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THE sub-committee on sites for the World's Fair of 1883 has, it is said, agreed to recommend the selection of what is called the Manhattan Square site, including also as large a part of the Central Park adjoining the Square as can be spared for exhibition purposes. In consideration of the use of such portion of the Park, the sub-committee suggests that the buildings erected in it be of a permanent character, to revert to the city after the Fair is over. Manhattan Square itself, is a small tract, containing less than twenty acres, lying between Seventy-seventh and Eighty-first Streets, and bordering easterly on the Central Park, and westerly on the Ninth Avenue, through which the elevated railroad runs, with a station already established at the Eighty-first Street corner. It adjoins a part of the Park already highly finished, the Lake extending very nearly to the boundary, while the receiving reservoir is but a few hundred feet away, so that the ground will be too restricted for anything like a convenient grouping of the large buildings. Manhattan Square itself, is barely large enough to contain one such structure as the Main Building at Philadelphia, and although there is a considerable area of vacant land on the adjoining streets, the temptation to save money by encroaching as much as possible on the Park, instead of paying private owners, will be so strong that the result will probably be the scattering of the various edifices at considerable distances from each other through it, separated as they must necessarily be by the Lake, the Reservoir, the Ramble, and other features which public opinion will not allow to be destroyed. In many other respects the selection is excellent. The land is very beautifully situated on an elevated ridge between the Park and the Hudson River; it is accessible, being not far from the geographical centre of the Island, but hardly so accessible as the sites above the upper end of the Park, which could be traversed by short spur lines from all the elevated roads, while Manhattan Square can be reached from the Second and Third Avenue lines only by crossing the Park, which will not be, and should not be permitted. The horse railroads from the populous east side of the city can get to Manhattan Square through the Seventy-ninth Street Transverse Road, which penetrates the Park by tunnels and deep cuttings about opposite the centre of the Square, but the way is narrow and the grades rather steep.

THERE is something to be said in favor of using the Central Park for certain buildings of the great Exhibition, since it would hardly be possible in any other way to secure their permanency, and such structures certainly have a value for many uses besides the temporary one of a World's Fair. To maintain such buildings for any length of time on land belonging to private estates in New York, would, however, be out of the question. The area covered by the Main Building at Philadelphia was, we believe, not far from seven hundred thousand square feet and this, with a proper allowance for approaches, would, as soon as it became desirable for dwelling-house lots, which must be within a few years, be worth from four to six millions of dollars, at the average price of well-situated lots in good times. The interest of so large a sum would form an annual burden which no industrial, hygienic, horticultural or other institution could endure, and the building would be speedily swept away. The public territory of the Park, on the contrary, offers a site free of rent, where the operating expenses only will need to be met by the management of such an undertaking, but it may not be amiss to say that the New Yorkers would do well to scrutinize closely the purposes for which they are to give up the use of their property. If they were to be liberal in this respect, they could have the Park covered from end to end with places of amusement in three years, free of cost to themselves, so they need not be too eager to accept the propositions made them. It is doubtful whether Philadelphia has reason to be proud of the gift of the Art Building at Fairmount Park, and New York is in a position to make much better terms than any other of our cities.

A VERY good point is made by the *Sanitary Engineer* in its last issue regarding the dangerous condition in which those towns are placed which have public water-supply, but no sewers. Bad as is the state of a thickly settled district in which the ground is honeycombed with vaults and cesspools, the earth pollution is comparatively circumscribed and trifling until the vast increase of liquid waste occasioned by the general use of aqueduct water comes to dilute the foul household matters, and give them power to penetrate far into the earth. No principle of sanitary engineering is better established than the rule that unless a sewer system soon follows the introduction of water service in a town, a marked deterioration in the healthfulness of that town is sure to result, manifested not alone by the increase of the strictly zymotic diseases, but also in malarial affections, which depend perhaps as much upon the dampness caused by the saturation of the soil as on the character of the saturating liquid. In several of the more intelligent communities this subject is now exciting much attention, but the cost of a sewer system, added to the "water debt" with which the towns are already saddled, is so great as to deter all but the most energetic of the citizens. This cost might, however, it seems to us, be brought within comparatively moderate limits by the adoption of the system carried out with such signal economy and success in Memphis by Colonel Waring, of collecting house-wastes only in a net-work of small pipes, leaving surface waters, which form the great bulk of the contents of ordinary sewers, to be disposed of in open gutters or otherwise, as circumstances might indicate. The collection and disposal of house-drainage only would be a simple problem, easily and cheaply solved in a way which could secure a community at once from filth or malaria poison, if it were not attempted to carry off the rainfall also in the same conduits.

IT is officially stated that the loss by the burning of the Ansonia Clock Company's factory in Brooklyn was about one million dollars, of which less than four hundred thousand was covered by insurance. It seems that several of the policies on the building had been cancelled on account of a change in the manner of conducting the business by which the manufacture of the wooden cases of the clocks was brought under the same roof with that of the metal movements, but most of the companies who held the risk were not so prudent, and their stockholders will have to suffer accordingly. The remainder of the loss — more than six hundred thousand dollars — will fall principally on rich men, who have other property left, but they and their children and dependents will have cause for many years to regret the calamity which a little more care in building, and a little more diligence in supervision, would certainly have averted. Meanwhile, the underwriters, and the public which supports them, and furnishes the money with which they pay for losses, seem likely also to learn a severe lesson before long. All accounts agree that the business of insurance grows worse instead of better, losses rapidly increasing, while rates diminish. The weaker companies one by one withdraw from the large cities, or abandon the business altogether, casting the burden of their contracts, which will in all probability be losing ones, on the stronger corporations by means of reinsurance. The habit of fire-proof building, which is now rapidly extending, withdraws many of the best risks, which have always borne an undue share of the burden of premiums, while the inferior class, not perhaps so much from the improvement of the art of combustible construction as by the increased height now given to buildings of all kinds, grow more hazardous, and the losses in them greater, year by year. The end will unquestionably be a general abandonment of our present habits of light and inflammable construction, but how much distress and loss must precede the change, and who is to lead it, — whether the underwriters, the fire engineers, or the architects, it is impossible to foretell.

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Cleopatra's Needle continues its slow progress towards the Central Park, and the trestle-work, on which it is to move from the entrance to its destined site, is nearly ready. One of the proposed features which the completed obelisk will possess we cannot very warmly approve. According to the New York *World*, it has been decided to mount the shaft, not exactly on the backs of four crabs, like many of those erected in Roman times, nor resting frankly on its stone plinth, as it was originally designed, but in a manner combining the worst features of both these methods; by cutting away the corners of the obelisk, so that four American crabs can be wedged in underneath, while the middle portion of the stone rests on the plinth. To say nothing about the mangling of its proportions caused by this needless chopping away of the shaft; the notion of supporting it partly at the corners and partly on the base does not seem particularly sensible. If the central portion of the bed bears firmly on the plinth, the crabs when contracted by very cold weather can hardly take much of the weight, and an uncertain equilibrium of the whole will be the result; while if all the weight is to be carried by the crabs, there is certainly no excuse for cutting away the corners which rest upon them in order to let the stone hang down between them. According to the *World's* authority the Roman expedient of employing metal supports to raise the shaft from the plinth, in order probably, to prevent decay arising from moisture drawn by capillary attraction into the joint, was uniformly unsuccessful, the inequality of pressure ultimately causing the overthrow of all the obelisks so mounted; but it is difficult to see in what way the arrangement now proposed would be better than the other.

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In New York City, the local Health Commissioners have been busy. One of the worst of the "shanty towns" in the upper part of Manhattan Island, situated between Sixty-seventh and Sixty-eighth Streets, has been made the subject of a report by a special inspector, who finds that the condition of the district is extremely bad, the ground soaked with filth, and the huts unusually crowded and close. It appears that the effluvium which hangs about the place is so offensive that the officers of the neighboring foundling asylum are obliged to keep their windows closed on that side, and several of the rooms are considered uninhabitable. The Mount Sinai Hospital, also, which is situated on high ground near by, is so invaded by the pestilential atmosphere that erysipelas, dysentery and diphtheritic troubles are constantly prevalent in the wards nearest the foul village. Under these circumstances the Board ordered the removal of the shanties, as a public nuisance. It may seem hardly becoming a journal which upholds a high sanitary ideal to regret the disappearance of these filthy dens, but we confess that we never pass a village of them without being irresistibly attracted by their extreme picturesqueness. Less gloomy and vicious-looking than the city rookeries, the habitations of the squatters, with their whitewashed walls of rough boards leaning in all directions, their roofs of rusty tin, torn in a crumpled sheet from some demolished warehouse, their dilapidated stovepipes projecting unexpectedly through roof or walls, and their groups of goats and children climbing about in the sunshine through the circuitous paths among the rocks, have a naïve charm peculiar to themselves. Now and then one can see among them dwellings of larger size, with porches and wings of the same general style of architecture, exhibiting a variety of outline and shadow, a breadth of effect, and unconscious simplicity, which would make them admirable objects for the background of a picture. Before they have been entirely improved out of existence, we would suggest that an enterprising sketcher might find among them many a motive which he could use to advantage in work of a much higher class.

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The New York State Board of Health has adopted a body of sanitary regulations, which, if thoroughly enforced, will go far to reduce the death-rate and promote the general health of the great community under its care. There is likely, we should judge, to be some resistance to a few of the ordinances, even the most necessary, but we hope to see it promptly overcome. Nothing but actual force will compel a large part of the rural population to abandon the filthy habits in which they have been brought up, and some such coercion as is now applied with most salutary effect to the lower classes in the cities will be useful in more sparsely settled regions. One of the new rules is that no privy vault shall be allowed within fifty feet of a well or spring. If this reform is carried out, an incredible number of dwellings will be thrown into commotion, especially in the smaller cities, where land is valuable, and house-lots small, while no slight degree of inconvenience will be caused in many cases. Another salutary regulation which is likely to prove unpopular, is one prohibiting public or church funerals for persons dying of scarlet fever, Asiatic cholera, small-pox, diphtheria or yellow fever. This rule is now enforced in some other states, with good results. It is time that the community should be awakened to the fact that the reckless conduct in cases of contagious disease by which innocent persons are exposed to infection through the carelessness or indifference of the patient or his friends, is little short of crime, and a few examples of conviction and punishment for this offence would have a most wholesome effect.

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English manufacturers of gas seem to be hardly yet awake to an idea which has occupied the attention of their brethren in this country for some time, — the promotion of the use of coal-gas for cooking and heating. Some of our more enterprising companies offer, we believe, to provide their customers with gas-stoves during the summer months at a nominal rent, looking for their profit to the increased consumption of gas from their use. The *British Architect* strongly advocates a similar experiment on the other side of the water. According to its figures, fourteen-candle gas can be sold in England for less than two shillings, or forty-four cents, per thousand feet, which is, it says, actually the present price in the city of Leeds. Such gas would do well enough for lighting, and would be cheap enough to be extensively used for heating, if its use were persistently advocated. At such a price we can well believe that this anticipation would be verified. If the value either of coal-gas or the less carburetted product made by passing steam over hot coals should fall so low among us, there is no doubt that means would be quickly found for utilizing it for heating. A gas hot-air furnace in the basement would be quite as convenient an apparatus as the radiators of a steam system, and much more healthful than direct radiation without change of air, while for cooking we have yet to see the steam oven which housekeepers generally would prefer to an open flame, if they could have this by the simple operation of turning a key.

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Attention is called by the *Fireman's Journal* to the advantages possessed by steam in extinguishing fires, and several instances are quoted where the accidental or intentional introduction of steam into a burning building had the effect of smothering the flames, and if not entirely extinguishing them, of so subduing them as to bring the fire under easy control by the ordinary means. One of the most striking cases was that of a large mill, which took fire through the accumulation of combustible rubbish in a hollow space between the upper ceiling and the roof, so that half the upper portion of the building was in a blaze before the accident was discovered. The conflagration spread so rapidly as to be soon beyond control, and the engineer of the fire department had ordered the destruction of the walls still standing, when a carpenter, in defiance of the engineer's prohibition, climbed into the burning building and with an axe broke one of the large cast-iron steam-pipes. The fires were still lighted under the boiler, and the steam poured out, increased by the exertions of others who understood the object which was aimed at, and fed the furnaces with any fuel at hand, and in a few minutes the blaze was seen to diminish, and to leave the portions of the rooms successively filled with vapor, this action continuing until the smouldering contents could be safely approached with the hose, and completely quenched and cooled with water, the result being the preservation of a large part of the structure, which without this aid would have been thrown down into a mass of ruins. The suggestion is made that manufactories could easily be fitted with automatic apparatus for throwing steam from the boilers into any room where needed, and perhaps it will be found practicable to use special engines for throwing in from the outside either watery vapor or what has also been proposed, carbonic acid gas, instead of water whose management presents so many difficulties.

## THE METRIC SYSTEM.—IS IT WISE TO INTRODUCE IT INTO OUR MACHINE-SHOPS?[1]—I.

THE organization of a Society of Mechanical Engineers offers a convenient and fitting opportunity for the presentation of the views of a mechanical engineer on the subject of the metric system to members of his own profession and to those who are similarly interested. During the month of May, 1874, I had the honor of reading before the American Railway Master Mechanics' Association a paper on "The Metric System in our Workshops: Will its value in practice be an equivalent for the cost of its introduction?" In that paper I treated the subject mainly in reference to its cost. From what has since been published by those who advocate the enforced substitution of the metric system for the weights and measures in common use in this country, it is evident that the subject will bear to advantage a different treatment. I now propose to supplement the question of cost by an endeavor to show that the system, *per se*, is not so well adapted to the wants of machinists as is the one now in use, and that its enforced introduction will do harm to our industries in place of doing good.

To the great bulk of mankind engaged in trade, in buying and selling, in bartering and exchanging, it matters little what system they adopt; it matters little whether they are obliged to use a yard-stick or a metre-rod, pounds or kilogrammes, quarts or litres. The cost to them of a change from one to the other is the cost of the few devices needed in weighing and measuring; the *rationale* of the system may never enter their thoughts.

With the machinist the case is different. He must not only possess costly means of measuring and weighing, with a degree of exactness unknown to others, but the results of these weights and measurements are fixed and unalterable. Enormous expenditures on tools, on drawings, on patterns, on everything he uses in making or building his machines are dependent on what is involved in the primary system used in determining weight and size. The product of this expenditure means everything that makes modern civilization possible. I propose, in this paper, to consider the subject only as it relates to our own profession; not in regard to its effect on the grocer, the dry-goods man, or on the druggist. I propose to show why, after nearly twenty years' constant use of the metric system of measurement, I record my opposition to any enforcing legislation in this direction, because *the metric system is not well adapted to the practice of the machine-shop*.

For nearly twenty years one large department of Wm. Sellers & Co.'s establishment has been worked on the metric system as thoroughly as the system can be worked in any machine-shop; as thoroughly as it is worked in France or Germany. The drawings made for this department are to the metric scale, figured in millimetres. The small tools and guages are to metric measurement only, and the product of the shop is scaled to metric sizes and called by names based on those sizes.

During all these years, and for many years before, we have taken pains to inform ourselves, so far as lay in our power, as to all possible good to be derived from the system, in the drawing-room as well as in the shop. We inquired into its defects and endeavored to overcome them by the same means as are resorted to in metric-using countries. The system is urged by theorists as a perfect system. All nations, we are told, should adopt it to bring about a desirable unity in weights and measures, even if all cannot be made to speak our language and all cannot be equally good and pious, as measured by some international scale of goodness and piety.

The metric system was legalized here in May, 1866. Some of its enthusiastic advocates now urge its being made exclusive and obligatory. Societies are organized to teach its principles to the people, and much money has been expended in publishing, but up to this time few conveniences have been placed in the hands of mechanics to enable them to use it in their calculations. Some years ago (the conditions remain the same to-day) letters addressed to leading publishing houses asking for metric books in the English language, equivalent to those to which we constantly refer, which books are as necessary to us as are our other tools, failed to bring a single favorable answer. What was asked for, was some book in which formulæ shall be given in the most convenient form expressible in relation to the metric nomenclature. Many books can be found urging its merits as a system, and the writers of these, in showing (?) that the metric system can be learned entire in say fifteen minutes, may think they have done what is needed, but no book yet published in the English language, so far as I have been able to learn, even approximates to what is required. We have nothing like the hand-books published in German. These Germans, in teaching their people, gave side by side in their almanacs of mechanics, the formulæ expressed in Prussian inches and in metres. When the year 1880 came around they dropped the Prussian inch from these books when it was possible so to do. There are many very good books of tables for the ready conversion of the measurements of one system into the other, but unless an engineer is as familiar with the metric system as with his own, they aid him but little. On the other hand, our English work books are many and valuable. The great bulk of literature of primary importance to mechanical engineers is in English, and expresssed in feet and in inches.

The absence of these help books need not, however, prevent any one *familiar with the metric system* from using it in his practice. If he can think in the new system he can work in it too. He can formulate what is directly needful to him if he will take the time and trouble to do so. The absence of these books has not prevented us from using it or familiarizing ourselves with it, and had it proved worth the effort, and possible, we would long ago have placed ourselves in position to advocate it, as none can knowingly do who have not tried it. In designing any engineering work, proportioned structures can be produced by either scale; the working drawings can be then made to whatever system obtains in the shop of erection. This change from one or the other system in the drawing-room is a matter of no difficulty whatever. The change from one system to the other in the workshop, however, involves more than the usual advocates conceive of.

Mr. Frederick A. P. Barnard, S.T.D., LL.D., who, besides being President of Columbia College, in New York City, is also President of the American Metric Bureau, and of the American Metrological Society, etc., etc., said, Dec. 27, 1877: "It is now little more than a dozen years since the movement in favor of the reform of the confused metrological system of the United States was set on foot. Originating with a few *advanced thinkers*," (the italics are mine) "and regarded with indifference by the multitude, it encountered, as it is the fate of all efforts to emancipate mankind from the burden of traditional evils to encounter, a much larger degree of opposition than of encouragement or favor." Then, after denouncing many of those who oppose the forced introduction of the system (see page 279 and elsewhere in his Metric System), says on page 283 of the same book, "Among the arguments urged by those who maintain the impossibility of change, only one appears to have much force, and that is the argument drawn from the dependency of machinery upon minute exactness in the measurements of parts and from the great expense which would attend the adaptation of machine-shops and machines to a new system." Quoting the majority report of the Franklin Institute as to probable cost, and referring to the second report of the committee of the New York University Convocation, in which report the number of dimensions requiring separate indications on the drawings of a twenty-five horse-power steam engine are given, he continues: "Singularly enough, these statements, and all the rest of the same class in both the reports referred to, instead of being arguments against the abolition of the present metrological system and the substitution of the metric for it, afford the strongest reason for believing that that is precisely the thing which ought to be done. We desire, I suppose, to create a demand for our steam engines and our manufacturing machinery on the contiment of Europe. . . . But a steam engine or a machine, all of whose parts are measured in English linear measures, if transferred to a metric country and there, by accident disabled, becomes nearly useless, *since the shops of such a country afford no facilities for repairing it*," etc., (the italics again my own).

It seems needless to tell engineers that these statements show so entire an ignorance on the part of Mr. Barnard of the merits of the case as can scarce be credited from such a source.

The unit of measurement used in making a machine does not in any way complicate the repairs of that machine. Machines built in England do not always agree with any of our even sizes; yet this discrepancy is a matter of no moment in the repairs of any of them. If we fail to find sizes corresponding to our sizes in English machines, presumably built on the same scale of linear measurement as are our own, neither do we find even millimetre sizes, always, in machines from France or Germany.

Wm. Sellers & Co. make injectors for feeding boilers. They make them to the metric scale. They were doing so some years before Mr. Barnard's "few advanced thinkers" went into the metrological reform business. Their instruments are made from drawings figured in millimetres in all parts, except where screws and screw-threads are needed. Screws to be cut on existing lathes cannot be conveniently figured metrically, unless we adopt the custom of some German shops to figure in one dimension and make gauges to some other one. A screw-bolt in Germany called 25 mm. diameter must be made 25.4 mm. size to conform to the screw system in use there; it will have 8 threads per inch and, consequently, 8 threads per diameter (I will explain this later). Screws cannot be metrically divided until metrically-divided lead screws have been originated and put in the place of the inch-divided lead screws *common to all lathes in all parts of the world*.

The people into whose hands these injectors pass know nothing of the scale of proportions to which they have been made. If some piece needs repairs and its shape has been lost by wear, it is needless to say that a knowledge of the scale would give no clue to that shape, but from some existing original any part can be copied; to copy requires no knowledge of the scale used. Repairs, too, as a rule, require deviation from the original size to compensate for wear.

While the value of the unit of measurement may be of little moment in repairs, it is, however, all-important in the first production of machines. This leads me to another misunderstanding on the part of advanced thinkers; this cleared away will bring us to the position required in a judicious consideration of the two systems in their application to the machine industries of our country.

In shop practice and in mercantile practice, to avoid an endless variety and confusion of sizes, certain dimensions in progressive order are adopted, being the sizes found most useful and most *salable* in practice. These progressive sizes we may call, in order to make the matter easily understood, *shop sizes* and *merchant sizes*.

[1] By Coleman Sellers, M. E. Read before the American Society of Mechanical Engineers, Nov. 4, 1880.

It is by the use of well-considered ranges of shop and merchant sizes that the maximum of convenience is obtained at the minimum of cost. Hence one metrological system may be found to possess advantages over another when put to the test of practice. The one that is best in affording the most convenient and the most easily used and *memorized* series of sizes should not be called unphilosophical. The resting-place for memory in the American series of shop sizes is the inch. The inch is subdivided by a process of repeated halving down to $\frac{1}{16}$ in the usual grade of shop and merchant sizes, as in bar iron. This gives 16 sizes to the inch for small sizes; 8, 4, 2 or 1 to the larger sizes.

Calculations based on the "inflexible law of mechanics," as read by *finite man*, intimates for the size of a certain part of some machine a dimension 3.95 inches diameter; the prudent engineer has possibly assumed a sufficiently ample *factor of safety* to permit him to select $3\frac{15}{16}$ inches, the nearest shop size below the theoretical size, $3\frac{15}{16} = 3.9375$ inches. He desires to use this shop size, because 4-inch iron, an obtainable merchant size of bar iron, will clean up from the black to this size; but if his dimension relates to castings or forgings he may select 4 inches as a shade stronger.

Metric-using people have ranges of shop and merchant sizes too. When I come to compare their possible series and their actual series with our own, some faint glimmer may come to those who now know nothing about the matter of the fact that our unphilosophic system is not so very bad after all.

In regard to what is involved in each shop size, in a money point of view, I will give but one single example. The inquiry to our own tool-room keepers for a list of the separate devices used in producing one size, viz., $1\frac{1}{4}$ inch, brings to me the names of one hundred and twenty-nine articles or sets of articles, such as drills, reamers, gauges, boring bars and cutters, taps of all kinds for all sorts of uses, hardened mandrels, etc., etc. These many pieces, costing many hundred dollars, represent one size only. They tally with and belong to the dimension marked $1\frac{1}{4}$ in many thousand places on drawings, which have been accumulating for years, to patterns loading down our pattern-lofts, to gear-wheels interchangeable over a continent, and to the output of our factory for years. So important in an economical point of view have come to be these shop size series, that machines built in one shop, if to be reproduced (not repaired) in another, must be redrawn to conformity to the shop system in use before the work can be begun to advantage. Year by year this harmony in shop sizes in America spreads over a larger area. Entire harmony in essential points exists in many of the leading shops. There are, however, examples still to be found in which machines built in one shop have no dimension in common with the shop sizes we use, as compared to our inch series or our millimetre series; for we use both. The expert recognizes such machines as having been built to gauges varied by the judgment of the master workman, or by the more *costly* method of fitting one piece to another already completed, a process not admissible in any well-regulated machine-shop.

A good workman may by hand construct, we will instance, a sewing-machine. He will alter and try, and rearrange its parts until he has satisfied himself with the result. He may not have scaled this machine to any system. It goes to the manufacturer who must perforce change some of the wild-cat sizes to conform to merchant sizes of the material to be used. For the rest, he may be content to fit gauges and templates to the model and reproduce it in minute exactness. We recognize, however, in every well-arranged series of shop sizes, and in the means employed to *maintain size*, the highest value of possible *merchantable* good workmanship, for in such possibilities we recognize economy in tools as well as in work, in interest on capital and in wages. This system has been growing year by year in spite of our so-called unphilosophic metrology. Eli Whitney, in 1798, gave a lesson in this direction when he began to make muskets with interchangeable parts, in Springfield, Massachusetts, but it was not until 1855, that the English Government recognized what Whitney had done by importing American gun-making machinery. Since Whitney's time, the standard system has been carried into all branches, not only of our own trade, but into all the requirements of other trades as well.

The metrology of the American shops is based on the inch, and on it only. This dimension is cut up into minor parts by halving to any degree of subdivision, practically in shop sizes to $\frac{1}{16}$; it is also divided into 10 parts and into 12 parts when such divisions serve any good end. All such divisions have their uses, and lead to no confusion. The inch squared is the base of our strains and pressures. The inch cubed gives us capacities. Later, I will speak of 12 and 36 inches squared and cubed. This one unit, the inch and pound weight of 7,000 grains Troy, is all that a machinist needs to carry on his business. His inch is the same inch as is used in England and in the Russian machine-shops. His pound is the pound in common use in England. In America we have dropped some needless weights and measures, just as we have seen fit to drop the letter *u* from some of our words. We do not use in the machine-shop the ton of 2,240 pounds nor its quarter nor its hundred-weight; we do use a weight called "ton of 2,000 pounds." This is the factor weight in strains, and by it we sell machinery. Other trades may retain some of these useless things; I am speaking only of machine-shop practice.

The unit of measurement in France and in Germany is the *millimetre*. It is not and cannot be the metre for the following reason: The great majority of all sizes used in the construction of any machine, whether it be big or little, are less than one metre. By the use of the millimetre only, decimals are avoided. 8 millimetres must be written 8 in the millimetre scale, while it must be written .008 in the metric scale. This is reason enough, for by the use of millimetres only, confusion of signs is avoided, and the *danger incident to decimals* is also avoided; hence *all* drawings are figured in millimetres only, up to dimensions measuring many thousand millimetres. This little dimension is then squared and cubed, or ten or a hundred millimetres are squared and cubed, for the uses corresponding to our squared and cubed inch and foot. As may be expected, happy coincidences of conveniences are found in either system. Thus an ardent metric advocate instances that 1 kilo to the square centimetre is just one atmosphere. We say 15 pounds to the inch is an atmosphere. Neither one is right, but the 15 pounds to the inch is 1 per cent nearer right than the other is. For a machinist who seldom uses atmospheres, a happy coincidence on the other side will be of more service. It so happens that wrought-iron bars with parallel sides measure in square inches of their section just one-tenth of their weight in pounds per yard. Now, inasmuch as "shapes" in iron are rated by the pounds per yard, for convenience in large structures, so it comes to pass that, when we know the rate per yard of any wrought-iron "shape," we know at once its sectional area. Inasmuch as compression and extension and factors of safety are involved in a knowledge of cross-section, it is handy to be able to find it so readily, is it not? A shape iron 80 pounds to the yard has 8 square inches area of section. If it is good for 10,000 per square inch in extension, we may load it with 80,000 pounds.

I have set out to compare the two scales — to compare the two units, rather, after an experience of twenty years with both. The inch is 25.4 times larger than the millimetre. These are the two dimensions we are to compare.

We will begin in the drawing-room. Here "the inflexible laws of mechanics" find their first expression in form on paper. Few machines, or even parts of machines, can be drawn full size. Hence comes the need of "scales." There is reason in all things, even in scales. The unwritten law of most machine-shops is to make every drawing as large as possible — as near full-size as the nature of the subject and the dimensions of the paper used will permit. We have in our drawing-room about 125 drawers, each of which will take in, without folding, drawings 52 inches (1320 mm.) long by 33 inches (840 mm.) wide. This is about as large a sheet as we can use to advantage, and tracings from these are not unmanageable in the workshop.

For metrical drawings we can use the following scales *only:*

| | |
|---|---|
| Full size in which | 1 mm. = 1 mm. |
| One-half size in which | $\frac{1}{2}$ mm. = 1 mm. |
| One-fifth " " | 2 mm. = 1 cm. or 2 cm. = 1 dm. |
| One-tenth " " | 1 mm. = 1 cm. or 1 cm. = 1 dm. |
| One-twentieth size in which | 5 mm. = 1 dm. |
| One twenty-fifth size in which | 4 mm. = 1 dm. |
| One-fiftieth " " | 2 mm. = 1 dm. |

Down to the one-tenth scale the dimensions can be read from a good millimetre rule; for the one-twentieth, the one-twenty-fifth and the one-fiftieth, scales must be constructed. The jump from one-half to one-fifth size is unfortunate. Could we conveniently quarter the whole size, we would have an increased area section, a matter of much moment. The $\frac{1}{5}$ of 10 inches is 2 inches, and the square of 2 is 4. The $\frac{1}{4}$ of 10 inches is $2\frac{1}{2}$ and its square is $6\frac{1}{4}$, a gain in size of over 50 per cent; a gain in comfort, in convenience, and in eyesight. Here we catch the first glimpse of the advantage of our own system; for with it draughtsmen can, from an ordinary well-divided inch rule, obtain the following scales: Full, $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{6}$, $\frac{1}{8}$, $\frac{1}{12}$, $\frac{1}{16}$, $\frac{1}{24}$, $\frac{1}{32}$, $\frac{1}{48}$, $\frac{1}{64}$ — 12 gradations, as compared to 7; and to these 12 can be added with perfect ease 5 of the others, making 17 in all, if the preference be for the decimally-divided inch, a scale carried in the tool-box of every machinist, and obtainable from the two-foot rule in so common use.

The scale series in most common use is that of $\frac{1}{2}$, $\frac{1}{4}$ and $\frac{1}{8}$; this halves down from whole size, and can be raised, in rapid drawing, by taking off diameter sizes from one drawing and using them as radius dimensions in the other, a process impossible between $\frac{1}{2}$ and $\frac{1}{5}$ sizes. The true value of this extended series of scales, with its peculiar advantages, is manifest to any one familiar with both, *and admits of no dispute.* Is it a wonder that draughtsmen brought up under a metric rule take so kindly as they do to our unphilosophical system?

Drawing is but a small part of the engineer's work. More or less calculating has to be done; many hours must be spent in figuring strains, estimating weights, determining speeds and what not. This brings us to the test of convenience in calculation, to the stronghold of the metric advocates.

Mr. Frazer says: "Let the carpenter or mason be asked how many tons of water a structure, whose *external* (I guess he means *internal*) dimensions are given, by his rule, will contain, and they will acknowledge that the decimal division is not the only advantage of the metric system, but that another is the perfect relation of extension, capacity and weight." For a structure 5 feet square and 10 feet deep the carpenter would divide, in his head, 250 by 32 and say 8 tons nearly, or 7.8125 tons exact of the tons of 2,000 pounds in use in all such measurements. The metric system would give for a nearly similar structure, say $1.5 \times 1.5 \times 3$ metres, a result obtained by multiplying only; but what then? This problem applies to water only. If these spaces were to be loaded with bricks the metric multiplication must be still further multiplied by the specific gravity of bricks, thus: $1.5 \times 1.5 \times 3 \times 1870 = 12{,}622.5$ kilos, while our mason's sum would read $5 \times 5 \times 10 \times 125 = 31{,}250$ pounds of common hard bricks, with an ease of calculation rather in favor of the two-foot rule.

I have mentioned the innumerable books which have been prepared, simplifying processes of calculations by tabulating the results of experiments on a basis of the inch unit. Of these books the English experiments form a large bulk of the valuable engineering knowledge of the world. Hodgkinson, for example, experimented with the crushing resistances of various substances, and the result of his experiments are in the possession of all engineers. He took samples in cylindrical form, 1 inch diameter, 2 inches long each, for these experiments. Armengaud quotes these experiments and tabulates the results, saying they were obtained by Hodgkinson, *avec des cylindres de* 0.$^{m}$0254 *de d$^{tre}$ sur* 0.508 m *de haut$^{r}$*" $= 1'' \times 2''$, and from these he deduces, for example, that *ash* has a crushing resistance of from 610 to 653 kilos per square centimetre.

Mr. Trautwine, quoting Eaton Hodgkinson's experiments, also tells us that ash, weighing from 45 to 53 pounds per cubic foot, has a crushing value of 8,600 pounds per square inch. Now, 1 pound per square inch = .0703077 kilo per square cm., or 1 kilo per square cm. = 14.2232 pounds per square inch, $\frac{8{,}600 \text{ pounds}}{14.22}$ = about 605 kilos to the square cm. Here, from Trautwine's deduction, the metric-using engineer will employ 605 as a factor where we use 8,600 in the same case. He, because his unit of measurement is less, or rather requires more figures to express it, multiplies these many figures by a lesser factor, while we, expressing our dimensions with lesser figures, use with these figures a larger factor. In other words, we can complete our calculation sooner because we are able to deal with the largest measures compatible with convenience. We can use the cubic inch, the cubic foot or the cubic yard, at our pleasure, just as the mechanic selects his tools in accordance with the extent of his work, and doesn't fool time away driving at a railroad-spike with a tack-hammer.

I have before me, as I write, French books and German books on mechanical engineering. In some, both French and German, all or nearly all formulas for strains are expressed in kilos per square cm., while Professor Reuleaux, in his many valuable books of reference, seems to adhere to kilos per square mm. Now to test the matter of convenience in a way familiar to all mechanical engineers, let us go to Reuleaux for our information as to the strength of cast-iron, in the familiar equation for beams of $W = \frac{4\,s\,b\,h^2}{l}$. Reuleaux says the value of $s$ may be taken as four kilos per square mm.; this equals 400 kilos per square cm., or 5,689 pounds per square inch. Let our example be a cast-iron beam of rectangular section, 9 inches deep, 4 inches wide, and 10 feet between its supports; given, to find its safe load in the middle. Let us round up these dimensions into a somewhat similar beam, measured in mm., 230 × 100 × 3000. Now $h$ = 230 or 9, $b$ = 100 or 4, $L$ = 3000 or 120.

The formula then reads:

$$\frac{4 \times 4^{k} \times 100 \times 230 \times 230}{6 \times 3000} = 4702^{k} \text{ for all dimensions, in mm.}$$

or $\frac{4 \times 400^{k} \times 10 \times 23 \times 23}{6 \times 300}$ for all dimensions, in cm.

If we take 6 from the denominator, then

$$\frac{4 \times 66.6 \times 10 \times 23 \times 23}{300}.$$

If we make the formula good for cast-iron only, and use centimetres in the numerator and metres in the denominator, which is the best we can do, $\frac{2.664\,b\,h^2}{l}$ for cast-iron $= \frac{2.664 \times 10 \times 23 \times 23}{3}$.

Compare this with $\frac{4 \times 5689 \times b\,h^2}{6\,l}$ which reduces to $\frac{316\,b\,h^2}{l}$ for cast-iron, and reads $\frac{316 \times 4 \times 9 \times 9}{10}$.

My note-books are full of such examples as this; it has been my wish to test this matter thoroughly; my experience covers many examples of engineers and draughtsmen educated in metric-using countries, who when they come to us, learn to use our measures as quickly as we can learn to use theirs, but adopt our methods of calculation as involving fewer figures. Thus, for all practical purposes, in strains, what will be strong enough in kilos, if we assume two pounds to the kilo, will be near enough right, and if the "grand truth of mechanics is that properties or dimensions of parts of machinery to accomplish any given purpose will be unaffected by any standard of length or weight applied to the part," it is therefore possible to arrive at the theoretical proportion by either system, and it is presumable that the workman will select the easiest one to work with, the more so if the easiest one happens to be the one he has been most used to. I have yet to see the example of a metric-educated draughtsman working in millimetre calculations on an inch-measured machine, while with our own experience with both we could follow him in either.

Cubic inches go farther than cubic millimetres, *i. e.*, they involve fewer figures in their expression; because a cubic inch is 16,000 times larger than a cubic millimetre, it is 16 times larger than a cubic centimetre; and while, again, the litre is, may be, 61 times larger than the cubic inch, yet the cubic foot is 27 times larger than the litre, and between the litre and the cubic metre there is no unit of measurement; 10 litres, like our gallon, has an edge only expressible in decimals.

The harmonious relation of extension, bulk, weight, and all that comes out strongest when we deal with distilled water. Away from that precious fluid, and we are required to know and use the weights of matter as they relate to water. I must confess I see no difference in favor of hunting up in books the specific gravity of matter or in looking for the weight of matter in pounds per cubic inch or foot or yard.

In hydraulic calculations the weight of distilled water, however, may be near enough to the weight of the water engineers have to deal with to enable them to reap all the advantages desirable from the system, did not the small units, the millimetres, or the many figures in the decimals of the metre, mar the result in a labor-saving point of view.

The value of the drawing-room system is tested or tried when the drawings reach the machine-shop. It is there that errors are found out. An incorrectly figured drawing costs nothing on account of the errors so long as that drawing rests quietly in its drawer; but it costs fearfully when the error is discovered in a partially finished machine. All engineers agree on one thing, viz., the fewest possible figures that can be used to express dimensions clearly, the easier it is to work to the drawing, and the less liability to make mistakes. Beautiful as is a decimal system in calculation, and we all use it, save in mental arithmetic, it has been found advisable to avoid the use of decimals as far as possible on the drawings used in our workshops, even in metric using countries. A misplaced point is an easy error to make, and may cause no end of trouble and expense.

## RED BRICK IN ARCHITECTURE.[1]

ONE of the most prominent features in the town architecture of the last few years is the artistic use of the familiar red brick — a use which has in certain hands developed unsuspected sources of effect, and, up to the present time, has met with an almost universal approval.

There must, indeed, be few amongst the dwellers in great cities who have not found a new delight in those pleasant breaks in the "long unlovely street" which the buildings alluded to afford; and he must be strangely insensible to the charms of the picturesque who has not felt his mind refreshed and his daily load lightened by their glow of unwonted color, their strange and fantastic grouping, and the play of fancy they show in detail and imagery.

The remains of the old sixteenth and seventeenth century red-brick houses were neglected or treated contumeliously, by the enthusiasts of the Gothic revival; but "the whirligig of time brings its revenges." Their turn has come at last. They are disappearing all too fast; but they have, in their declining years, become the objects of intelligent and sympathetic study — an earnest scrutiny into the methods by which their builders, with means so simple, contrived to produce effects so captivating — and they will not have departed without leaving behind them the lesson of their charm. It remains to be seen whether we shall have the wisdom to profit by it.

There are indications that we have already reached a crisis — a turning-point — in the modern use of brick as a vehicle of artistic expression; and in the hope that we may not stray into a misuse of so valuable a material, I am induced to offer the following remarks.

We all remember the publication of Mr. Ruskin's works on Venetian architecture, and of those by Mr. Street on the "Brick and Marble Architecture of Spain and Italy," and the amount of attention which those works directed to the field for architectural design and effect afforded by the use of similar materials. Immense ingenuity was expended upon fanciful arrangements of colored bricks, for lack of marble, moulded or plain, and their disposition dentil-wise, as cornices, corbels, machicoulis, wall-diapers, and, in short, in every conceivable order and combination. In spite of all the energy devoted to the work, one can scarcely point to a single satisfactory example of that particular use of a material which for a time engaged and almost absorbed the attention of designers of every school. The "streaky-bacon" style has become a by-word, and has now, I believe, only one solitary exponent.

It has thus been made clear to us beyond question that our architects have not the gift of color. Notwithstanding the range of colors, practically unlimited, which the enamelling and vitrifying processes applied to bricks placed in our hands, all attempts to turn them to account have signally failed. The time may come when we shall be able to grapple successfully with the problem, but there are at present no indications of its advent. Meanwhile, if we are not colorists, we have amongst us those who have proved themselves experts in monochrome; and their works have met with an immediate and wide-spread success which contrasts instructively with the failure of former experiments.

Now, for the exercise of this faculty of working in monochrome, there is no medium for the architect so ready, so facile, and so kindly as the finer qualities of our native red brick. Its tone is the tone of the red crayon, which has always been a favorite with artists. Its brilliant warm lights, delicate half tints, and the rich browns of its shadows afford us all we can reasonably require, and, rightly treated, put us in possession of a medium of architectural expression, which, if unequal to the demands of the highest art, is nevertheless supremely fitted for our every-day requirements. Age, moreover, only deepens the general tone, and mellows and harmonizes the whole.

We are, however, in imminent danger of undoing all the good which has been done, by a new method of treatment, and the substitution of moulded and machine-stamped ornamentation for the more costly but effective hand-work; excluding the "human element" in

[1] From the *Magazine of Art*. New Series. No. 1. Published by Cassell, Petter & Galpin.

favor of the purely mechanical. The evils which such a departure brings in its train are incalculable. It may seem to the purist and to the scientific engineer an indefensible conceit to cut and carve brick-work which may be so much more easily and cheaply moulded, as clay, into the desired forms. But art cannot be judged from utilitarian standpoints. Like necessity, it has no laws, but is justified solely by results.

The works of the engineer are, no doubt, of unimpeachable constructive integrity, and, scientifically considered, above reproach, but by the general verdict of mankind they are for the most part abominably ugly. Nor is it easy to see how his scientific method can lead to any other result. To the objection above anticipated there is only one reply, but it is conclusive. All experience shows that good constructive art and mechanical processes of reproduction cannot co-exist.

What, for instance, has cast-iron to bring forward for comparison with wrought, in the field of ornamental art? The difference between them is the difference between the nervous sweep of the artist's pencil and the cold mechanical accuracy of the draughtsman's curve. But even if you could stamp upon each copy the impress of the mind of the original designer, the force of the objections to the use of mechanical reproductions would be unimpaired.

We are so constituted that the frequent repetition of even a good thing robs it, *pro tanto*, of its value as art. The Greek and Roman mouldings and enrichments with which we have been nauseated, and from which our varying architectural fashions are a perpetual revolt, are good in themselves. But we have been wearied out of all appreciation of their merits. And, in like manner, any attempt to scatter broadcast, copies of the best portions of our modern work will not only defeat its own object, but in the long run destroy the pleasure we take in the original work which prompted the ill-judged attempt. The poet tells us that "Nature broke the die in moulding Sheridan;" and one may be sure that Nature knew perfectly well what she was about. It is conceivable that even counterparts of Sheridan might become inconveniently numerous.

One would not ordinarily look to Macaulay for light upon a question of art; but reading him for other purposes, I have come by accident upon a sentence so true and pregnant, that I would it were printed in letters of gold, and displayed in every architect's office. It runs, "The sure sign of the general decline of art is the frequent occurrence, not of deformity, but of misplaced beauty."

That ornament, however beautiful in itself, is misplaced if employed in too great a profusion, and that so employed the best of it will at length pall on the jaded sense, is shown by what one may truly call a sorrowful passage in the "Stones of Venice." After that description, unexampled for beauty and power, in which the cumulative glories of the front of St. Mark's are separately set out, the writer asks, "And what effect has this splendor on those who pass beneath it? You may walk from sunrise to sunset and you will not see an eye lifted to it, nor a countenance brightened by it. Priest and layman, soldier and civilian, rich and poor, pass it by alike regardless."

Now our safeguard against this redundant use of original ornament is its costliness, and the security its costliness affords that its beauty will not be misplaced, that it will be used sparingly, that it will be appropriated to the accentuation of important kind of features, and that the place allotted to it in the composition will be a place of honor. But ornamental features which can be bought ready-made by the yard, or by the ton, at little more extra cost than their proportion of the outlay on the original model, are in danger of being used indiscriminately. One weakness of our modern architecture is its want of breadth, of dignity, of repose — a weakness which will be aggravated by the coming deluge of ready-made ornamental accessories. Their cheapness will bring them within the reach of the incompetent, who will endeavor to atone by a profuse employment of them for their want of originality.

The Stuart builders proceeded upon quite different lines, and our only chance of successfully emulating their example is to adopt their system. First, the material was of the very finest quality, and the workmanship most careful and exact — points on which deterioration has already set in. Secondly, the separate bricks, though all of a size, were not allowed to govern the proportions of the parts. They were cut down and carved *in situ*, regardless of the intervening fine joints — joints as fine and close as they could be gauged. Thirdly, the ornamentation was designed and wrought *in situ* to fill a specific function and adapted to particular circumstances.

The revived artistic use of the material under discussion has, in the best hands, been subject to the same restrictions, and it is upon such a restricted use of it that its future depends. It is, therefore, with deep concern that one notes a tendency everywhere discernible to supersede the costly but effective hand-work by cheap ready-made substitutes. If it gain the ascendency, the progress of our street architecture will be, in this development, fatally arrested, and we shall have once more to cast about for a fresh inspiration and a new departure.

## THE ILLUSTRATIONS.

MANTELS FOR THE RHODE ISLAND NATIONAL BANK, PROVIDENCE, R. I.; MESSRS. WALKER & GOULD, ARCHITECTS, PROVIDENCE, R. I.

THESE mantels were designed to be placed in the directors' room, connected with the new Banking Rooms now being fitted up for the Rhode Island National Bank.

The one placed uppermost in the illustration was chosen as being best suited to the general finish of the room, and is now being executed in black walnut. The tiles used are from the Chelsea Tile Works.

DESIGN FOR A WINTER HOTEL AT THE SEA COAST. MR. BRUCE PRICE, ARCHITECT, NEW YORK, N. Y.

COMPETITIVE SKETCH FOR THE BUILDING FOR THE BOSTON ART CLUB. MR. W. G. PRESTON, ARCHITECT, BOSTON, MASS.

OFFICE BUILDING FOR MESSRS. HOBART & PENNINGTON, NEWARK, N. J. MR. CHARLES EDWARDS, ARCHITECT, NEW YORK, N. Y.

## THE SEWERAGE SYSTEM OF THE FUTURE.[1]

AT a meeting of the Society of Arts in the year 1876, I referred to the arrest of scientific treatment at the point when water issues from the supply-pipes, and the idea was taken up and has been fully and satisfactorily worked out by Mr. Isaac Shone, a mining and civil engineer of Wrexham, who read a paper at the annual Congress of this institution at Stafford in 1878. I then remarked that probably, in future years, that meeting would be especially noted for its introduction of "the sewerage system of the future," and after two years' observation and experience of its excellence, I agree with the following quotation from a letter lately received from Mr. J. J. Mechi, of Tiptree Mall, Essex, who says: "Nothing can change my conviction of the practical utility of Mr. Shone's admirable and simple invention, and I feel sure that, ultimately, it must be generally adopted."

At the time of writing this paper I have no pecuniary interest whatever in Mr. Shone's patents, and it would doubtless be more prudent for me to stand by, as so many other engineers are doing, and see whether the inventor will succeed in his exertions to get a town to try his system, for that is really the point, as all who have studied the question admit *que ce n'est que le premier pas qui coute*, and that if one town or a part of it once experienced the sanitary and economical advantages which the adoption of this system would secure to it, the revolution in sanitary engineering would be accomplished.

The system in question has been before the world for two years, and has met only with praise from those who have studied it, and among that number not an objection has been made which could not be readily answered. I am fully satisfied with the trial which has been made at my farm during the last year and a half, not, be it understood, for any purpose or advantage of mine in irrigating the land, but simply as an exhibition to numerous visitors of the inventor's method of lifting liquid from a low to a high level by the power of a steam-engine, or water power at long distances from the point at which the lift is required. Now, every engineer who has ever planned the sewerage of a town must recognize the advantage accruing from the facility of giving good falls to his collecting sewers towards certain man-holes under the streets, wherein, by a simple automatic apparatus, their contents can be made to mount with unerring certainty, some 10, 20, 50, or 100 feet, and then begin their gravitating course towards the outfall, or be pushed on by the same power along a level or rising main in any required direction. Formerly, such a plan would have required a regular pump and motor with attendance on the spot, the expense and inconvenience of which led the engineer to make such lifting-stations only on a large scale, and as quite exceptional aids to gravity. He was thus tempted to be content with flatter gradients than it was desirable or safe to adopt, but as there is no reason why Shone ejectors cannot be placed out of sight under any street or square without interference with traffic, and actuated by power generated by steam or water at any convenient place several miles distant, if necessary, from the several ejectors, the engineer is now free to choose the most favorable localities towards which, as centres, he can give an artificial fall for the collecting sewers of each district where a natural one is not available. Plans and estimates have been prepared for the sewerage of several towns on this system, which show very considerable economy as compared with the unscientific system of the past, so there is no objection on that score to detract from the weight of the sanitary argument for its universal adoption, and I have no doubt that an absolute revenue will be gained by the delivery of sewage proper to the land in a more marketable condition than it has yet been offered to the farmer.

Passing from the pneumatic ejector above referred to, I will introduce to your notice another valuable improvement, combining the most perfect sewer-gas trap with automatic flushing for house-drain or public sewer, which we owe to the same inventor, who, recognizing its analogy with his pneumatic ejector, has called it the hydraulic ejector. Both the pneumatic and the hydraulic ejectors are intermittent in action, collecting and storing for a few seconds, or a longer period of time, whatever sewage is led into them, and ejecting their contents automatically, and with perfect certainty, the moment they become full. The only limit of height to which the pneumatic ejector can project its contents is the air pressure which it is economical to apply; but the hydraulic ejector, as its name implies, is limited by the total fall or head of sewage, and, of course, it is not pretended that it will do more than discharge in one gush what would, if it had been clean water, have flowed down a pipe which had the same fall distributed evenly over its whole length. With dirty water or sewage, however, the advantage of storing up and discharging in gushes, by siphon action, has long been recognized and applied by Mr. Rogers

[1] Abstract of paper read before the members of the Sanitary Institute, by Colonel Jones, at the recent Exeter Congress.

Field, C. E., in his well-known flush-tanks. In circulars describing the original flush-tank of the inventor, its two defects were candidly intimated by the recommendations (1) to throw a jug of water in suddenly to start the siphon action, if the tank at any time failed to discharge itself automatically; and (2) to remove the cover and clean out sediment from the tank occasionally.

Now, servants and others are not always very attentive to the directions of those interested in the regular working of any contrivance, and I think Mr. Shone has taken the very simplest and most practical means for dispensing with the necessity for issuing any directions for insuring the perfect working of his hydraulic ejector by pivoting over it a tumbling-box or basin, which, when filled by a small pipe — say from a sink or any other convenient source — will automatically tumble over and right itself. It is thus evident that when the tank has been filled by the other discharges of the house, or the sewers led into it, the next succeeding overturn of the basin must inevitably start the siphon action, which will empty the tank as effectually as Mr. Rogers Field's jug of water poured in by hand. The second precaution suggested by Mr. Rogers Field has been obviated in an equally simple manner, by starting the siphon from the very bottom of the tank, which shelves down to that point, so that any sediment accumulating there is subjected to the full force of the discharge, and must go out in front of the lighter contents of the tank. Mr. J. C. Edwards, of Ruabon, manufactures these ejectors in the simplest possible manner, by making a fire-clay bottom and cover to fit one of the ordinary 2-feet sanitary pipes, set vertically to form the body of the tank, the siphon being composed of ordinary 4-inch sanitary pipes, cemented together as usual. I should here mention that Mr. Rogers Field has introduced a very ingenious improvement upon his old form of tank, to which alone I have alluded above. This is called the annular siphon, and doubtless works well with clean water or screened sewage in tanks of large dimensions; but, owing to the cubic space occupied by this annular siphon, which must necessarily be deducted from the total internal measurement of the tank, as rendered non-effective for flushing purposes, it cannot, I think, be so economically applied on a small scale, and it is highly probable that the rags and miscellaneous articles always found in unscreened sewage will lodge on the sharp edges presented to the outflow of the sewage, even if the annular space were as favorable for that purpose as the simple pipe usually employed.

## ROOFS AND RAINFALL.

THE capacity of new roofs to withstand a rainy season may be quickly tested by a steady rain of a few days' duration. When oak-timber was plentiful and slating was done under the "measure and value" system, there was seldom need of repair to the roof till the building was literally worn out and the gutters refused any longer to carry off the surplus water. In those days gutters and flats were seldom laid with lead less than eight pounds to the foot superficial; flashings were covered with lead of six pounds; but the era of speculative building, and leasehold tenures have brought with them an entirely new system. In these days, houses built to live in and those intended to let are of different qualities, and there is no more certain method of judging of a well-built house than the examination of its roof. To a non-professional person this may be difficult, but he has always one never-failing means at command, namely, the condition of the upper ceilings. These may show signs of damp spots near the front or side walls, if they do not more plainly and undisguisedly reveal other glaring imperfections in the roof. In the construction of small houses, the utmost carelessness is manifested: the rafters are generally made to span from front to back, and are of the meagrest description; there are no purlins or struts; the slates are brittle and porous in quality, they do not give out a metallic sound when struck, nor bear being easily "holed." In examining the roofs we find them improperly bonded, some slates placed lengthwise, no sufficient lap, no double courses at the eaves, no filleting of cement, and the slates secured by inferior nails of mixed metal.

The operation of covering-in houses in London is one very rapidly performed, and the slater is left pretty much to his own devices. If there be an architect employed he is not always free from blame. A house may be roofed badly, the timbers may be disposed awkwardly and uneconomically; instead of the rafters springing from the walls they may be placed without any reference to them; the ridges and gutters may be disposed so as to form a great receptacle for rain-water and snow on the roof, and flats may be employed unnecessarily. The weakest points in roofs are those where the slating joins a stack of chimneys, where gutters are formed, as behind a parapet, and wherever an interruption takes place to the flow of water. A gutter in the middle of a ceiling, a case of constant occurrence in the metropolis where the party-walls form the ridges, is a direct source of mischief. An incessant down-pour is sure to find out the weak points of the middle gutter, the defective "filletting" or "flashing"; the lead may be worn in holes, the cement fillet may have cracked or have never been properly formed, and the flashing may be an apology for one, yet they all may have answered under the ordinary shower of rain. The perfectibility of our roofs must, in a great measure, depend on the slater and plumber, and their skill and integrity are the only guarantees the builder or tenant has. When, by the covenants of the lease, the tenant undertakes to keep the roof water-tight, a bad roof becomes a serious infliction upon him; even where the landlord agrees to keep in repair the outside of a house, and the roof is constantly needing mending, the tax is one which bears heavily upon the comfort of the one and the pocket of the other.

But the roof has another function besides that of throwing off the rain in a perfect manner: it might be made the gathering-ground for the household supply of water. For country districts, the value of storage has been urged by our leading sanitarians, and in towns its collection, in properly-constructed reservoirs, would diminish the amount of surface-water which deluges the areas and back yards of our houses, or floods our sewers. If we take London, very few houses are provided with tanks, or rain-water butts, and an immense rainfall must necessarily be drained off by the sewers, either directly entering them, or indirectly, by first running over our areas and roads. The inconvenience resulting from a large accession of rainfall is, therefore twofold; it deluges our areas and roadways, as well as choking our sewers. A few days' continuous rain at once forces upon us the serious nature of the matter. Basements are flooded with a dilution of rain and sewage matter, for there are no separate conduits for surface-water, as there should have been, and our roads are rendered impassable in nearly all the low districts. If this immense rainfall could be caught and stored, or even partially, the sewers would not be so overburdened, and the water might be used for many, if not all, of the purposes of the household. If, as we are given to understand, the average rainfall over the British Isles is from 25 inches to 30 inches annually, we can by an easy calculation find out how much might be collected for a house of a certain size. Of course allowance has to be made for certain losses in collecting. A tiled roof wastes about 20 per cent; a slated roof about 10 per cent. This loss is partly by absorption, and by the capillary attraction between the slates, and partly by the splashing over the edges of roofs and gutters. If we take a house of moderate size in a town, say 20 feet by 50 feet deep, we have 1,000 square feet, and at 30 inches rainfall, deducting for loss, a mean daily yield of water of about 30 gallons may be estimated. In dry years this would be reduced, but still there might be calculated a supply of over 20 gallons, sufficient for all ordinary purposes, or as a supplementary supply to other sources.

The question of storage need not be one to present any difficulty; an underground tank is the best, as not liable to great changes of temperature, hot suns, and those impurities to which the butt or cistern overground is exposed. Where an underground tank cannot be constructed, one might be obtained under the roof of the low buildings or offices of sufficient capacity, in which case galvanized iron would be a good material; but where there is ground enough for a reservoir below the surface, a concrete or brick tank lined with ½ inch of Portland cement to prevent all possibility of infiltration, and provided with an intercepting chamber for the pipe from the roof, with manhole, is the best receptacle for storage. For a house of the size we have imagined, a cistern of a cubical capacity of 750 feet would suffice, and, for rough calculation, a shilling a cubic foot may be taken as the cost. It has been recommended that instead of one large reservoir, two or more smaller ones would be desirable, and one of such tanks might be placed in the roof of the house, or sufficiently high to supply the upper floors. We have said nothing about the pitch of roof, though the steeper it is the quicker the rain runs off, and there is less disturbance by the action of the capillarity between the slates; the aspect of the house is the main element in calculating for a supply. Facing a wet wind a roof will catch a good deal; according to one authority (Mr. Wallis, F. M. S.), a flat roof will catch most water in a sheltered position, and a steep one in an exposed position. The main conclusion, however, we wish to draw is that, with a well-organized system of roof-collection, the rainfall instead of becoming a source of flood and devastation, carrying with it wretchedness and disease to our large town populations, might be usefully housed to supplement the present water supply.—*Building News.*

## THE PROPER FORM OF LIGHTNING-CONDUCTORS.[1]

A LIGHTNING-CONDUCTOR, erected for the protection of a building, consists of a ribbon, rod, chain, rope, or other mass of metal attached to the highest point of the structure, and descending to the earth. What shall be the form of this conductor has been a vexed question from the days of Franklin to the present. Shall it be dependent on extent of surface or on sectional area? In other words, does the transference of electricity, when the potentials are so high as to cause lightning discharges, obey the law of Ohm, or is this law modified by the presence of some fresh condition? Snow Harris was a very warm candidate of the surface form. He used flat ribbons for his ships, and tubes for his buildings. Henry, of Washington, believed in the efficacy of surface. According to him, frictional electricity passes at the surface, galvanic electricity through the mass. M. Melsens is found on the same side, and Guillemin, of Paris, led many French electricians to favor the same view.

On the other hand, Faraday almost angrily espoused the opposite side. "As respects electrical conduction," said he, "no advantage is gained by expanding the rod horizontally into a strap or tube. Surface does nothing; the solid section is the essential element."

The advocates of the solid and cylindrical form argue that the lightning-conductor is simply a path by which electricity is transferred from a point of high potential (an electric cloud) to a point of lower potential (the earth), and that its efficacy depends solely upon

[1] Paper read before Section A (Mathematical and Physical Science) of British Association. William Henry Preece.

its resistance. It obeys the law of Ohm, and its efficacy is, therefore, for the same material dependent on its mass and sectional area.

The advocates of surface argue that, as in all cases of static charge, electricity exists only on the surface, so when electricity of "high tension" is conducted away, it is the surface that plays the prime part, and, therefore, the greater the surface the easier the path to the discharge. Again, they say when a cylindrical conductor conveys a charge of electricity, it is raised to a "high tension," and is rendered capable of doing mischief; but with the same charge, the greater the surface the less the density on the surface, and, therefore, the greater the safety. In other words, with a given quantity of electricity, the greater the surface, the less the potential. Moreover, they urge, since, according to Guillemin, currents of electricity flowing in the same direction retard each other with a power varying with the distance separating them, and since a rod may be considered as a bundle of smaller but parallel rods, so a current of electricity may be considered as being made up of many parallel currents, each retarding the other. Hence, a ribbon will conduct better than a rod, because the currents are spread further apart, and retard each other less. These arguments have led to the employment of unsightly ribbons and expensive tubes, which have considerably interfered with the establishment of this very necessary element of safety to buildings.

The arguments in favor of the surface form are, in the opinion of the author, deductions from exploded theories, from imperfect experiments, or from erroneous interpretations of well-ascertained facts. No direct experiments have ever been made to solve the question, as far as the author knows. Quantities of electricity — that is, static discharges from condensers — are in incessant use for telegraphic purposes, and are found to follow exactly Ohm's law, even with the most delicate apparatus. The knowledge of the flow of electricity through conductors, of the retarding influence of electro-static capacity upon this flow, and of the distribution of charge, has become so much greater of late years through the great extension of submarine telegraphy and the labors of Sir William Thomson, Clerk Maxwell, and others, that I question if any English electrician would now be found to argue in favor of the surface form. Nevertheless, ribbons and tubes still continue to be used, and it appeared very desirable to settle the question experimentally. I determined to try to do so.

*First Experiments, June* 28, 1880.

Dr. Warren de la Rue, who is always ready to place his splendidly equipped laboratory at the service of science, not only allowed me to use his enormous battery and his various appliances, but aided me by his advice, and assisted me in conducting the experiments.

Copper conductors, 30 feet long, of precisely the same mass, (*a*) drawn into a solid cylinder, (*b*) made into a thin tube, and (*c*) rolled into a thin ribbon, were first of all obtained. The source of electricity was 3,240 chloride of silver cells. The charge was accumulated in a condenser of a capacity of 42.8 microfarads. It was discharged through platinum wire of .0125 inch diameter, of different lengths. The sudden discharge of such a large quantity of electricity as that contained by 42.8 mf. raised to a potential of 3,317[1] volts is very difficult to measure. It partakes very much of the character of lightning. In fact, the difference of potential per unit length of air is probably greater than that of ordinary lightning itself. It completely deflagrates $2\frac{1}{2}$ inches of the platinum wire, but by increasing the length of the wire, it could be made to reproduce all the different phases of heat, which are indicated by the various shades of red, until we reach white heat, fusion, and deflagration. Hence the character of the deflagration, which is faithfully recorded on a white card, to which the wire is attached, by its scattered particles, is a fairly approximate measure of the charge that has passed, while the length of wire raised to a dull red heat is a better one, for any variation in the strength of the current within moderate limits is faithfully recorded by the change of color.

*Experiment* 1.— Similar charges were passed through the ribbon, tube, and wire, and in each case $2\frac{1}{2}$ inches of wire were deflagrated. No difference whatever could be detected in the character of the deflagration.

*Experiment* 2.— Ten inches of wire were taken, and similar charges passed through. In each case the wire was raised to very bright redness bordering on the fusing point, and in two cases the wire broke. In each case the wire knuckled up into wrinkles, and gave evidence of powerful mechanical disturbance. The same wire was not used a second time. No difference could be detected in the effect through the different conductors.

*Experiment* 3.—Silver wire of the same diameter and length was used, and similar charges transmitted through it. Redness was barely visible, but the behavior of the wire was similar in each case.

The conclusion unhesitatingly arrived at was that change of form produced no difference whatever in the character of the discharge, and that it depended simply on mass.

*Second Experiments, July* 19, 1880.

As it might be urged that the length of conductor tested was so short, and its resistance so small that considerable variations might occur, and yet be invisible, similar lengths (30 feet) of lead — a very bad conductor, its resistance being twelve times that of copper — were obtained, drawn as a wire, made as a tube, and rolled as a ribbon, each being of similar weight.

[1] The electr[illegible] force of the chloride of silver cell is 10.3 volts.

*Experiment* 4.— Charges from the same condenser, 42.8 mf., but with 3,280 cells, were passed through, and the discharges observed on 6 inches of platinum wire, .0125 inch in diameter, which in each case was heated to bright redness. No variation whatever could be detected, whether the wire, the ribbon, or the tube were used.

*Experiment* 5.— In order to form some idea as to how closely we could estimate any variation in the character of the discharge, we used a long piece of platinum wire, and adjusted the lengths until we obtained just visible redness. Then a diminution of 10 per cent, (3 feet) produced a marked change to dull redness, and further excisions raised the temperature to brighter and still brighter red.

The conclusion arrived at was that any change in resistance of 5 per cent, would have been clearly and easily discernible.

It therefore appears proved that the discharges of electricity of high potentials obey the law of Ohm, and are not affected by change of form. Hence, extent of surface does not favor lightning discharges. No more efficient lightning-conductor than a cylindrical rod or a wire rope can therefore be devised.

## THE SANITARY ASPECT OF PLASTERING.

A GREAT part of the interior finish of an ordinary room is composed of perishable, frail, and dirt-holding materials. The ordinary wainscot, which pretends to be a plinth, is a kind of wooden shell fastened in front of the wall, the space behind which forms a parade-ground for mice when they get into a house, which they constantly do when they find such commodious arrangements made for their privacy and security. A well-executed wainscot, carried full above "chair-back height" round the wall, or a completely wainscoted room, each has a good effect, though it may be doubted whether the latter forms the healthiest lining to a room. When the expense of so costly an adjunct can be gone to, there is a possibility that the work will be solidly put up; but the ordinary house wainscot is a mere piece of joiner's sham, worst of all when, as is often done, there is the silly pretence of a sub-plinth to it, of course, in another separate piece set on. A solid piece of thick wood, with the moulding worked out of it, and fixed close against the wall, would be a very different affair, though one can hardly, even in that case, see the absolute necessity of the addition; but where this cannot be afforded, it would be far better to be content with merely a solid rail of wood, with a concave quarter-circle moulding run in it, so as to connect the lines of the floor and wall by a small curve, which can be easily swept, instead of allowing them to form an angle where dust and dirt will lie in a way difficult to remove. This is assuming the existence of a plastered coating on the wall. It seems a quixotic undertaking to tilt at plaster, which has enjoyed so long a life as the accepted internal coating of walls; and we may be asked what we would propose as a general substitute for it, and may admit that consistently with necessary economy, it is, perhaps, not so easy to say. But it is quite certain that a model wall-finish ought to have one of two qualities; it should be capable of being easily and thoroughly cleansed, or it should be capable of easy renewal. Plaster has neither characteristic. It holds a great deal of dirt, and can hardly be cleaned at all, and it cannot be renewed without much trouble, dirt, and expense, and emptying the house or the apartment for the purpose. For hospitals there is not so great an objection, because in every well-regulated hospital every ward should be empty for a time by rotation, and the plaster could be chipped off and renewed during that period, if medical sanitarians think (and some of them do) that this entire removal of the lining of the ward is the only way to disinfect it thoroughly. But such a proceeding cannot be conveniently undertaken in a private dwelling-house. In a majority of houses the resource is papering, and, artistically speaking, a great deal may be said for papering as a means of producing an agreeable effect in an inexpensive manner, and a great deal of very good decorative art has of late years been applied to the design of wall-papers. But papers, like plaster, come under the denomination of materials which can neither be well cleaned nor easily changed, and which absorb and hold a great deal of unhealthy matter. They are, of course, much more easily renewed than plaster, but the temptation in cheap house property which is not very well looked after to lay one paper over another is very great, and is often indulged; and nothing can well be more deleterious to the healthiness of the room than this; and stripping off and repapering, though much simpler than replastering, cannot be done often enough to ensure a really clean and healthy state of the walls. There appear to be three courses open to us. One is the employment of Parian cement, or some other hard and washable cement, as the interior lining for walls, when nothing is to be placed over the surface. In the poorer class of houses which are not papered, the plaster surface is one of the worst in sanitary condition, and even in unsightly appearance, after a certain term of occupation, which could be found. Mere lime-whitening, if the wall is a sound one, is a much better and healthier finish, though certainly not agreeable in aspect, and is easily renewed. Where Parian or other cement is deemed too expensive (although nothing ought to be considered too expensive which concerns the actual healthiness of a habitation), and where lime-wash is considered too rough, coating the plaster with such a preparation as silicate paint, which will bear washing, is a great improvement on papering, or on the ordinary paints. In houses of the best class there remains the alternative of building the inner faces of the walls with solid materials of a high class, such as glazed brick or some of the numerous terra-cotta materials which are now offered to the choice of those who build. There is then something perfectly capable of being cleaned, provided always that it must not have surface decoration which is too deeply cut and which would leave hollow places where dirt would collect, and which would be difficult to clean satisfactorily. If such an internal finish be thought too cold for this climate, then there is the resource (we are now speaking of habitations where expense is not a primary consideration) of hangings which can be easily taken down and put up again, changed, cleaned, or renewed, which can be removed from the room when not in use and thoroughly aired. There is the question of picture-hanging to be considered, of course, in a majority of houses. When some material can be strained close to the walls when hung, pictures can be hung over it (as at the Grosvenor Gallery), or a very good effect, combined with warmth and comfort, may be produced by tapestry or other hangings on the lower part of the wall, with the solid interior surface left above a certain level as a background for the pictures. The object which runs through all these suggestions is the same, — to have the walls of our rooms either of such material, if permanent, as can be efficiently cleansed without injuring it, or hung or fitted with such decorative material as can be easily removed and cleansed or replaced as often as the greatest attention to sanitary conditions demands. Now the fact is that nearly all inhabited rooms are at present finished internally in a way which precludes the observance of either of these conditions. With impervious walls, however, let it always be remembered that ventilation must be more especially attended to.

Plaster is an insidious tempter also in the excuse it gives for those foolish and unmeaning ornaments which are called plaster cornices, and which are made worse by being "enriched" with ornaments usually questionable in design, always perishable in material, and almost always contrived so as to hold a quantity of dust, dirt, and soot, which is never dislodged. It is not easy to say whether this superstition of the plaster cornice arose in the first instance from the idea that every internal wall must have a plinth at the bottom and a cornice at the top, because the external wall has; or whether the plaster cornice is a kind of reminiscence or suggestion of a corbel to carry the floor above. Whichever be its origin, it is equally unmeaning. There is perhaps no part of the internal economy of our buildings which is more marked by the spirit of the jerry-builder than the junction of walls and floors. A large and pretentious plaster cornice, with its wooden backing or bracketing, is really a process of hanging a quantity of stuff on to the walls at that point, in a form which simulates that of a bracket bearing on the walls and supporting the overfloor. The reasonable and solid way of doing the thing would be to project a corbel, say of terra-cotta, built into the walls, and projecting sufficiently into the room to give a bearing for the floor-joists over; and this would form the finish of the wall-surface and fill up the angle between it and the ceiling.

The ceiling is a question by itself, being as it is under different statical conditions from the wall-surface, and depending even more than that on the principal of construction and the material that may be employed in bridging the space from wall to wall. When wood flooring is employed, the simplest way, no doubt, is to leave the joists open, and varnish them and the under side of the flooring-boards, which, in such case, should be thicker than usually employed, and, of course, grooved and tongued. But this is bad in the way of light, and, moreover, does not sufficiently dampen sound between the room above and the room below. What is quite certain is, that to underdraw the joists with lathing and plaster is one of the worst methods that can be employed. The plaster reflects light, it is true, but it also collects and renders peculiarly visible all dust from occupation of the room and soot from combustion; it cannot be cleaned except by the process of rewhitening it, which means shutting up the room for some days, and the plaster is a material peculiarly liable to crack under the shaking of the joists from traffic in the room above. We have before now drawn attention to and explained the small phenomenon which most people have noticed, especially in small rooms where much gas and coal is burned in proportion to the area of the room, of the lines of the joists showing on the plaster ceiling in lines rather whiter than the rest of the plaster. The appearance results from the fact that in interspaces between the joists, the porous plaster receives and retains a great amount of soot and dust, which seems to work its way right into the plaster, but which does so less readily where the plaster has the solid backing of the joist immediately over it. The shaking of the plaster may no doubt be obviated by placing it on separate ceiling joists, but what an amount of perishable material and what holiday spaces for vermin this involves. A wood ceiling, is, of course, much superior, but rather dark, and decidedly costly if well done. A well-known firm of decorators have patented a form of enamelled-iron ceiling material which offers some advantages, and can be affixed to wooden joists. The specimens we have observed have been tawdry in design, but this need not be so, and the material appears capable of such treatment as to reflect as much light as a plaster ceiling, and to be capable of ready cleansing. But it is a matter for serious consideration whether some of the various methods of solid floors of iron and concrete, or other materials, should not be far more used than they are, even in ordinary dwelling-houses. They possess the immense advantages of solid construction, — no internal hollows and dark recesses; they are more sound-proof and more safe against fire than timber floors, and they are capable of being finished as ceilings in a way perfectly capable of cleansing as often as is thought desirable. In the case of rooms of the better class, a very good effect might be got by dividing a concrete and cemented ceiling into low domical sections. In houses of the poorer class, and with smaller rooms, concrete floors can be so easily and cheaply applied, even without any iron in the case of small rooms, and are so much more conducive to good sanitary conditions and constant cleansing, that they seem to be the most natural method for use in this class of property. There is an objection to concrete floors on account of want of warmth and of the elasticity of a wooden floor. In the case of poor houses in crowded districts, however, the sanitary advantages of a washable floor (if utilized) greatly overbalance these drawbacks: in the case of houses of a superior class wood flooring-boards can be laid down on bearers over the concrete floor, and in that case could be laid so as to be easily removable for thorough cleansing of the structure, so as not to leave any long accumulation of decaying matter between the boards and the cement floor. — *The Builder.*

## THE ELECTRIC LIGHT IN LONDON.

AN interesting exhibition took place at North Woolwich on Monday, September 27, in the Royal Albert Docks. This exhibition will probably mark the day to which hereafter historians will refer as the date when the electric light was, within the precincts of London, brought for the first time into use for an exclusively public and practical purpose. Of course, many illuminations have been witnessed within the past year or two whereby the usefulness and the merits of the new invention were fully brought out, but hitherto the exhibitions, at least out of doors, have more or less borne an experimental character. Within doors the electric lamp has replaced the old gas jet at a large number of establishments. For instance, it found favor in Printing House Square with the proprietors of the *Times*. It has worked satisfactorily in a number of London warehouses. A large mercantile house in Watling street, whose premises were destroyed by fire some two years ago, now prefer electricity to gas. Among the railroad stations that of the Great Eastern must be mentioned, where the electric lamp is in practical use. The lamps on the Thames Embankment form one of the experiments. And the test to which the light has been exposed has induced the Corporation of the City of London to invite tenders, with a view of permanently lighting up by electricity the embankment, the adjacent bridges, and furthermore, the streets radiating west from the Mansion House, viz., the Poultry, Cheapside, Queen Victoria Street and some others. With reference to the exhibition on Monday last the main feature in connection with it is that in future ships may load or unload at all hours, day and night.

The Royal Albert Dock forms part of those gigantic works constructed by the Directors of the London and St. Katherine Dock Company. In fact it is an extension of the Victoria Docks which as a whole were, by her Majesty's permission, named the Royal Victoria and Albert Docks. The basin of the Royal Albert is four hundred feet wide, and one mile and a quarter in length. This entire space was, on Monday, lighted by means of electric lamps, twenty-seven in number, placed on latticed iron poles nearly eighty feet high. The lamps are of a new and ingenious construction, calculated to resist the influence of the severest weather. The illuminating power is produced at four stations, judiciously distributed as required over the dock-grounds. At each of these stations engines of twenty (nominal) horse-power are at work in connection with Semmes's dynamo-electric machines. The lamps are provided with carbons of sufficient power to burn during sixteen hours, while the lights in the sheds are of smaller compass. Unfortunately, some blundering occurred on Monday which tended to mar the intensity of the effect which the exhibition produced on the mind of the visitor. In reality, ample evidence had been adduced at the outset, of the completeness of all arrangements. The steamer Garonne, one of the huge Australian packets belonging to the Orient Line, had arrived in the river and was docked by means of the electric light. The feat was accomplished with the greatest ease, and proved at once the wisdom and prudence exercised by the dock management in availing themselves of the new invention. Not only was the steamer berthed, but the passengers were enabled to land, their baggage being examined, notwithstanding the advanced hour of the night, by the aid of a number of lights placed under the sheds. The illumination in and out of doors was nearly equal to daylight, permitting the transaction of business without hindrance. — *New York Herald.*

## PURIFYING AIR.

CHICAGO, Nov. 12, 1880.

TO THE EDITOR OF THE AMERICAN ARCHITECT: —

*Sir*, — Has not some one invented a process by which impurities, such as unconsumed carbon, can be removed from air-supply to heating furnaces, or air for ventilating apparatus?

We are much in need of something of the kind in this city.

Yours truly, TREAT & FOLZ.

[The ordinary method used by engineers for purifying air supplied to rooms is by filtering it through some fibrous substance, as cotton or wool. It is very common to insert in the cold-air boxes of furnaces a screen made by enclosing a layer of wool fibre between two sheets of wire gauze. Cotton would answer the same purpose; either will strain out floating impurities, even microscopic dust, as readers of Tyndall will remember, and the screens, if set vertically, are not likely to get clogged for a long time, while they oppose very little resistance to a gentle current. — EDS. AMERICAN ARCHITECT.]

## NOTES AND CLIPPINGS.

The American Institute of Architects. — We would again call attention to the approaching convention of the American Institute of Architects, on Nov. 17th, to be held in the rooms of the Supreme Court in the new Public Buildings, Philadelphia, according to the circulars issued. Much interest ought to be shown in the proposition to change the constitution as relating to the federal union now existing between the Institute and its Chapters and all those who are for or against such change should be heard. The forthcoming report of the Board of Trustees will be looked for with interest as touching this matter and it will also suggest some important changes with a view to increase the interest of members and the profession at large.

Overcrowding in the National Library, Paris. — The French National Library in Paris is at present burdened with 2,078,000 volumes, the largest number in any one library in the world, and more than twice as many as there are in the next largest, the British Museum, which has only 1,000,000. This vast accumulation is due to the French law, which requires the deposition of a copy not only of every work that is issued from a French press but a copy of every edition of a work. The consequence is that the duplicates of popular books are enormous; the library not being allowed to sell any of those it may consider superfluous. There are consequently over eighty copies of "Nana" on hand, and Noel and Chapsal's grammar needs a room all to itself.

A Concrete Church. — In proof of the possibility of churches' being built entirely of concrete, without even timber for the roof, the *Antiquary* mentions that there is, or was till lately, such a building, which was originally intended for religious purposes. It is a very small chapel, situated on the Denbighshire coast, near the Colwyn station on the Chester and Holyhead Railway. Close to it is a weir on the sands, and the chapel was built for the parish priest to say mass in daily for the success of the fishery. Its dimensions are of the smallest — perhaps about 10 feet by 6 feet. The roof and walls are alike of concrete. It is quite dismantled, and has not been used from time immemorial. The vicar of Llandrillo-yn-Rhos received a rent-charge, in lieu of the tithes of the fish, for officiating.

The Cathedral of St. Magnus. — The object of greatest interest in the Orkney Islands is the Cathedral of St. Magnus, at Kirkwall, which dates from the twelfth century, and is still entire and in an excellent state of preservation. In the sixteenth century it was extended both towards the east and towards the west, the same material being used as in the original structure — namely, old red sandstone, which abounds in the islands. Haco, King of Norway, who died in the adjoining bishop's palace in 1263, was buried here, as was also Margaret, the Maid of Norway, who died here on her way to Scotland in 1290. One of the finest features of the cathedral is the western doorway, in which there are the remains of some very fine carving much effaced by atmospheric action. A striking effect is produced by alternating yellow with red sandstone in the pillars and mouldings.

Turner's Influence upon Water-Color Art. — The main influence of Turner's work upon later water-color art has been rather that of a liberator than a law-giver, and it is necessary to dwell strongly upon the assertion that, great as this painter was — with a greatness, indeed, which, like that of Shakespeare, makes all words of praise seem little better than an impertinence — yet he has founded no school — has had on the whole no followers. His services to English art have been tremendous, but rather of the kind which uproots tradition than that which founds a school; and I doubt whether any considerable section of English artists are at the present day working upon the same lines as our greatest landscape-painter. The truth is, that while Turner, in one sense, stands at the head of modern art, he, in an almost truer sense, comes at the tail of ancient art, he closes an epoch almost more than he inaugurates one.—*Cornhill.*

Rhenish Bridges — Work has recently been commenced upon the fixed bridges over the Rhine at Mayence, the only means of crossing, with the exception of the railway a mile or more above the town, having hitherto been by pontoons. This is of importance for the city, as twice during the last winter, at the breaking up of the ice, all connection with the opposite shore was cut off. To give, for the present, a navigable depth of water, the stones and posts of the old bridge between Mayence and Castell, built by Charlemagne, are being removed from the bed of the river. Between 796 and 803 A. D., this emperor caused a wooden bridge to be built over the Rhine upon twenty-five piers, which was subsequently struck by lightning and burnt to the level of the water. The numerous boat-mills at this place have been anchored to its piles. Up to this time about fifty of these piles, each from fifteen to twenty feet long, have been lifted from the bottom of the Rhine. The oak wood, a thousand years old, is still so well preserved that it can be employed for carpentry-work, and even the iron found in the posts, which is covered by only a thin coating of rust, is fit for service.

Pergamon. — Excavations in Pergamon have recommenced since the return of Mr Humann to the site, and additional parts of the altar have already been found. A decision as to the future location and exhibition of the treasures is withheld by the Prussian government until a total summary of the collected objects is possible, the marbles already unearthed, referred to by papers in Nos. 237 and 239 of the *American Architect*, are at present deposited in the old Museum of Berlin.

Art in San Francisco. — What's the use — what on earth, we say, is the use of talking about art culture in San Francisco, when it is an open secret that a certain rich mining man recently sent to Florence for a copy of the Venus of Milo, and when the statue was delivered actually sued the Central Pacific Railroad Company for mutilating a work of art, and, what is more, recovered large damages. — *San Francisco Post.*

A Large Picture-Frame. — An unusually large frame, for a gigantic picture by Hans Makart, is described in the *Academy*. It measures thirty feet by twenty, and is of solid wood, richly gilt and ornamented with bunches of grapes and vine leaves in full relief. Some idea of its size and solidity may be gained when it is mentioned that it absorbed sixty-six planks of wood, and that the part exhibited — namely, one side twenty feet long, and parts of the top and bottom each five feet long — weighs two tons. The subject of the picture for which the frame was designed is "Bacchus and Ariadne."

An Efficient Clock. — One of the most efficient and wide-awake clocks in the country is in the possession of Darius L. Goff, of Providence, R. I. It is nearly 200 years old, but has been improved from time to time so as to keep pace with the march of modern ideas. Occupying a position in the front hall of the house, it regulates the entire household. The front door, as it is opened and shut during the day, performs the work of winding. Within the dial is an ingenious mechanism by which the light in the front hall is turned up as darkness comes on, and again is lowered at the orthodox bedtime. At dawn, when it is time for the servants to bestir themselves, the clock rings a bell in the back hall summoning them to work. An hour later a bell in the front hall warns the family that it is time to rise, and half an hour later, the peal of the bell summons them to breakfast. Besides these arrangements the clock is connected with another in Mr. Goff's sleeping-room, whereby the two are struck simultaneously.—*New York Tribune.*

Employers and Architects. — "The abominable ugliness of our towns," says the London *Academy*, "and the badness of our architecture generally, is a theme upon which some men never tire of expatiating, and some would mend matters by abolishing the whole tribe of architects. But the fault lies with the employers, and until they can learn to know good work from bad we must not expect much improvement. Any man who wants good architecture, and knows what it is, may now have what will bear comparison with the best in times past; and the reason why we do not see more of it is that most of the employers are either entirely indifferent about the matter or deliberately prefer the bad. If an architect is employed at all on a private building he is generally chosen for any reason rather than his artistic ability; and most public ones are put to competition, which almost certainly prevents them from getting into good hands. The men who have the selection cannot recognize a good design even if — what, indeed, does not often happen in a competition — there should chance to be one among the number sent in. So far does this ignorance extend that even a body of artists like the Royal Academy so bestows its architectural honors that they must often be regarded as the rewards of commercial and not of artistic success."

A Source of Danger to Canterbury Cathedral. — A few years ago Canterbury Cathedral was almost miraculously saved from destruction by fire. Precautions were taken by the Dean and Chapter to prevent accidents, and visitors were prohibited from ascending the great tower. But a visitor who has contrived to make the ascent says, that danger results from that prohibition. Dry twigs and rubbish have been allowed to accumulate on the winding stairs, and in fact the upper parts of the building are apparently uncared for. "It was often a cause of some anxiety," says the writer, "to know how to find a foothold, owing to the vegetable *débris* forming an almost continuous, yielding slope; and all this inflammable material, which I am satisfied would kindle at a spark, is said (I doubt not, truly) to be brought in by jays and other birds, which make their nests in these quiet localities, to which they gain access through the air-holes left in the walls by the architect. I should be sorry at present even to be required to light a match in the turrets, so charged does the atmosphere appear to be with combustible material." There may be some exaggeration in the account, but the writer deserves thanks for pointing out what may be a source of danger to the cathedral. On the occasion of the last fire the public were not satisfied that the authorities had been careful in adopting means for the protection of the building.

The Nude in Art. — After the recent discussion upon the "Nude in Art," at the Social Science Association, and the remarks of the President (Professor Richmond) upon the peculiar interpretations of the nude which at times find their way into the Paris Salon, the following remarks of M. Francisque Sarcey upon this subject may, says the *Architect*, be of interest. When expressing his regret at the growth of what has been termed the *littérature pornographique*, which has dishonored journalism, more especially for the last five or six months, he says: — Between the Tahitians, whose clothing is of the scantiest kind, and the English, who would like to see the legs of the piano put into breeches, there is an infinite distance. However, there exist in life a number of circumstances where nudity of body is compelled to show itself, and he asks, is a horror of the nude — which is his definition of shame — consistent with these necessities? It happens that modesty is never shocked when it shows itself for any other object than its own display. A sick woman exhibits her body to the physician without any one dreaming of being offended thereby. A woman poses before a number of men, and hides herself at the entrance of a stranger. The artists see the beauties of the model, the stranger the nudities of the woman. Carry this reasoning into the arts, and you will see how it becomes easy to recognize a work which justly offends one's modesty, and that which is chaste. Whenever the artist seeks in the study of the nude some conception of an æsthetic kind, and not the simple exhibition of the nude, which offends us, his intention is apparent, and this intention serves as a covering to the nudity. — The following incident concerning the painter Gustave Courbet was told by M. Sarcey on the occasion of his denunciation of the element in French journalism referred to. M. Courbet had exhibited at the Galerie de Khalil-Bey some works of rather a free nature, which he had not hesitated to sign. "People paint nude angels," said he, "but who has ever seen an angel? What is it I have done, after all? Drawn the nude; the nude is never indecent." "No, but the *déshabillé* is," replied a friend; "and that is what is observed in your picture!"

# BUILDING INTELLIGENCE.

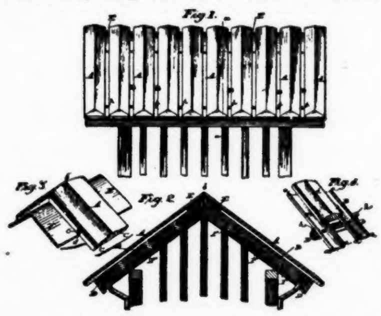
[Reported for The American Architect and Building News].

[*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.

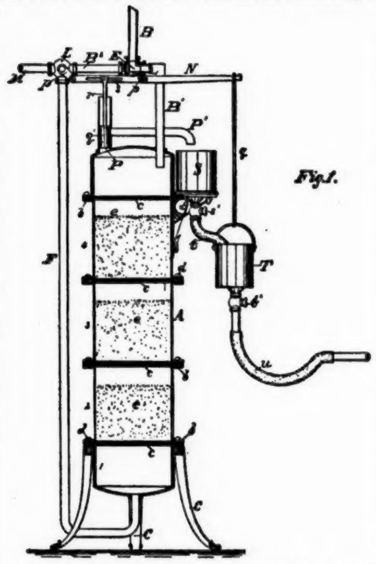
[*Printed specifications of any patents here mentioned, together with full detail illustrations, may be obtained of the Commissioner of Patents, at Washington, for twenty-five cents.*]

232,643. ROOFING. — Hermann W. Hoeft, La Crosse, Wis. Fig. 1 is a side view. Fig. 2 is a vertical section on line *x x* of Fig. 1. Fig. 3 shows the cap-plate covering the ridge of the roof in its relation to the planks. Fig. 4 shows the planks in their relation to the tin strips and gutters. The object of the invention is to provide a simple, cheap, durable, and thoroughly water-proof roof adapted to the rapid discharge of water from its surface. The invention consists in the combination with the roof-timbers of strips of heavy plank placed a short distance apart, beveled on top, and longitudinally grooved underneath, near their edges, and united in parallel rows by narrow strips of tin or other suitable metal, whose edges are turned up to enter the grooves in the planks before mentioned, the ridge of the roof being covered by a cap of metal whose edges are turned up and enter transverse grooves in the roof-planks. The tin strips constitute a part of the covering of the house, and they carry off nearly all the water, owing to the beveled form of the planks.



The water is more rapidly carried off than if it ran down the whole length of the planks to the eaves. The water runs on the wood but little more than half the width of each plank before being discharged onto the tin and carried to the gutter. The wooden portion of the roof consists of lengths, A, of plank, of such length as to reach from ridge to eaves, including such projection of eaves as may be desired. These pieces are to be five and one-half to seven inches wide, beveled on the top, so as to form a ridge on each piece, and rounded at the edges, and provided with grooves, C C, on the under side, to receive the edges of the tin strips B. These planks should be placed one-half to three-fourths of an inch apart. Under them, and occupying the spaces between them, are long strips of tin, B, extending the same length, from peak to eaves. The tins B are turned up at both edges, *a a*, and these are inserted in the grooves C C before mentioned. The surface of the tin is plain, except that where the gutters D D are under the projection of eaves there are holes, *h h*, to carry the water into the gutters. The upper ends of the planks are mitered together at *b*, so as to obviate the necessity of a ridge-board over the wood; but there is a tin ridge over the tin strips B and under the planks A. The grooves C, in which the tins are inserted are to be three-sixteenths to six-sixteenths of an inch deep and three-eighths of an inch from the edges of the plank, according to the pitch of the roof, the creases to be more or less deep, a slight pitch requiring a deeper crease, so as to prevent accumulations of water and snow from setting back over the turned-up edge of the tin. This form of roof will require cross-rafters, F, as well as hip-rafters, G. The tin peak-board E is also to be crimped and turned up, the turned-up edges *c* to be received in transverse grooves *d* in the plank, as clearly shown in Fig. 3. The gable-cap E is turned up and cut out alternately, to fit first the wood strips A, and then the tin strips B, so that there is no turn-up or crimp in the tin spaces between the wood strips.

232,735. FILTER. — Benjamin T. Loomis, Baltimore, Md. — This invention provides an automatically self-cleansing filter. The filter case is made of as many cylindrical sections as may be necessary. Between each pair of sections before they are bolted together, is adjusted a filter plate *c*, and upon this is poured the filtering material, sand, gravel or charcoal, as the case may be, until the compartment is nearly full. The water to be filtered enters the top-most chamber through the pipe B′ and after filtering is drawn off from the bottom through the pipes F and M. Two two-way cocks E and L regulate the inflow and outflow of the water and are connected by the bar N, whose movement actuates the lever arms of these two cocks and opens or closes the pipes. An outlet pipe P at the top of the filter is fitted with a plunger *q′* which is connected with the bar N and by its rise or fall moves this bar and consequently the valves E and L. This pipe P discharges into a reservoir S which in turn empties through a cock *s′* into another reservoir T which is suspended from the end of the bar N. The operation of the filter is as follows: First, the cock *s′* must be adjusted to discharge the contents of the receptacle S when filled in a given time — say, in one hour or in two hours, and cock *t′* should be similarly adjusted to discharge the contents of receptacle T. The water entering from B′ is filtered, and the filtering will continue as fast as the fluid is drawn off from pipe M, until the settling or packing of the filter material or the accumulation of impurities causes a resistance to the passage downward of the fluid that is greater than that caused by the weight of the receptacle T and bar N on the valve-plunger *q′*, when the pressure of fluid from the source of supply will force the plunger *q′* up, opening the connection to the waste-pipe P′, and at the same time turns the cocks E and L, thereby di-



recting the inlet-current to the bottom of the cylinder. The fluid entering below under pressure forces its way up through the filter material in each compartment, thus relieving it from its packed and settled condition, and a continuance of the upward pressure serves to raise the material and thoroughly loosens it throughout, and in this very loose condition the liquid passes up freely, and the impurities which have accumulated are promptly purged, finding escape through pipes P and P′ into receptacle S. The cock *s′* permits the dirty fluid to escape slowly into receptacle T, where the additional weight of the fluid operates to draw down the bar N, and changes the cocks so as to let the fluid enter from pipe B′. When all the dirty fluid has escaped from both receptacles the pressure within the cylinder from the source of supply will force the plunger *q′* up again, as just described. The difficulty heretofore experienced in freeing filters of the impurities which accumulate in the filtering material has been owing to the fact that the filtering-material compartment, formed by a perforated plate above and below, has been packed full, no space being left between the filtering material and the perforated plate above it to admit of the raising, separating, and thorough loosening up of the filtering material. As a consequence, the reversal of the fluid-current carries off only the impurities which are collected upon the surface of the mass of filtering material; but such impurities as have penetrated into the body of the filtering material are not purged.

234,114. SERVICE-BOX. — James E. Boyle, Brooklyn, N. Y.

234,126. SHUTTER-FASTENER. — Randolph Hayden, Middletown, Conn.

234,177. CURTAIN-FIXTURE. — Jos. Darling, Peachville, Penn.

234,190. METHOD OF GENERATING ARTIFICIAL HEAT. — Benjamin N. Heustis, Phelpstown, N. Y.

234,232. HOT-AIR FURNACE. — Oliver Bryan, New York, N. Y.

234,287. WASTE-WATER GUARD FOR WATER-CLOSETS. — George Jennings, and Geo. Jennings, Jr., Stangate, Eng.

234,288. WATER-CLOSET. — Geo. Jennings, and Geo. Jennings, Jr., Stangate, Eng.

234,304. PIPE-TONGS. — Charles H. Louvrien, Erie, Penn.

234,313. DERRICK. — John McMyler, Cleveland, O.

234,317. BLIND-SLAT ADJUSTER. — John H. Monk, Brooklyn, E. D., N. Y.

234,369. — HOT-AIR REGISTER. — Geo. W. Bucher, Waverley, Md.

234,370. BOARD-FASTENER. — Nikolaus A. Hoernes, Chicago, Ill.

234,373. AWNING. — Dwight S. Richardson, Brooklyn, N. Y.

### Baltimore.

BUILDING PERMITS. — The following building permits have been issued since the last report:

Wm. Davidson, addition and improvement to building, s e cor. Lancaster and Wolf Sts., 35′ x 120′.

Henry P. Horn, three-st'y brick building, East St., between Douglass and Low Sts.; three-st'y brick building in rear.

Gabriel D. Clark & Co., 4 three-st'y brick buildings, 16′ front each, s w cor. Edmondson Ave. and Mount St.

James Turner, 3 three-st'y brick buildings, n w cor. McCollough and Wilson Sts.

17 permits were issued for the week.

STORE. — Mr. Chas. Bein is about to erect a handsome store and dwell., on Lexington St., near Charles St., 20′ x 74′, three stories high; to be of press brick, and have Indiana stone trimmings; cost, $7,000; Mr. Wm. F. Weber, architect.

NEW PARK ENTRANCE. — All the preliminaries have been arranged for the erection of a new entrance to Druid Hill Park, on Eutaw Place. It is proposed to go to work promptly on the entrance.

SCHOOL-HOUSE. — An ordinance has passed both branches of the City Council. appropriating $15,000 for the erection of a school-honse in the southern section of the city, for the accommodation of the school on Hamburg St.; also, an ordinance appropriating $23,0(0 for the improvement of Chatsworth Run sewer, between Baltimore and German Sts.

ICE-HOUSE. — Mr. Wm. F. Weber, architect, is preparing drawings for a new ice-house and storage-loft, on Ramstead's Wharf, for Messrs. Gogel and Woodward, 50′ x 150′; cost, $9,000.

### Boston.

BUILDING PERMITS. — *Brick.* — *Coleman St.*, cor. Bellevue St., for Geo. H. Wells, 1 dwell. and stores, 22′ x 40′, two stories; Geo. H. Wells, builder.

*I St., Nos.* 98 *to* 100, for Mrs. Hannah Stark, 2 dwells., 20′ x 44′; Wm. Stark, builder.

*I St.*, cor. East Fourth St., for Mrs. Hannah Stark, 1 dwell., 22′ x 40′; Wm. Stark, builder.

*Unnamed St.*, opposite Beaver St., John L. Gardner, Jr., 1 stable, 38′ x 55′; Woodbury & Leighton, builders.

*Marlborough St., Nos.* 381 *to* 391, for George Wheatland, Jr., 6 dwells., 23′ x 42′, two stories, mansard; Vinal & Dodge, builders.

*Washington St., No.* 2080, for Owen Nawn, 1 hay and grain store, 25′ x 75′; Otis S. Pierce, builder.

*Wood.* — *Circuit St.*, cor. Regent St., for G. L. Thayer, 2 dwells., 17′ 6″ x 30′, two stories, mansard; J. W. Lord, builder.

*Monroe St., Nos.* 49 *to* 51, for David H. McKay, 2 dwells., 22′ x 32′, two stories; David H. McKay, builder.

*Zeegler St., No.* 115, for James P. Ingols, 1 dwell., 21′ x 28′, two stories; Henry S. Locke.

*Geneva Ave.*, near Blue Hill Ave., for S. Walter Wales, 1 stable, 60′ x 60′; Wood. S. Murray, builder.

*Hampden St., No.* 190, for Frank W. Willey, 1 hay and grain store, 30′ x 35′; Robt. H. Clouston, builder.

*Haywood St.*, near Warren St., for Eben F. Brown, 1 dwell., 22′ x 31′, two stories; Eben F. Brown, builder.

*Dorchester Ave.*, cor. Centre St., for Ira A. Medlery, 1 dwell., 22′ x 32′; two stories; Ira A. Medlery, builder.

*Washington St.*, near N. Y. & N. E. R. R., for Wm. G. Dolan, 1 dwell., 23′ x 46′, two stories; Geo. G. Lown, builder.

HOUSE. — A dwelling-house is being built on Marlborough St., for Otis Norcross, Jr., from plans of N. J. Bradlee & Winslow, architects. It is three stories high, front of brick, with carved brick trimmings. T. Y. Whidden & B. D. Whitcomb, contractors.

### Brooklyn.

BUILDING PERMITS. — *Margaretta St.*, s s, 192 feet west of Bushwick Ave., 3 two-st'y brick dwells., 18′ x 40′; cost, about $4,000 each; owner, George D. Wallace, Jersey City; architect, J. E. Styles.

*St. Mark's Ave.*, s s, 250 feet east of Carlton Ave., 5 three-st'y brown-stone dwells., 26′ x 50′; cost, $7,500 each; owner, etc., J. E. Styles, 415 First St.

*Throop Ave.*, e s, abt 50 feet south of Monroe St., 2 two-st'y brick dwells., 17′ x 35′; owner, Patrick Butler, 364 Hart St.; builder, P. J. Canavan.

*Throop Ave.*, cor. Monroe St., 3 two-st'y brick dwells., 16′ 8″ x 36′; cost, $3,500 each; owner, Patrick Butler, 364 Hart St.; builder, J. J. Canavan.

*Seventh St.*, s s, between Fifth and Sixth Aves., 6 two-st'y brown-stone dwells., 18′ 4″ x 40′; owner and builder, Patrick Mullady; architects, Parfitt Bros.

*Norman Ave.*, n s, 50 feet east of Manhattan Ave., 3 two-st'y frame dwells., 16′ 8″ x 40′; cost, $2,575; owner, Catharine Schenck; architect, Stephen M. Randall; builder, G. J. Roberts and S. M. Randall.

*Monroe St., Nos.* 255 *and* 257, n s, 225 feet west of Marcy Ave., 2 two-st'y brown-stone dwells., 20′ x 43′; cost, $4,000 each; owner, etc., F. C. Vrooman, 444 Gates Ave.

*Rutledge St.*, n s. 122 feet east of Bedford Ave., 3 two-st'y brown-stone dwells., 19′ 6″ and 22′ x 40′ and 42′; cost, $4,000 each; owner, Jas. Sheridan, 216 Lee Ave.

*Schermerhorn St.*, cor. Smith St., 4 four-st'y brown-stone flats, corner house 26′ 9″ x 22′ x 73′, two fronting on Schermerhorn St., 23′ x 64′, and one fronting on Smith St., 25′ and 20′ x 49′; owner, F. Augustus Schermerhorn; architects, Parfitt Bros.; builders, Lee & Martin.

*State St.*, cor. Hoyt St., 8 three-st'y brick dwells., 17′ 9″ and 18′ 3″ x 44′; owner, A. P. Preterre, 130 West Twenty-Second St., New York; architect, John Correja; builders, J. Demott & Son.

*Rogers Ave.*, w s, 80 feet south of Prospect Pl., 6 two-st'y brick dwells., 16′ 8″ x 45′; owner, George Nichols, 619 Warren St.

*Noble St., Nos.* 76 *and* 78, s s, 100 feet west of Franklin St., 1 one-st'y frame storage, 50′ x 100′; cost, $2,000; owners, Abendroth & Root; architect and builder, S. F. Bartlett.

*Pulaski St.*, n s, 300 feet west of Tompkins Ave., 1 three-st'y brick dwell., 20′ x 40′; cost, $1,000; owners and builders, R. & E. W. Phillip, 109 Kesciusko St.; architect, E. W. Phillip.

*Classon Ave.*, e s, 268 feet south of Flushing Ave., five-st'y brick factory, 82′ and 63′ 4″ x 100′; cost, $30,000; owners, The Tucker & Carter Cordage Co., 70 South St., New York; architect, A. V. B. Bush; builders, Charles Long and B. Banks.

*Washington Ave.*, e s, 100 feet north of Lafayette Ave., 1 three-st'y brown-stone dwell., 25′ x 45′, and extension, 18′ x 20′; cost, $8,000; owner, B. Fowler, 444 Lafayette Ave.; carpenter, D. H. Fowler; mason, Jacob Brown.

### Chicago.

A UNION DEPOT. — The three railroad companies using the lake front depot — the Michigan Central, Illinois Central, and Chicago, Burlington and Quincy — have about completed arrangements for the purchase of the three blocks on the lake front, north of the Exposition building, for $800,000. Upon the ground thus obtained they intend to build a union depot.

### Louisville.

BUILDING PERMITS. — Considerable activity was shown in the past week in the erection of frame buildings and improvements, ranging in cost from $300 to $2,000. In addition the following building permits were granted: —

| OWNER. | USE. | COST. | ARCHITECT. |
|---|---|---|---|
| J. L. Smith | Store | $3,000 | Henry Wolters |
| M. A. Blatz | Dwelling | 5,500 | |
| Southern Dairy Co. | Factory | 5,000 | |
| L. A. Wramplemeir | Dwelling | 2,000 | |
| W. T. Hunter | Dwelling | 2,000 | C. A. Curtin |

IMPROVEMENTS. — The following is a list of some of the most noticeable improvements under way.

| OWNER. | USE. | COST. | ARCHITECT. |
|---|---|---|---|
| L. & N. R. R. | Shop | $4,000 | M. H. Baldwin |
| Callahan & Son | Warehouse | 12,000 | Builder |
| L. C. & L. R. R. | Freight Depot | 30,000 | J. H. Pierson |
| J. W. E. Bailey | Dwelling | 15,000 | C. J. Clark |
| Marion County Distilling Co. | Distillery | 10,000 | Jno. Andrewartha |
| J. B. Wathen & Bro. | Warehouse | 10,000 | H. Nettlesroth |
| J. B. Wathen & Bro. | Distillery | 6,000 | H. Nettlesroth |
| Ky. Malting Co. | Malt House | 20,000 | |
| Wramplemeir Furniture Co. | Factory | 21,000 | |
| Jas. S. Pirtle | Dwelling | 7,000 | Chas. D. Meyer |
| Mrs. E. E. White | Dwelling | 15,500 | C. J. Clark |
| J. L. Monk & Son | Distillery | 25,000 | |
| Thos. H. Sherley | Office Bldg. | 10,000 | H. P. McDonald & Bro. |
| Melwood Distilling Co. | Warehouse | 8,000 | Henry Wolters |
| J. J. Roach | Dwelling | 10,000 | J. B. McElfatrick & Son |
| W. C. DePauw | Warehouse | 10,000 | F. Cooper |

WAGES. — Mechanics are getting good wages, and there is a scarcity of them in nearly every branch of work. Carpenters are at a premium here, and many of them could find employment. Bricklayers are paid $3.25 per day in the city, and $3.75 in the country.

### New York.

BUILDING PERMITS. — *Fifty-Fifth St.*, cor. First Ave., 1 brick church, 78′ x 125′; cost, $70,000; owner, R. C. Church of St. John the Evangelist; architect, Arthur Crooks; builders, Giblin & Lyon and Jas. Thompson.

*One Hundred and Twenty-Ninth St.*, s s, 250 feet east of Seventh Ave., 2 three-st'y brown-stone dwells., 12′ 6″ x 52′; cost, $4,000 each; owner, Emma F. Baxter, 324 East One Hundred and Twenty-Fifth St.; architect, Charles Baxter.

*One Hundred and Thirteenth St.*, s s, 95 feet east of First Ave., 1 two-st'y brick tenement, 25′ x 52′; cost, $3,500; owner and builder, Jas. Duffy, 1842 Third Ave.; architect, Andrew Spence.

*One Hundred and Twenty-First St.*, n s, 50 feet west of Avenue A, 3 three-st'y brick dwells., 16′ 8″ x 42′; cost, $4,000 each; owner, John B. Haskin, Fordham, N. Y.; architect, Andrew Spence; builder, Robt. McChristie.

*Eighty-Second St.*, s s, 231′ 6″ west of Avenue A, 2 four-st'y brown-stone tenements, 25′ x 53′; cost, $12,000 each; owner, Thos. H. Walker, 177 East One Hundred and Fourth St.; architect, Andrew Spence.

*West Thirty-Sixth St., No.* 407, 1 three-st'y brick work-shop, 25′ x 97′ 6″; cost, $4,000; owner, Francis Cook, 453 West Sixty-Second St.; architect, Geo. Holzeit.

*West Twenty-Seventh St., No.* 513, 1 four-st'y brick store and tenement, 25′ x 48′; cost, $8,000; owner, John G. Littlefield, 404 West Thirteenth St.; architect, Alex. M. McKean.

*Monroe St., No.* 95, 1 two-st'y brick livery stable, 25′ x 74′; cost, $4,500; owner, Albert Busch, on premises; builder, Henry Hollwedel.

*Third Ave.*, cor. One Hundred and Eighth St., 3 four st'y brown-stone apartment-houses, 25′ x 52′; cost, $9,500 each; owner, Joseph Mayer, 2067 Third Ave.; architect, George M. Walgrove.

*One Hundred and Eighth St.*, s s, 73 feet west of Third Ave., 1 four-st'y brown-stone apartment-house, 27′ x 57′; cost, $11,000; owner, Joseph Mayer, 2067 Third Ave.; architect, George M. Walgrove.

*Fifty-First St.*, n s, 125 feet west of Ninth Ave., five-st'y brown-stone flat, 18′ x 86′ 5″; cost, $14,000; owner and builder, S. McMillan, 245 West Forty-Sixth St.; architects, Thom & Wilson.

*Fifty-Fifth St.*, 300 feet west of Sixth Ave., 1 two-st'y brick stable, 25′ x 90′; cost, $6,000; owner and architect, Wm. C. Lesster, 232 West Fifty-Second St.; builder, not selected.

*One Hundred and Sixteenth St., Nos.* 228, 230 *and* 232, s s, 300 feet east of Third Ave., 3 three-st'y brown-stone dwells., 16′ 8″ x 48′; cost, $8,000 each; owner, Mrs. Catharine A. Fagan; 323 East One Hundred and Sixteenth St.; architect, John McIntyre; builder, John F. Moore.

*Eighty-Fifth St.*, n s, 128 feet east of Ave. A, four-st'y brick tenements, 17′ 2″ and 17′ 2″ and 13′ x 65′; cost, each, $13,000; owner, John W. Smith, 550 East Eighty-Fifth St.; architect, W. R. Smith.

*Sixty-First St.*, s s, 40 feet east of Fourth Ave., 2 four-st'y brown-stone dwells., 20′ x 53′ 1″; cost, each, $18,000; owner, John Davidson, 128 East Fifty-Second St.; architect, Jas. E. Ware; builder, John Davidson.

*East Thirty-First St., No.* 161, 1 three-st'y brick dwell., 16′ 6″ x 50′; cost, about $6,000; owner, Wm. Sampson, 149 East Thirty-First St.; architect, P. C. Brown; builder, G. D. Hilyard.

*Sixty-Third St.*, s s, 100 feet east of Fourth Ave., 1 four-st'y brown-stone storage warehouse, 50′ x 130′; cost, $40,000; owner, Thos. Kilpatrick, 152 East Sixtieth St.; architect, C. W. Romeyn.

ALTERATIONS. — *Washington St., Nos.* 182 *and* 182½, raised six feet, floors divided into apartments; cost, $2,500; owner, H. Offerman; architect, Wm. José.

*East Twenty-Second St., Nos.* 220, 222, *and* 224, rear part raised one-st'y; cost, $5,000; owner, Ernst Gabler, 227 East Twenty-Second St.; architect, Julius Kastner.

*East Fifty-Fourth St., No.* 4, two-st'y brick extension, 14′ x 28′; cost, $2,500; owner, Caroline G. Read, No. 6 East Fifty-Third St.; builder, Wm. Shears.

*Sixty-Ninth St.*, n s, 410 feet east of Ave. A, raised 3′ 8″; cost, $5,000; lessee, Emma C. Gent, 30 East Ninety-Third St.; architect, J. Kastner.

*Jefferson St.*, e s, 45 feet south of Rutgers Pl., raised five stories; cost, $7,000 to $8,000; owner, E. H. Crampton; architect, E. W. Crampton; builders, P. Castner and Crampton Bros.

*East Twenty-Second St., Nos.* 315 *to* 321, new girders, beams, etc., as before fire; cost, $8,000; owner, Alois Berman; architect, John Brandt.

*Broadway, Nos.* 1259 *and* 1261, No. 1261 to have one-st'y brick extension, 20′ x 31′, new plumbing-work put in for hotel, etc., cornices of both houses renewed, and retaining-wall, water-closet, etc., put in yard of No. 1259; cost, $6,000; owner, Philip Milligan, on premises; architects, D. & J. Jardine; builders, Samuel Lowden and T. J. Duffy.

FACTORY. — A Lard Refinery for Duncan McFarlane, to be built of brick and stone, is to be erected on Fourteenth St., corner of Thirteenth Ave., at a cost of $30,000, from designs of Mr. Herman Kreitler; Richard Deeves is the contractor.

BUILDING MATERIALS are about as last week, but brick commands higher prices, thus carrying out our prognostications of a few weeks ago.

CHURCH. — Among the buildings soon to be erected in this city is the new Roman Catholic Church of St. John the Evangelist, at the northwest corner of First Ave. and Fifty-Fifth St. It will be of brick with a brick front, the dimensions being 78′ x 125′. The plans are drawn by Arthur Crook, and the estimated cost is $70,000.

STORE. — A large store is soon to be erected by James McCreery on the south side of East Fourteenth St., at Nos. 22, 24 and 26, now occupied by the Arlington Building. It will extend through to Thirteenth St., and will be five stories high. Its ground dimensions are 75′ x 206½′. The material will be brick, with an iron front. The estimated cost is $75,000. D. & J. Jardine are the architects.

### Philadelphia.

BUILDING PERMITS. — *Frankford Road*, e s, north of Westmoreland St., two-st'y dwell., 16′ x 45′; Sam'l Carver, owner.

*Thirty-Second* and Master Sts., ice-house, 38′ x 82′; J. B. Doyle, contractor.

*Thirty-Second St.*, e s, north of Master St., ice-house, 64′ x 150′; J. B. Doyle, contractor.

*Twenty-Sixth St.*, north of Girard Ave., two-st'y dwell., 14′ x 44′; Thos. Shuster & Son, contractors.

*Naudain St.*, between Twentieth and Twenty-First Sts., 2 three-st'y dwells., 16′ x 40′; Wm. Bunch, Jr.

*New Market* and Portland Sts., four-st'y factory, 55′ x 102; W. Steel, contractor.

*Sergeant St., No.* 707, one-st'y store-house, 22′ x 80′; Geo. Kessler, contractor.

*Fourth St.*, south of Reed St., three-st'y dwell., 16′ x 42′; H. W. Maloy, contractor.

*Washington Ave.* and Prime St., freight shed, 20′ x 195′; P. W. & B. Railroad Co., owners.

*South Sixth St., No.* 1503, three-st'y dwell., 18′ x 42′; Mrs. M. Ott, owner.

*Redwood St., No.* 527, two-st'y dwell., 16′ x 38′; Henry L. Lovett, contractor.

*Herman St.*, east of Twenty-Ninth St., two-st'y dwell., 14′ x 32′; W. F. Albrecht.

ADDITIONS. — *Fifteenth St.*, south of Tioga St., two-st'y addition to school-house, 32′ x 76′; H. A. Miller, contractor.

*Germantown Ave., No.* 3332, two-st'y front building, 14′ x 20′; J. Summers, owner.

CHESTNUT HILL IMPROVEMENTS. — Chas. B. Dunn, Esq., is making very extensive additions to his residence; Theophilus P. Chandler, Jr., architect.

Mrs. Chas. Taylor, is having erected a stone mansion; Theophilus P. Chandler, Jr., architect.

MATERIAL MARKET. — The market is steady at previous quotations, with a good demand for structural iron for architectural purposes; also, hard brick meet with ready sale.

STORES AND FACTORY. — For Messrs. A. J. Holman & Co., 3 stores and a factory, 60′ x 173′, four stories high, are to be erected on Arch St., below Thirteenth St., of brick with stone trimmings, from designs of Messrs. Wilson Bros. & Co.

### St. Louis.

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

| OWNERS' NAME. | USE. | Strl's | R'ms. | Cost. |
|---|---|---|---|---|
| West St. Louis Turner Building Association, | Turning Hall, | 1 | 1 | $8,000 |
| H. Morell, | Dwell. | 2 | 6 | 4,000 |
| Charles G. Stifel, | Dwell. | 2 | 15 | 20,000 |
| W. E. Bradford, | Stores. | 3 | 28 | 20,000 |
| H. Hauke, | Dwell. | 2 | 12 | 35,000 |
| A. Cornet, | Dwell. | 2 | 18 | 85,000 |
| T. Manning, | Dwell. | 3 | 10 | 48,000 |
| T. Manning, | Dwell. | 3 | 10 | 48,000 |

### Toledo.

STORE. — Two-st'y and basement brick store-building, Adams St., for Max Rothfuss; cost, about $4,000; E. O. Fallis, architect.

HOUSE. — Two-st'y residence, brick and stone, cor. Eleventh and Jefferson Sts., for Dr. Kirkley; cost, about $6,000; architect unknown.

Weather very wintry, and considerable difficulty experienced in getting enclosed the numerous buildings whose masonry is still uncompleted.

### General Notes.

ADAMS, MASS. — The Greylock Company have decided to build, on the corner west of the old mill, a two-st'y wooden building, 25′ x 50′. The lower story will be used for a store, to accommodate the operatives, and the second story for a hall. Work will begin at once.

ALBANY, N. Y. — Superintendent Eaton hopes to have the Senate Chamber in the new capitol ready for occupancy next winter, but it will not be completed. Eighty workmen have been already discharged, and more will be put off.

AMHERST, MASS. — Messrs. Allen & Kenway, of Boston, are the architects of the new chapter-house. It is a three-st'y brick building, 40′ x 40′.

BRADDOCK, PA. — Messrs. Wilson Bros. & Co., of Philadelphia, are preparing plans for a new passenger depot for Pennsylvania R. R.

BUFFALO, N. Y. — Mr. M. E. Beebe, architect, is building an $8,000 addition to the house of F. W. Tracy, Esq.

CHEYENNE, WYO. — F. W. Cooper, architect, has under way at present: —

A residence for G. A. Searight, two-st'y brick, stone trimmings; cost, $6,000; Hurd & Bourk, contractors.

A church-building, for Baptists, 200 sittings, brick, stone trimmings, Gothic; cost, $5,000; M. P. Keefe, contractor; foundation just completed.

Frame house for J. W. Collins; cost, $2,500; R. B. Hovrie, contractor.

Brick house for R. B. Hovrie; cost, $3,500.

Frame cottage for H. W. Holt; cost, $2,000; M. P. Keefe, contractor.

Stable for G. C. Charlton, brick, 32′ x 100′; J. P. Weybrecht, contractor; cost, about $5,000.

CLEVELAND, O. — The new brick building which is being erected on the City Hospital grounds is nearly completed. The building is 40′ x 60′, and will cost, when finished, about $7,000.

DANVILLE, KY. — Messrs. Carrigan & Curtin, of Louisville, Ky., have completed plans for additions to the Deaf and Dumb Institute. The additions are two wings, one of which will be commenced shortly, the other to be built next spring. Approximate cost, $70,000.

DUBUQUE, IO. — Mr. F. D. Hyde is the architect of a dwelling-house for E. M. Woodworth, which is building on Locust St., at a cost of $10,000.

HAMPTON ROADS, PA. — Inspector Higginson, of the Fifth Lighthouse District, has received notice from Washington that the government has decided to rebuild at once the lighthouse on Thimble Shoals, in Hampton Roads, two and one-half miles east of Fortress Monroe, which was destroyed by fire on the morning of October 30. It will be of the pentagonal screw pile build, with heavy iron girders and supports, and will cost about $25,000.

MANCHESTER, N. H. — A brick block is building, on the corner of Chestnut and Hanover Sts., for G. F. Basher, which will cost $18,000. Mr. J. T. Fanning is the architect.

MONTGOMERY, ALA. — A brick building is going up at the corner of Montgomery and Washington Sts., for Cramlin Bros., which will cost $9,000; Mr. Wm. T. Walker is the architect.

SHREWSBURY, MASS. — Messrs. Barker & Nourse, of Worcester, are the architects of the new school-house; cost, $2,000.

STATEN ISLAND, N. Y. — A residence is to be built for Mr. Robert C. Lowry. Messrs. Wilson Bros. & Co., of New York, are the architects, and Mr. T. Donnelly is the contractor.

TECUMSEH, MICH. — Remodelling First Universalist church; N. B. Bacon, architect; cost, about $5,500.

WORCESTER, MASS. — Mr. J. B. Woodruff is the architect of two houses for Harrison Bliss, one a brick tenement on Belmont St., which will cost $10,000; the other a brick tenement on Lincoln St., which will cost $4,000.

### Bids and Contracts.

EBENSBURG, PA. — The Philadelphia Metal Cornice and Roofing Co., have the contract for cornice work on the Cambria County, Pa., court-house, to cost $100,000. H. Schenck, of Erie, Pa., is contractor.

SALEM, MASS. — The proposals for the construction of the new building for the Board of Health have been opened

SCRANTON, PA. — Philadelphia parties have taken the contract to build the court-house for $275,000. There were sixteen bidders.

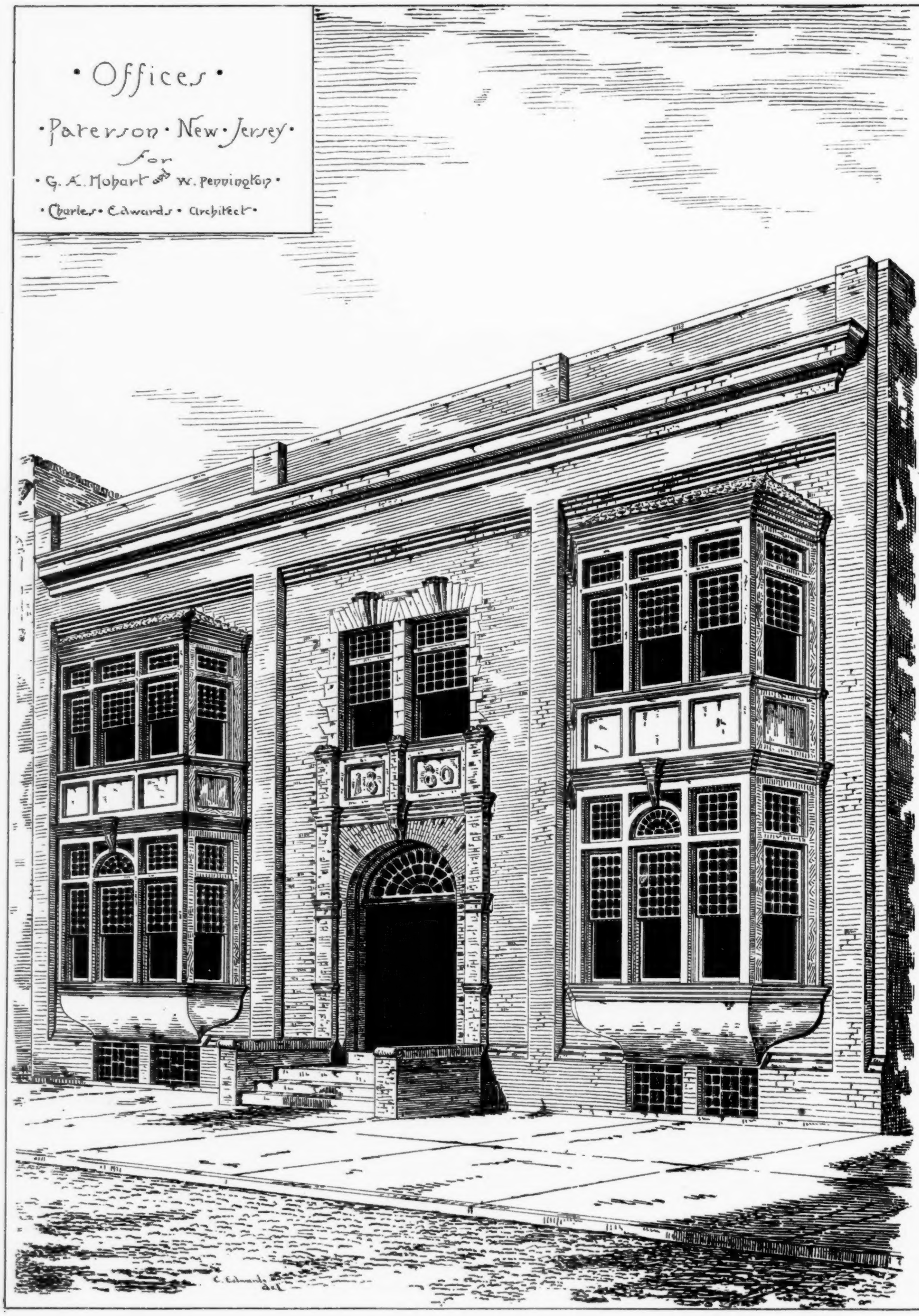
WHITE SULPHUR SPRINGS, W. VA. — Bids for building the new hotel and other improvements at the White Sulphur Springs, West Virginia, were opened Thursday, November 11th, at the office of the Camden Consolidated Oil Company, Baltimore, Md. The building will be in the form of a hollow square, and the quadrangle in the centre will be four acres in extent. The hotel is to furnish accommodations for 500 guests. The contract will be awarded to the lowest responsible bidder.

WASHINGTON. — Bids for the iron work on the roof of the north wing of the new State, War and Navy Department building were received as follows: Dwight & Hoyt, Springfield, Mass., $87,000; Phœnix Iron Company, Trenton, N. J., $90,933; Bartlett, Haywood & Co., Baltimore, $75,517; Passaic Rolling Mill Co., Paterson, N. J., $78,645; J. B. & J. M. Cornell, New York City, $72,130; Phœnix Iron Co., Philadelphia, $81,334. The award is not yet made.

### Industrial.

BRIDESBURG, PA. — The work already done towards the erection of Edwin H. Fitler & Co.'s cordage works begins to develop their vast proportions. The cordage-house, 50′ x 315′, is nearly up to its full height of three stories. The foundation for the storage-house, 100′ x 250′, is laid.

TACONY, PA. — H. Diston & Sons' extensive rolling mill is completed, — dimensions 160′ x 200′. They have also during the season erected 22 dwellings for the use of their employés.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• G. A. Hobart & W. Pennington •
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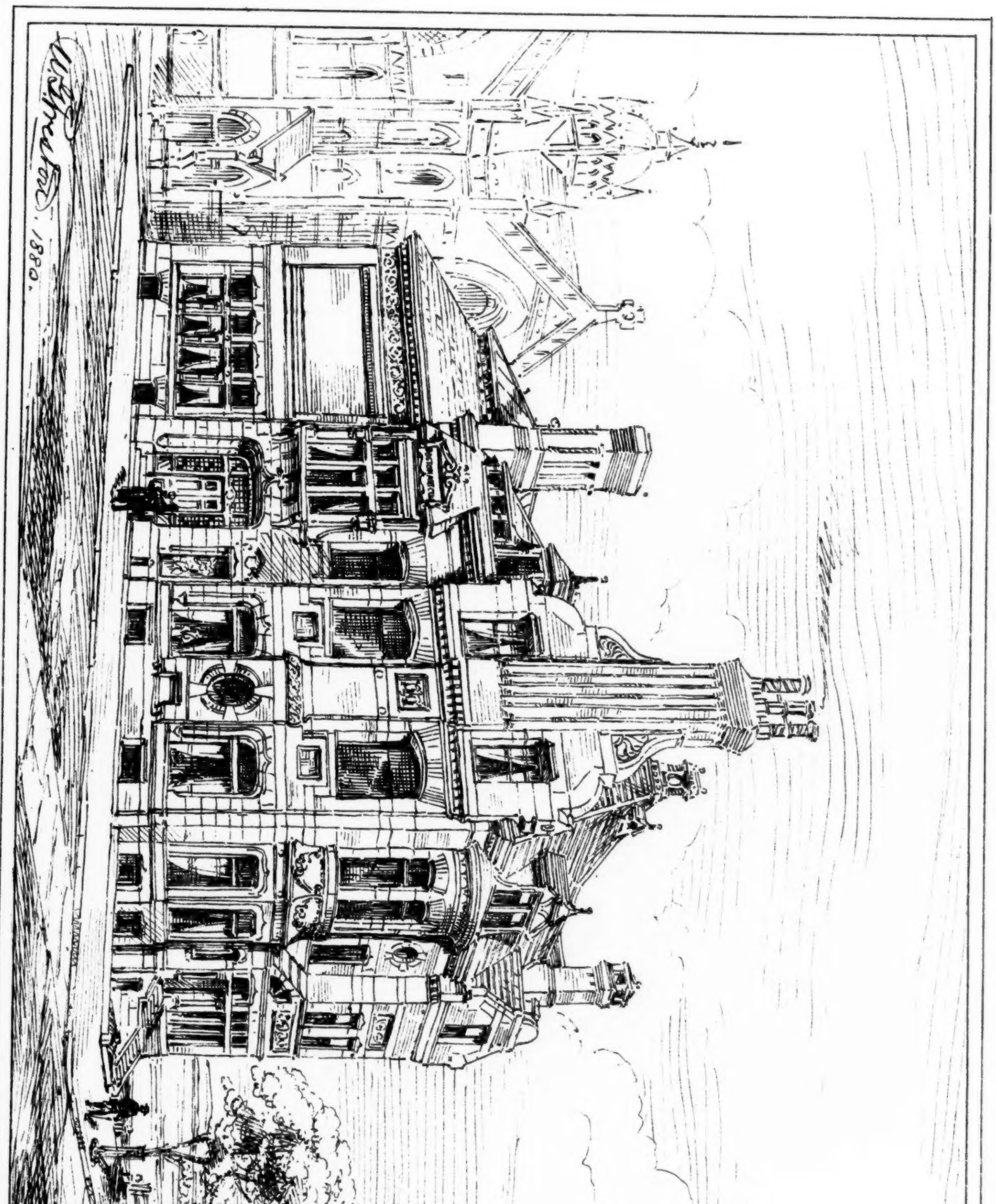
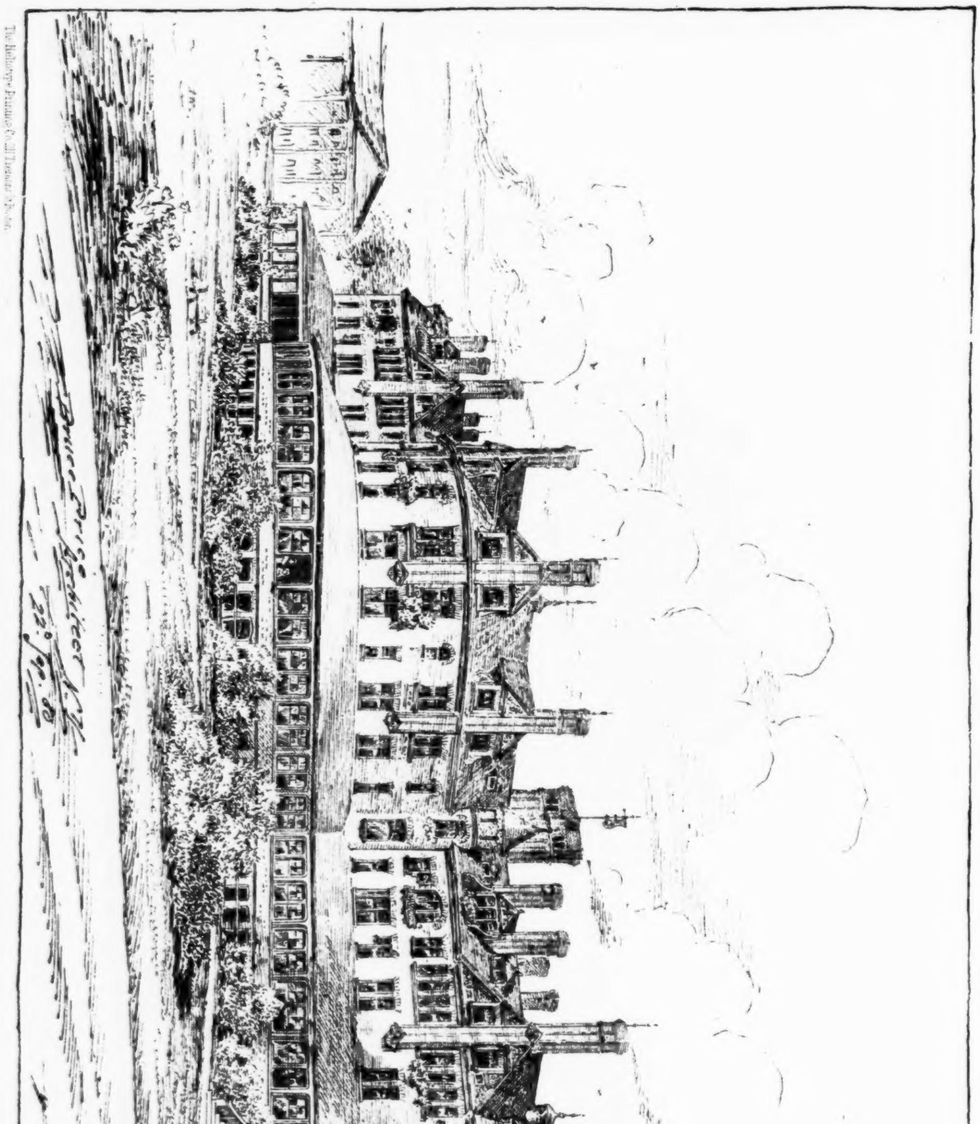
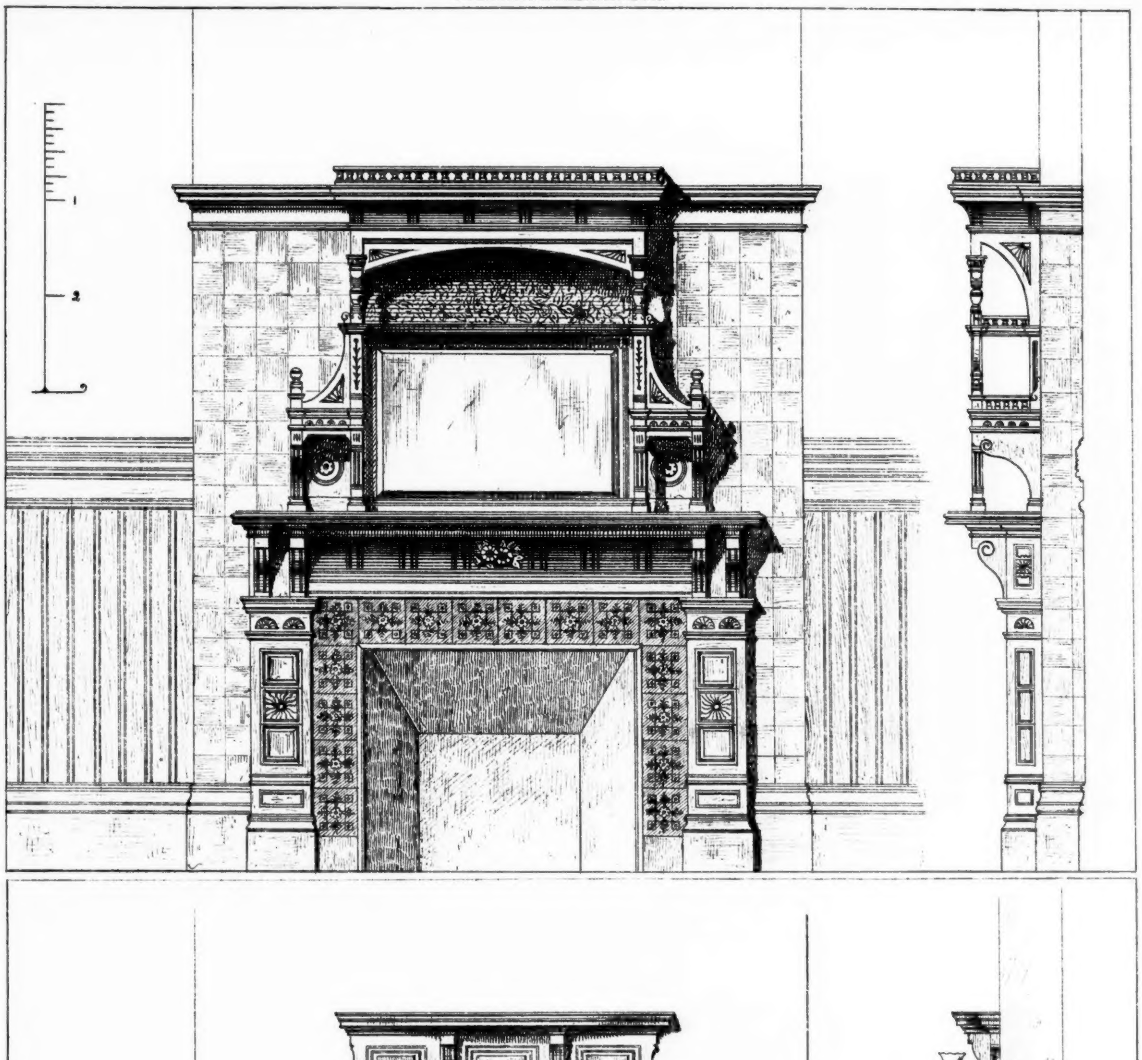
C. Edwards del.




COMPETITIVE SKETCH FOR THE BOSTON ART CLUB BUILDING.

W. G. Preston, Architect.


Design for A Winter Hotel at the Sea-side.
Bruce Price Architect N.Y.



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