent means that will allow it to move up and down freely and partially rotate when the valve is raised by the pressure of water against its under side. When the trap is full of standing water the float will press the valve D upon its seat across the passage, in which position it will remain until water attempts to pass through to the main sewer on its way from the house. When this happens the additional pressure of water against the lower inclined face of the valve or stopper will force it from its seat and lift the float C in the vertical tube or chamber, so as to allow the water to pass through to the main sewer under the valve; but when the valve is on its seat and closed any pressure coming from the main sewer, whether it be gas or water, will only press it more firmly upon its seat. The stem-connection E is made wedge-shaped, with its sharp edge toward the house-sewer, so that it will be less liable to catch and lodge any rags, pieces of paper, or other substance that is carried by the water.

246,149. VENTILATOR.—August Kind, Berlin, Germany. This hydraulic ventilator or the air-propelling apparatus is worked by means of water under pressure; and its object is to refresh, purify, moisten, and



to cool (or heat) the air of dwelling and other rooms. Fig. 1 is a vertical section of the apparatus. Fig. 2 is a horizontal section of the same, taken through the passages F. Fig. 3 is a view of the apparatus applied, showing the feeding and discharge pipes and some of the circumjacent parts of a room. The cylinder C, open on the lower end, is fastened concentrically on and into the larger cylinder, A, the bottom of which is slightly hollowed out. The annular space E, between the two cylinders A and C, forms the air-passage which leads to the air-distributor K on top of the apparatus, through the perforated cover D of which the air passes into the room or into a draught-pipe, leading off the bad gases of dwelling-rooms, the vapors of kitchens, etc., into the open air or into a chimney. The inner space of the cylinder C forms the spray-chamber, communicating on the lower end with the air-passage E, on the upper end with the air-openings F under the bottom of the distributor K. To the under side of this bottom is fastened the spray-nozzle H, receiving the water which is under pressure from the conducting-pipe P, and discharging it in form of a diverging cone against the inner walls of the cylinder C. By the force of the water the latter is partly deflected from the walls of the cylinder C against the opposite walls, from whence it drops down to the bottom B of the cylinder A; partly it falls down directly to the bottom B, and is carried off by the waste-pipe Q, furnished with a trap, M. The working of the apparatus is as follows: The water ejected and spurting from the nozzle H with great force fills the cylinder C with a very fine divided spray of water, which acts in downward direction like a continuous plunger, carrying along all the air contained in the cylinder C, and sucking, therefore, new air, gases, or vapors through the openings F. When this mixture of air and water spray has reached the lower part of A, the purified and cooled (or in winter-time, when the water is used hot, heated) air separates from the water, is pressed upward, and escapes through the openings on top of the distributer K. The passages F are in effect holes cut into the cylinders A and C, which holes are closed on all sides between the cylinders. The air-passages E continue to the dome K, except where they are interrupted by the passages F. It is easy to understand that when the air of a room is drawn into the openings F, and after passing the apparatus is forced again into the room, it is purified and cooled (or heated), and that in this manner a very healthy and refreshing ventilation is produced. Instead of drawing the air from the room it may be fed to the apparatus from outside of the room by a pipe leading to the openings F, as shown in Fig. 1 by dotted lines. In Fig. 3 is shown, in smaller scale, the apparatus as used in a kitchen to free the latter from moisture and moist vapors. Z is the sink, into which the waste-water of the pipe Q is carried off. Y is a pipe leading the drawn-off vapors and air into the chimney.

248,573–575. FILTER.—Gottlieb F. Burkhardt, Boston, Mass.

248,588. WRENCH.—Joseph P. Haigh, Pittsburg, Pa.

248,601. VENTILATOR.—Patrick Mihan, Chelsea, Mass.

248,607. FIRE-ESCAPE.—George A. Phifer, New Richmond, O.

248,638. QUARRY-FRAME FOR ROCK-DRILLS.—Geo. R. Cullingworth, New York, N. Y.

248,639. STAGE-TRAP.—William M. Davene, New York, N. Y.

248,645. SKYLIGHT.—Jas. W. Geddes, Baltimore, Md.

248,650. HEATING-STOVE.—George W. Herrick, Detroit, Mich.

248,652. T-SQUARE.—Arnold Hoermann, Hoboken, N. J.

248,661. GLASS MONUMENTS, TABLETS, ETC.—Christopher W. McLean, New Berne, N. C.

248,663. WATER-CLOSET SEAT.—George R. Moore, Philadelphia, Pa.

248,664. ARTESIAN WELL.—Benjamin R. Norton, Alameda, Cal.

248,667. PORTABLE FLOOR, ETC.—Jacob Ring, Brooklyn, N. Y.

248,680. PIPE-JOINT.—Edward P. Trumbull, Hartford, Conn.

248,702. STEAM-PIPE AND PILE-DRIVER.—Jesse Button, New York, N. Y.

248,749. PNEUMATIC WATER-ELEVATOR.—Samuel W. Hudson, Hudsondale, Pa.

248,787. ROCK-DRILLING MACHINE.—Henry F. Parsons, San Francisco, Cal.

248,790. PORTABLE COMBINED BATH-TUB AND HEATER.—William Q. Prewitt, Lexington, Ky.

248,812. MACHINE FOR DRILLING METAL.—William Tunstill, New York, N. Y.

248,825. LIGHTNING-ARRESTER.—Lewis T. Young, Philadelphia, Pa.

248,827–831. AUTOMATIC FIRE-EXTINGUISHER.—Frederick Grinnell, Providence, R. I.

248,832. WEATHER-STRIP.—Mortimer S. Harsha, Chicago, Ill.

SUMMARY OF THE WEEK.

Baltimore.

BUILDING PERMITS.—Since our last report eighteen permits have been issued, the more important being as follows:—

J. S. Rosenthal, 3 two-st'y brick buildings, Mount St., n of Edmondson Ave.

Wm. Miles, to alter stone building into 5 dwells., in rear s e cor. Little Monument and St. Mary Sts.

John North, three-st'y brick building, Little Church St., between Johnson and Williams Sts.

J. S. Tucker, 8 three-st'y brick buildings, 7 with 15' front, 1 with 18' front, Lafayette Ave., beginning at n w cor. Mount St.

P. M. Conway, two-st'y brick building, No. 31 Lemon St., between Amity and Schroeder Sts.

A. Weiskettel, 5 three-st'y brick buildings, and 4 two-st'y brick buildings, Dillon St., between Canton and Robinson Sts.

Jno. H. Morrow, 2 two-st'y brick buildings, in rear of 147 York St., between Sharp and Hanover Sts.

MISSION BUILDING.—Mr. Benjamin B. Owens, architect, is preparing drawings for a City Mission building, to be located on North Paca St., between Lexington and Saratoga Sts. The building, which is to be erected under the auspices of the M. E. Church, will consist of a hall in the rear, 70' x 95', with seating capacity for 2,000 persons; the front building, 30' x 70', being divided into a small hall, kitchen, etc. The building will be constructed of brick and stone, and cost about $20,000.

Boston.

BUILDING PERMITS.—*Brick.*—*Newbury St.*, near Hereford St., for Chas. W. Parker, dwell. and stable, 23' x 44', two-st'y.

Columbus Ave., No. 561, for Woodbury & Leighton, family hotel, 22' 6" x 95' 6", four-st'y and mansard; Woodbury & Leighton, builders.

Commonwealth Ave., near Exeter St., for Thomas M. Rotch, dwell., 28' x 55' 4", four-st'y and mansard; Woodbury & Leighton, builders.

Beacon St., Nos. 272 *and* 274, for Francis L. Higginson, dwell., 75' x 112', three-st'y; Webster & Dixon, builders.

N St., Nos. 137 *and* 139, for H. B. Stratton, 2 dwells., 20' x 30', two-st'y; H. B. Stratton, builder.

Unnamed St., rear of, near Harwich St., for John S. Lamprey, family hotel, 45' x 65', four-st'y; John F. Mead, builder.

Wood.—*Melville Ave.*, near Washington St., for Mrs. R. F. Shaw, dwell., 36' x 40', two-st'y; S. H. L. Pierce, builder.

Mt. Warren Pl., near Walnut Ave., for Geo. B. Faunce, dwell., 24' x 42', two-st'y.

Dix St., rear of, near Dorchester Ave., for R. Gardner Chase, stable, 38' x 45', two-st'y.

Western Ave., near Waverley St., for John W. Hollis, 6 dwells., 20' x 28', two-st'y; Jacob W. Berry, builder.

High St., rear of, opposite Charles St., for John Gately, dwell., 21' x 28'; John String, builder.

Wellington Wharf, No. 149 *Medford St.*, for Trumbull & Cheney, storage, 30' x 80'; Trumbull & Cheney, builders.

Washington St., rear of, near Rockwell St., for R. G. Parker & Co., greenhouse, 15' x 49', and 10' x 95'; R. G. Parker & Co., builders.

Shawmut Ave., Nos. 832–836, for Highland R. R. Co., carriage-shed, 25' x 89', two-st'y.

Island St., near Hampden St., for James Hooper, dwell., 18' x 30', two-st'y; Lansing & Drisco, builders.

Western Ave., near, opposite Waverley St., for James Hathaway, 6 dwells., 20' x 30', two-st'y; Benjamin Wood, builder.

Wales St., near Harvard St., for Emma L. Jacobs, dwell., 22' x 28', two-st'y; B. B. Lawrence, builder.

Bird St., rear of, near Ceylon St., for N. Y. & N. E. R. R. passenger station, 8' x 75'; Chas. Ensign, builder.

Mt. Pleasant Ave., No. 42, for Miranda E. Small, dwell., 17' 10" x 37', two-st'y; A. D. Gould, builder.

Pond St., near Avon St., for Jas. Glynn, 2 dwells., 19' 10" x 25'; Jos. P. Shaw, builder.

Brooklyn.

BUILDING PERMITS.—*Huntington St.*, n s, and w s Gowanus Canal, one-st'y frame shed; cost, $2,400; owners, H. J. Baker & Bros., Pearl St., New York; builder, Chas. M. White.

Third Pl., n s, 100' w Smith St., 2 four-st'y stone flats; cost, each $8,000; owner and builder, James W. Dearing, 467 Hicks St.; architects, Parfitt Bros.

Tenth St., n s, e of Sixth Ave., 6 two-st'y brick dwells.; cost, each $3,400; owner, J. J. Allen; builders, J. Shorrock and P. Maguire.

Fulton St., s s, 160' e Bedford Ave., 2 four-st'y brownstone tenements; cost, each $10,000; owner and carpenter, Albert Wilkinson, 331 Macon St.

Dean St., n s, 124' 2" e Bedford Ave., 3 three-st'y brownstone dwells.; cost, each $7,500; owner and builder, John Lee; architect, J. Mumford.

Boerum St., n s, 390' e Old Bushwick Ave., *and Boerum St.*, s s, 549' e Old Bushwick Ave., 4 two-st'y frame dwells.; owners, Cross, Austin & Co., cor. Kent Ave. and Cross St.; builders, W. Dafeldecker and F. J. Berlenbach.

Rush St., n s, between Kent and Wythe Aves., one-st'y brick shed; cost, $2,000; owner, John Mollenhaur, builders, Thos. Parks and J. N. Brewster.

Clason Ave., w s, 257' s Gates Ave., 3 three-st'y brownstone dwells.; cost, each $4,500; owner, Stephen R. Post, 265 Gates Ave.; architect and builder, Joseph I. Kirly.

Monroe St., n w cor. Throop Ave., 5 two-st'y brick dwells.; cost, $3,500 each; owner, architect, etc., E. B. Sturges, 135 De Kalb Ave.; mason, Jas. Reckard.

Buffalo.

HOUSES.—Brick dwell., cor. of Swan and Chestnut Sts., cost, $8,000; owner, Elijah Saxton.

Brick dwell., North St., near the "Circle"; cost, $10,000; owner, R. K. Noye; architect, J. L. Silsbee, of Syracuse, N. Y.

RECEIVING-VAULT.—For Forest Lawn Cemetery Association, to be constructed of Medina and Connecticut sandstone, 45' x 72'; cost, $18,000; architect, C. B. Cook.

Chicago.

BUILDING PERMITS for the week ending October 31, 1881:—

C. Hacker, one-st'y front addition, 18' x 20', 1 Samuel St.; cost, $600.

Wm. Blauckhagen, brick basement, 20' x 44', 515 Superior St; cost, $1,000.

John Vorey, one-st'y brick cottage, 20' x 44', Eighteenth St., near Laflin St.; cost, $1,000.

C. Erickson, one-st'y and basement brick store, 59' x 90', 1190 Milwaukee Ave.; cost, $8,000.

John Helmka, one-st'y brick cottage, 20' x 24', Eighteenth St., near Laflin St.; cost, $800.

James Stenson, two-st'y brick barn, 40' x 55', 99 Monroe St.; cost, $3,000.

Mrs. M. L. White, brick basement, 22' x 50', 686 Warren Ave.; cost, $1,200.

C. J. Johnson, one-st'y brick cottage, 20' x 24', Parnell St., near Thirty-fifth St.; cost, $700.

Mrs. S. Stipplemann, two-st'y brick dwell., 25' x 60', 1073 Madison St.; cost, $4,000.

Mrs. Sarah Butlerfield, five-st'y brick store, 24' x 130', 20 Lake St.; cost, $20,000.

R. F. Torrence, two-st'y brick barn, 28' x 50', 3634 Ellis Ave.; cost, $2,000.

(*Continued on next page.*)