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A TELEGRAM from London announces the death of Mr. John Henry Parker, the distinguished author of the Glossary of Architecture, and perhaps the most intelligent and influential of the leaders in the Gothic revival movement in England. Mr. Parker was born in London in 1806, and was educated for another profession, but his inclination toward architecture was so strong that that at the age of twenty-six he abandoned his other work, and devoted himself entirely to the study of his favorite art, particularly to that form of it which was then attracting the passionate devotion of so many able men. Mr. Parker's turn of mind seems to have been a practical and industrious one, and in 1836 he published the most useful book ever presented to the students of a particular style—the Glossary of Architecture. This book, which was filled with a most exhaustive series of examples of English Gothic detail, chosen with the utmost taste, and beautifully drawn, was extremely popular, passing through several editions, successively revised and enlarged, which are still much sought after. About 1859 was published an edition, revised by him, of Rickman's Gothic Architecture, a work worthy, in its careful and conscientious thoroughness, of Mr. Parker himself. Next came a work upon the Domestic Architecture of the Middle Ages, which completed his services toward the English Gothic. It is not surprising that the study of mediæval domestic and monastic architecture should have led him back to that architecture from which it was remotely derived, and Mr. Parker found himself deeply interested in the excavations in progress at Rome. With these investigations he was identified during the remainder of his life, publishing several volumes on Roman archæology, and promoting in person the work of exploration.

WE are in receipt of some news from Cleveland, Ohio, which will be interesting to that heroic band of artists who propose to submit competitive designs for the Garfield monument which it is proposed to erect in that place. According to the Cleveland *Herald*, the authors of that extraordinary "invitation to artists" upon which we commented some time ago, having sent copies of their precious document to "all the prominent sculptors in America and Europe," are now resting in pleasurable anticipation of the results of their enterprise. The time for completion of the plans or models has been extended until the first of May, but the ardor of the contending sculptors is expected to be so great that they will rush to lay their offerings at the feet of the judges three months before they are due; and the monument committee is accordingly "looking for plans daily." "When they begin to arrive," we are further informed, the members of the committee "expect to have their hands full in studying the different points of beauty of all the designs." The accumulation of "points of beauty" will, if the complacent anticipations of the committee are realized, go on so fast that "by the first of May the collection is expected to be full of interest, and, no doubt, worthy of preservation." We trust that our readers will remark this handsome compliment to the "prominent sculptors of America and Europe," and will join with us in our esteem and admiration for the appreciation of artistic effort which it indicates. One trifling circumstance seems to us to invite remark. Without wishing to deprive the members of the committee of their enjoyment in "studying the different points of beauty of the designs" for the next three months, it may be as well to suggest that the worst misfortune which can befall a competitor who chooses to leave his fate in the hands of ignorant and incompetent judges is to have his design come early before them. Knowing nothing about its originality or technical merit, and incapable of understanding its meaning, expressed in a language of which they have never learned the rudiments, the small and superficial tickling which they experience at the sight of a showy model is immediately succeeded by satiety, and the arrival of the latest comer, radiant with the charm of novelty, is the signal for throwing away all those which have become stale by familiarity. So well understood is all this in countries where artists or their work are held in respect, that the designs submitted in competitions are invariably kept under lock and key until all are received, and are then displayed together for the first time to those who are to decide upon them; and the idea of examining designs one by one, as leisure or inclination might suggest, would be regarded in such places with surprise and disapprobation. We have, however, before pointed out some of the differences between the Garfield competition and those common in civilized communities, and need not here dwell upon them at greater length.

IF any one of our readers thirsts to be placed at the head of that noble band of artists whose united toil is to enrich the Garfield committee with a collection of works "no doubt worthy of preservation," we can give him a few hints which will perhaps serve to promote his success. To take up first the most important suggestion; let him, if he would win in such a competition, by no means have anything to do with the competition. There will be enough unsuspecting boys and ambitious draughtsmen to furnish sport for the monument committee and the public through the medium of the ostensible competition, but it is not by such means that "jobs" are to be secured. He who would make his services valued must himself put a price upon them, and the main requisite for success in such contests before non-professional judges is first to secure the position of a professional artist reluctantly condescending to enter a struggle unworthy of his powers. For playing this part effectually, some standing as a superior being is an essential preliminary, but a judicious dissemination of items in the local newspapers, begun when the competition is first suggested and continued for a considerable period, will give an excellent foundation for a reputation. Some time after the terms are announced, and the less astute competitors are hard at work on their designs, he who would win should, having well scattered his printed ground-bait, appear upon the scene in the guise of a colossal genius, wandering through the earth to direct and instruct mankind. At this delicate point in the proceedings the aid of a newspaper reporter is indispensable; but the crisis once past the rest follows easily. The benevolent genius, having established his fame on a firm foundation, is soon approached by the managers of the competition, who feel how greatly their credit would be enhanced if they could persuade him to enter the contest. Of course he refuses, explaining that his time is too valuable to be wasted in speculations. This reply increases his merit in the eyes of the managers, who become more anxious than ever to add to their laurels by gaining his services. Hints will then be thrown out relating to some possible compensation for a few sketches, and assurances are given that he will be allowed ample time to prepare them, with such other trifling privileges as the examination of the other competitive designs, discussions with the managers as to what sort of design will suit them best, and so on. The interests of the great man and the jury are now identical; they desire nothing more than to have the glory of announcing their award of the commission to the distinguished X—and the distinguished X—is quite ready to see their desire gratified. After the lapse of a convenient interval a model or sketch is submitted, and adopted by acclamation, and the farce ends.

IT is gratifying to find in a Topeka newspaper a well-written appeal to its readers to interest themselves in the subscription for raising funds to build the pedestal of the Bartholdi statue. The Governor of Kansas, it seems, has called a public meeting, in response to a communication from the American

Committee, and the State will, it is hoped, furnish a substantial contribution for completing the memorial of a national friendship which, partly sentimental though it may be, is yet a real and notable one. For more than a hundred years this country has been at frequent intervals in the receipt of favors, sympathy and kindnesses of various sorts, both public and private, at the hands of the French, and hitherto, it must be confessed, it has made a very meagre return for them. The presentation to the United States of this birthday gift is perhaps the most spontaneous and delicate courtesy ever shown by one nation to another, and our boggling awkwardness about receiving it is quite as annoying to those whose kind feeling prompted them to send it as similar conduct would be to the giver of a present in private life. If we do not wish to lose entirely our character for gratitude and good manners, we should make all the haste we can to give the Bartholdi statue the reception which it deserves.

DR. HARVEY, of Orange, N. Y., contributes to the *Sanitary News* some interesting papers on malarial diseases, which he has studied as they appear around him, recording his observations with an intelligence and freedom from prejudice which make them doubly valuable. Considerable portions of the towns of Orange, Bloomfield and Belleville lie near the banks of a small stream, which is interrupted at intervals by mill-dams. Of the families living in the valley of this stream ninety per cent, according to Dr. Harvey's estimate, have been afflicted with intermittent fever at some time within the last five years. As a partial compensation for this, it is found that typhoid fever, consumption and the eruptive fevers are less common in the malarial district than in the healthier regions, but the constant prevalence of a disease which attacks nearly all the inhabitants at short intervals, and keeps even those who escape acute symptoms under a depressing influence, is a serious calamity. Local opinion attributes the miasma of the valley to the mill-ponds, and although the mill-owners strenuously deny that their ponds affect the health of the district, it is observed that in other places, near by, where the water-courses, although lying in a similar relation to the region about them, have not been interrupted, ague is unknown. Like a really scientific observer, Dr. Harvey has noted all the circumstances, whether important or unimportant in appearance, attending the presence of persistent malarial poisoning, and has become convinced, notwithstanding the prejudice to the contrary which he at first entertained, that the character of the drinking water used has something to do with the communication of the fever. Nearly all the households in the infected district obtain water from shallow wells, sunk a few feet into the saturated ground, and suffer from chills. One proprietor, however, about three years ago built a cistern for rain-water, and has since employed the cistern water entirely for domestic use. During that time his family has been entirely exempt from fever, although before the well was abandoned there were always one or more cases in the house. Another family, which had for years used a shallow well, and suffered from continual chills, about eighteen months ago had a pipe-well driven to a depth of about sixty feet, penetrating the sandstone which underlies the region. Since the new well came into use malaria has apparently forsaken the house, and although the inmates have suffered from other diseases, no case of ague has occurred among them.

THE architects of France, by invitation of the Société des Architectes et des Ingénieurs des Alpes Maritimes, hold this week a conference at Nice, to consider topics of professional as well as public interest. The professional subjects discussed comprise the reform of legislation affecting architects and engineers; the expediency of requiring that a diploma showing their attainments, should be obtained by all persons desiring to practice architecture; the best means of improving the standard of education among building contractors and workmen, and the professional charges of architects. As a relief from the strain of this weighty business papers are to be read by various members of the societies represented, and visits are to be made to places of interest in the neighborhood. The paper of the first day is by M. Charles Garnier, the architect of the Grand Opéra, upon Polychromy applied to Constructions. Perhaps no living architect has studied this subject so thoroughly, and the delivery of the paper will be a noteworthy occurrence. Among the excursions will be one to the little principality of Monaco, and to some Roman remains in the neighborhood, and another across the Italian frontier to San Remo and Ventimille. The exercises close, as usual in such cases, with a dinner.

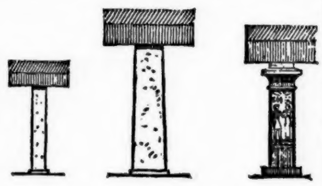
THE "Architect of the Beasts," as a very clever contributor to *La Semaine des Constructeurs* calls himself, writes in a recent number concerning the construction of pig-sties, presenting some considerations which are worthy the attention of those who have to direct the planning of farm buildings. It is unnecessary to quote his description of the arrangement of the "*porcherie*," such as it is found in the great agricultural establishments of France, our farmers being as yet far enough from bestowing such pains upon the lodgment of their humble live-stock, but some remarks upon the details of material and construction are quite applicable to this country. In his opinion, the surest means of making pigs fat and healthy is not, as we are apt to suppose, a liberal provision of filth as well as food, but "cleanliness and comfort." To secure the first he advises that the pen around which the separate sties are placed, as well as the sties themselves, should be paved with concrete, laid with a pitch, and raised ten or twelve inches above the surrounding ground. In the pavement should be formed grooves to drain away water more quickly, and a trench filled with stones should surround the whole place, to keep the subsoil dry beneath the concrete. In the pavement of the pen should always be formed a channel, to convey a stream of running water; and in each pen, fed by the same stream, should be a hollow basin, in which the fat and almost motionless hogs can without exertion bathe themselves, as they are very fond of doing in warm weather.

WE trust that there are some better reasons for opposing the introduction of the metric system into this country than those presented by the President of what seems to be the dignified body known as the "International Institute for Preserving and Perfecting Weights and Measures." According to a report in the New York *Times*, the "International Institute" is on the point of sending an expedition in search of arguments against the "Napoleonic innovation" of metric weights and measures to that fountain of abstruse science, the Egyptian desert. It is hardly necessary to say that the process for securing the opinion of the ancient Egyptians upon the problem before them will be the measurement of the dimensions of the pyramid of Suphis at Gizeh, this particular method having served for proving each of the foolish and contradictory theories in regard to ancient mensuration and astronomy brought forward within the last three thousand years. It is well-known that the lengths obtained by different observers vary according to the theory which they wish to establish, and the International Institute, recognizing this fact, and having also decided what the dimensions "ought to be," proposes to have new measurements taken, which will without doubt coincide precisely with those deduced from the new theory. It seems that the "members of the Institute" are "well aware of the mathematical, astronomical, and cosmical knowledge" which this particular pyramid contains, and believe it to be "an epitome of astronomy and an epitome of chronology of the races," "a Bible in stone, a monument of science and religion never to be divorced." More than this, they regard themselves as "the undoubted descendants of those who built that pyramid," and consider it their duty "to investigate and understand the wisdom contained therein." For persons in this state of mind no investigation will be too difficult, and we are only surprised that the members of the Institute should not stay at home and learn all they wish to know by calculation and inspiration instead of sending out workmen to engage in the prosaic task of shovelling the sand away from the base of the structure. It may, however, be necessary to lay bare the "prophetic slopes" of the pyramid before the whole of the "cosmical relations" of the American system of weights and measures can be made clear to an unbelieving public, and we observe, indeed, that the Institute, perhaps remembering that it will have avoirdupois, apothecaries' and troy weight to explain before it can prove the descent of all our tables from the perfect system from which it claims to derive them, proposes to dig out the Sphinx at the same time with the pyramid. We need not point out the grand results which are certain to flow from the examination of both these prophetic monuments at once, under the light of a well-digested theory, and we advise those individuals who desire "to throw this country into inextricable confusion" by the introduction of the metric system to bestir themselves, before their designs are frustrated forever by the aid of the wisdom of the Egyptians.

A NEW HISTORY OF EGYPTIAN ART.[1]— III.

Wooden Statuette.

NOTING the resemblance between the forms of Egyptian columns and those of various native plants, both in the shapes of the capitals and of the clustered and banded shafts, many writers have jumped to the conclusion that the native architect went directly, and in the very first place, to Nature for his motives — that direct, conscious imitation was the basis of his work. But M. Perrot conclusively shows that such was not the case. The farther back we go the less of such imitation or even adaptation of natural forms do we find, and the most "realistic" work in this line is comparatively late in date. In a passage which is one of the most interesting in all the work he shows how such forms are merely ornamental, and had not their origin in the constructive creations of early times. The earliest shafts are plain, either round, polygonal, or square, and the earliest capitals simple and constructive in form. The first floral shapes are decoratively *applied* to the capitals and shafts, are *upon* them, so to say, and not *in* them. Their adoption seems to have been owing to the primitive fashion of adorning the temples for festivals by binding stems of lotus or papyrus around the shafts and wreathing their capitals with blossoms. Then the decorative motives thus suggested were painted or carved upon the stone, and were gradually amalgamated with the primitive shape until the final almost representative type was evolved. Even in its most elaborated shape this did not always become strictly constructive in appearance. M. Perrot points for illustration to the well-known "campaniform" capital, with its beautiful outline as of an opening, wide-spreading floral disk. "This capital," he says, "throws out a fine and bold curve beyond the shaft; but we are surprised, even distressed, to find that the surface thus obtained is not employed for the support of the architrave, which is carried by a comparatively small cubic abacus which rests in the centre of the capital. . . . We feel inclined to wonder why this fine calyx of stone should have been constructed if its borders were to remain idle. It is like a phrase commenced but never finished. Without this fault the composition of which it forms a part would be worthy, both in proportion and in decoration, of being placed side by side with the most perfect of Greek columns." M Perrot argues — and rightly, it seems to me, though I believe he has Mariette against him here — that such points show that the flower-shape was not the original motive of the capital, but an afterthought borrowed from decoration. But since it is mere matter of taste, one may be allowed, perhaps, to differ from him in his estimate of the artistic beauty of the result. To my mind the capital is more perfect as it is than had the petal-edges been used to support the architrave. The graceful effect of the free, beautiful curve would then have seemed to be put, I think, to a purpose for which it is apparently unfit. Now that we see the weight reposing on the central block, our eye is not thus worried, though it must be confessed this block is in itself but ill amalgamated with the surrounding forms. Yet I feel as though the artistic instinct of the builder had here been surer than that of his usually so sympathetic critic. Sympathetic and clear-sighted he certainly is when he decides that the clinging forms of the lotus, the slight and fragile stems of the papyrus, are never likely to have inspired the massive column of the Egyptians in a direct way — that these are much more likely to have assumed this garb as a decoration merely.[2]



A couple of pages relating to the profession of an architect contain some curious details, among others the fact that "architects were generally the sons of architects. Brugsch has given us one genealogical table in which the profession descended from father to son for *twenty-two generations*," which is as though an American practising to-day could look back over an unbroken line of architectural ancestors, to find the first of them building castles for William Rufus. When we contemplate such lapses of time as these, and consider the styles which mark their extreme points, we need not share the old idea as to the immutability of Egyptian art, to agree that architectural fashions changed a good deal more slowly in the valley of the Nile than has been the case in European periods.

I should never have done, however, if I paused over every passage in the architectural section which seems of especial interest. It is better to pass at once now to the chapters which treat of sculpture. Here for the first time we realize the whole import and significance of the lessons we had been taught in the beginning of the work with regard to the early religious ideas of the Egyptians as embodied in their mastabas or tombs. For it is from these early sepulchres that have come to us in recent years those many statues dating from the Ancient Empire which have completely revolutionized our former ideas of the sculptor's art as practised in Egypt.

M. Perrot directs attention to the fact that this art developed much in advance of the builder's, a phenomenon not presented with anything like equal distinctness in the art history of any other nation. The sculptor produced masterpieces as early as the time of the pyramid-builders, while the full bloom of architecture occurred in Upper Egypt many centuries later. The reason he finds, I repeat, in the religious ideas of the people. "Among the Egyptians the progress of sculpture was accelerated by that national belief in a posthumous life for the body which we have described in connection with their funerary architecture. By the existence of this constant and singular belief we may explain both the early maturity of Egyptian sculpture and the great originality of its most ancient style." Among the arrangements for the comfort and continuance of the *ka*, or double, the most important was the preservation of his tangible form, since should this perish annihilation could not be avoided. "This support was afforded to some extent by the mummy; but the mummy was liable to perish by the action of time or the hand of the destroyer. The Egyptians were led to provide against such a catastrophe by the invention of the funerary statue. In the climate of Egypt stone and even wood had a far better chance of duration than the most carefully embalmed body, and statues had the additional advantage that they could be multiplied at will. There was nothing to prevent ten, twenty, any number of them being placed in a tomb (the tomb of Ti contained twenty). If but one of these images survived all the accidents of time, the double would be saved from that annihilation to which it would otherwise be condemned. Working under the impulse of such an idea, the sculptor could not fail to do his best to endow his statue with the characteristic features of the original." It is easy, then, to understand how Egyptian sculpture began, not with ideal figures of however primitive a kind, but with portraiture. The art arose in answer to a definite religious demand, and not as the satisfaction of a purely æsthetic impulse. Of course not all the many works which we possess from this school of realistic sculpture are masterpieces. Such exist in goodly numbers — statues which are marvels of accurate portraiture and of artistic expression. But the majority are artisans' work, executed in large numbers and more or less mechanically, for the less particular or less wealthy class of customers. The leading sculptors had their hands full executing commands from the great ones of the land, and around them clustered, as in all ages, a crowd of lesser workmen. Thus the first statues produced by the Egyptians were sepulchral in character, and were at least supposed to be portraits, being actually such in the case of notable persons able to employ the best talent, and supposedly such with those who were obliged to buy inferior or "ready-made" articles, which were kept in stock, as the proprietor of a modern marble-yard keeps funeral slabs, ready to be particularized by the addition merely of name and date. "As the power and wealth of the Egyptians grew, their artistic aspirations grew also. They rose by degrees to the conception of an ideal, but even when they are most visibly aiming at grandeur of style, the origin of their art may still be divined; in their happiest and most noble creations the persistent effect of their early habits of thought and belief is still to be surely traced." The chapter on this early sepulchral art is full of interest in every line, many novel and beautiful illustrations being given, and the points and diversities of their originals being discussed with the utmost nicety of criticism. If these works, ranging from life-size portraits of kings and queens down to expressive little statuettes showing domestic occupations of many sorts, and even straying over the borders of caricature, do not convince the reader of the essential vitality, variability and plasticity of the sculptor's art among the Egyptians, he must be blind and dull indeed.

Limestone Statue in the Boulak Museum.

What we know of the Ancient Empire ends with the sixth dynasty, after which comes a long period irradiated by little light either from history or from art. It was only with the twelfth dynasty that art made good its revival. The change of style was very great — though for an explanation of its details I must necessarily refer my readers to M. Perrot himself. I will only note a beautiful plate

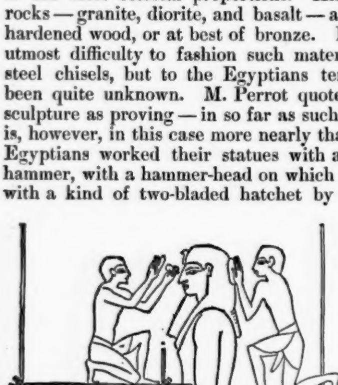
[1] *A History of Art in Ancient Egypt*, from the French of Georges Perrot and Charles Chipiez. In two volumes; Illustrated. Translated and Edited by Walter Armstrong. London: Chapman & Hall. New York: A. C. Armstrong & Co. 1883. Continued from page 44, No. 422.

[2] The later we get in time, as I have said, the farther we travel from the early simple constructive forms of the first decorative sculptors, and the more nearly we approach to "naturalistic" treatment, until at Esne and at Philæ, in the days of decadent art, we find capitals copied literally from natural motives, palm branches and dates, for example, given as realistically as was possible. A similar phenomenon may of course be noted in the history of mediæval ornamentation. Contrasting the work of the eleventh with that of the fifteenth century, we contrast structural shapes ornamented by mere decorative patterns or by the barest suggestion of natural forms, with deliberate, painstaking imitation of nature's themes. It is not uninstructive to note that the ignorant have in both cases made the same mistaken criticism, founded upon the false idea that the inspiration of art must always definitely come from natural shapes. It is, I think, no more absurd to say that the vaults and arches of Gothic churches were inspired by the interlacing boughs of trees, than that Egyptian columns were "copied" from the papyrus or lotus.

on page 240, a head of a Queen Taia, as a proof that the sculptor of this period could produce a work which, for artistic grace and charm, as well as for faithful, living portraiture may be set beside the productions of any age and any land.


The Queen Taia, Boulak Museum.

Still later periods are described with equal skill and clearness, and a chapter is devoted to "The Principal Themes of Egyptian Sculpture." After this comes a most important section discussing "The Principal Conventions in Egyptian Sculpture." I can do no more than briefly say again that it largely oversets our preconceived notions on the subject, pointing out that the chief cause of many of the formalities, abstractions and other qualities which have usually been regarded as due entirely to convention and the force of tradition or dogma, is to be found in the conditions under which the sculptor worked — in the materials which he had at his command, and the tools which were supplied him. Certain *artistic* conventions do certainly exist, alien to our own ideas in art, but congenial to the soul of the Egyptian spectator in every age; but conventionalities of workmanship are another matter. How largely these moulded the work of the sculptor is shown by a comparison of the monumental works in granite or other very hard stone, upon which our criticisms have usually been exclusively founded, with those minor works in limestone, in wood, in plaster, or in clay where the hand and spirit had fuller play. These are extremely varied, fresh, truthful and individual. We find in them none of the marks supposedly characteristic of the Egyptian schools, such as rigidity of attitude, excessive breadth of modelling, and the adherence of the limbs to each other or to the trunk. In easily plastic materials the Egyptian artist worked much as have done the artists of other schools, but when his materials were monumental he was forced into peculiarities of practice. Not only is this the case with the bas-reliefs, whose aim is decorative and not representative, but with the free figures of all sizes, from below natural up to the most colossal proportions. His materials were the hardest rocks — granite, diorite, and basalt — and his tools were of stone, of hardened wood, or at best of bronze. In our day it is a work of the utmost difficulty to fashion such materials with the aid of the best steel chisels, but to the Egyptians tempered iron seems to have been quite unknown. M. Perrot quotes Soldi's book on Egyptian sculpture as proving — in so far as such things can be proved, which is, however, in this case more nearly than might be fancied—that the Egyptians worked their statues with a metal "point" struck by a hammer, with a hammer-head on which were several such points, and with a kind of two-bladed hatchet by means of which chips were driven off.


A Painting at Thebes showing Sculptors at Work.

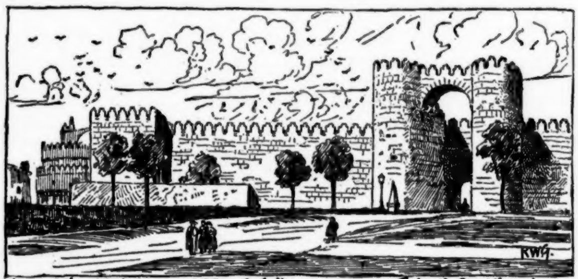
The surfaces produced by such tools had to be polished in order that the sketchy roughnesses they left might be removed; hence the Egyptians always polished their statues. But both file and rasp seem to have been unknown to them, and it is probable that they attained their end by means of boards sprinkled with powdered sandstone, wetted through a hole in the middle, of flat stones, and of emery. In spite of the endless patience of a people to whom time and labor seem to have been of small account, there must always, says M. Perrot, "have remained a certain inequality and rudeness in works carried out by instruments that bruised and shattered rather than cut. The stubbornness of the material, and the defects of the tools employed had a double consequence. In order to avoid all danger of spoiling his figure when roughing it out the sculptor was compelled to err on the side of over-solidity and heaviness; he was obliged to multiply the points of support, and to avoid anything like delicacy or slightness of parts. On the other hand he was obliged to fine down, and almost to obliterate the suggestive contours of the living form by the final polish, in order to correct the irregularities due to the rude and uncertain nature of his implements. All this explains the absolute necessity of the supporting blocks reserved by the Egyptian artist at the back of his statues, and of the great massiveness of their forms, and of the stone left between the limbs when they are separated from one another." Nothing could have been more easy than to remove these masses after the work was completed, and the danger of fracture from the hard blows of the hammer was overpast, by means of the drill; but that instrument by which the necessary holes could have been made without dangerous shocks was certainly unknown to the Egyptians. "The same influence is to be traced in the modelling as well as in the poses of Egyptian statues. Their general forms are fairly well understood and expressed, but there is none of that power to suggest the muscles under the skin, and the bones under the muscles which distinguishes Greek sculpture. The suppleness and elasticity of living flesh are entirely wanting. Everything is in its place, but details are as much suppressed as if the work were to be seen at a distance from which they would be invisible." The lesson thus taught is then enforced by reference to the works in less intractable materials, to which I have already referred. Here we find great freedom and individuality, but never the technical perfection of Greek art, for here the materials were too soft, and did not admit of the exquisite workmanship to which marble alone gives perfect play.

The more truly *artistic* conventions of Egyptian work, conventions of aim and idea, are partly explained in the same way, but partly by the influence of Egyptian writing in its employment of pictures toward a simplifying and conventionalizing of natural forms; this practice acting on the national taste, and tending to form the most striking feature of this plastic style — "the continual endeavor to strip from all that is accidental and particular, to generalize and simplify it as much as possible." I cannot pause over all the interesting discussions which still remain in this section — not even over the examination into the supposed "canon" upon which so much of the conventionality of Egyptian work has been fathered, or over the concluding passage which shows the close artistic harmony that existed between the work of the sculptor and the architect in the valley of the Nile. I will only quote one more paragraph as giving a valuable summary of the whole matter. "The history of Egyptian sculpture is the history of a contest in the mind of the artist between two opposing forces. In the early years of the monarchy his first duty was to supply a portrait-statue, the chief merit of which should lie in the fidelity of its resemblance. Of this task he acquitted himself most skilfully and conscientiously, reproducing every individual peculiarity, and even deformity of the model. His chief attention was given to the face, as being the member by which men are principally distinguished one from another. Even then, and in the funerary statues, the body was much more general in its forms than the head. In the course of succeeding ages the sculptor was able whenever he wished to make a faithful portrait, either of an individual or of a race, to bring this faculty into play, and clearly to mark the differences by the varying character of the head; but yet his art shows an ever-increasing tendency to follow the bent which had been given to it by the practice of glyptic writing, and by the long contest with unkindly material. After the close of the Ancient Empire Egyptian art became ambitious of a higher style. Under the Theban Pharaohs it worked hard to attain it, and it knew no better means to the desired end than the continual simplification and generalization of form. This is the great distinguishing characteristic of the Egyptian style. The uniformity, stiffness, and restraint of the attitudes, the over-rigorous symmetry of the parts and of the limbs, and the close alliance of the latter with the body are only secondary features. We shall find them in the works of every race compelled to make use of materials that were either too hard or too soft. . . . And it must not be forgotten that many wooden and limestone figures have been unearthed which surprise us by the freedom of their attitudes and movements. The true originality of the Egyptian style consists in its *deliberately epitomizing that upon which the artists of other countries have elaborately dwelt*, in its lavishing all its executive power upon chief masses and leading lines, and in the marvellous judgment with which it seizes their real meaning, their proportions, and the sources of their artistic effect."

The chapters on painting and the minor arts are also of great value, but my review has run to such unwarrantable length already that I must close with a word as to the English translation. It has been done by Mr. Walter Armstrong, of Oxford, already known as a writer on art, and while not to be called an ideal translation is yet a capable and satisfactory version. I have not the opportunity to compare it with the original volumes, but if I remember rightly he has slightly abridged the words of the original in more than one place, though never so as to hurt either sense or clearness. M. Perrot's style is one of the most charming even among the styles of French writers on art, renowned as they are in this direction. To say it has been entirely preserved in English would be to say too much, but we do at least get a book which is for the most part in well written English, which is always clear, and which does not afflict the ear with the sense of over-literal translation, or the mind with the feeling that, on the other hand, too free a version has been made. We may count ourselves fortunate in getting so satisfactory a rendering of so admirable and useful a work at such a short interval after its appearance in Paris.

M. G. van Rensselaer.

SPANISH ARCHITECTURE.[1] — IX.



Apse of the Cathedral Walls of Avila Gate of San Vincente

MADRID is very peculiar among capital cities. In the natural course of events, there should be found some of Europe's greatest archæological treasures of every kind,— buildings of intense historic interest, streets redolent of legends and fables of dynasties and of the people,— in the chief city of ancient Spain, sometime boastful of supremacy in every human potency and virtue. But it is not so. On the contrary, no great country has a less attractive, less agreeable capital than this. Notwithstanding possibilities and desirabilities, the capital of Spain is Madrid, and Madrid is unprofitable. Especially is this the case if one comes to it after having seen some of the charming characteristic cities which are numerous in the country. Then not even that novelty of language and customs which is to be enjoyed by the new-comer is noticeable.

It is a very modern city, and was planted where it stands without reason or wisdom. And since those early days men have made a bad situation worse by ignorance of natural laws.

Charles V took a fancy to this locality, where he had a hunting station in the midst of forests inhabited by large game. Doubtless the claims of many rival cities to be chosen capital of the re-united country, and the jealousies which any selection would arouse had something to do with this, but the king's will, or the king's whim, is generally quoted as the source of the blunder. However, the city was founded and established as the capital and only court of Spain, and soon became so secure in that office that efforts to correct the error were unavailing. Now mark the change. Human efforts might have done much to ameliorate the evils of the locality, but instead of that the place is ten times worse to-day than it was then. The abundant forests rapidly disappeared and not a sapling was saved or a shoot planted to replace them. It is said that the Spaniard hates trees. I do not think that is quite true. I think he loves them too well, for fuel, and only hates any kind of work for so useless an object as the benefit of posterity. Be that as it may, these plains devastated of their wood are miserable wastes. The route from Toledo to Madrid is mainly through cheerless flats where crops are wrested from the sandy earth in such sadness as seems to illustrate the primal curse. Yet what it might be is shown in some spots where irrigation is practised, and the face of the earth bursts into pleasant verdure. Where a river brings water in constant abundance the height of fertility appears. But the river of Madrid, the Manzanares, is only a little one, a tributary of the Tagus, and is moreover a stream of uncertain flow; at one time a roaring torrent, and at others (when water is most wanted) perfectly dry. Of course it is and was an uncivilized mountain savage, but equally of course it is a great deal savager since the forests were cut from its "*vega*" and ravines. The city gets its water from the same mountains but from another source. The Sierras named "de Guadarrama" lie to the north, thirty or forty miles away, snow-capped and chilling, the birthplaces of biting winds whose qualities are dreaded even by the natives.

The city is about square, with very irregular streets, some, however, wide and handsome, fine boulevards, two or three squares and a small park.

The great Royal Palace is worth inspection but scarcely merits description. It stands on the western side of the city on the edge of the plateau overlooking the dry river-bed below. East of it in the city is the Plaza del Oriente. It is ornamented with a much vaunted equestrian statue of Philip IV, which certainly has some good points. They are mostly passed over in admiration of the attitude of the horse, rearing upon his hind legs, which are so little under him that I longed to make him put one of his forefeet down, and cease to struggle with gravity. To enable him to maintain this position of unstable equilibrium (if it is equilibrium at all) his bronze tail is clustered down his legs as an additional support. Then there are, ranged around the oval garden in the middle of the square, forty-four colossal statues of kings and queens of Spain, monotonous in attitude and without delicacy in execution. They want some connecting lines of parapet or balustrade to bring them into a group, to connect and harmonize them; as they are, they constitute not a series, but a dispersed crowd.

The Plaza Mayor, a little farther in the city, has some interesting old houses, etc., and another equestrian statue of Philip III. It is on a wretched horse. This square was the scene of the great Autos de Fé, and of the grand court bull-fights in former days. It is said that the leases compel the occupants of houses to surrender their front rooms and windows to be fitted as boxes on these occasions. Near by, the Calle de Toledo, an ancient-looking narrow street, is the place to see what is most really Spanish in Madrid. Shops turned inside out, so to speak, almost in the Moorish fashion, with the stock-in-trade flapping in the wind to tempt the gaping rustics for whom this market exists. *Capas* and blankets, sashes, guitars, knives, shoes, and a hundred other things for the populace, line the sides of the street. Plenty of bits for the lover of quaint humanity here. The Puerta del Sol, once perhaps a gate, is now the central Plaza of the city, an intersection of streets somewhat irregular but spacious, rather French looking in the matter of architecture, animated and gay, whenever the weather permits, the rendezvous of the people. Hence a broad street with more diversity than usual, leads eastward out of the city toward the park and bull-ring. It is called Calle de Alcala. Many handsome modern buildings adorn it and more are rising. On this side is the celebrated Prado, the great boulevard; with trees, fountains and some statuary and monuments. But its greatest attraction to the stranger artist is the gallery containing the superb collection of pictures. Here for the first time I appreciated the greatness of Velasquez and Murillo. And of Rubens, Titian, Tintoretto, Teniers, Paul Veronese and the wonderful Raphael, there are numerous examples. And of course a hundred other names adorn the catalogue. I was astonished at the splendors of this collection. It is one of the finest in Europe, and so little known, comparatively speaking, that it is doubly attractive. It is not my function to attempt any detailed description, but I cannot refrain from saying that any lover of art who comes within five hundred miles of it, ought, if he can, to turn aside to see it.

Another collection well worth a visit to Madrid is the Museum of Armor, or Royal Armory, where may be seen marvels of the metal-workers' arts of the good old days. Suits complete for the battle-field, for the tournament, and for courtly show, of nearly all ages during which armor was in vogue, and from all the European cities celebrated for its production. And not only as interesting relics of warrior times are they to be observed, but beautiful examples abound of the highest art in chasing and engraving, damascening, and inlaying, and *repoussé* work, even, pressed into the service of the luxurious old princes. They are all very well shown; many upon models of men and horses. There is, too, a museum of archæology which I learned had some things worth examination, but I missed it by reason of a public holiday, when it was closed.

The bull-ring is, as a public building, a legitimate subject for my notes of architecture, but I can hardly claim that a description of the sport to which it is devoted has a proper place here. Nevertheless I venture to take the pages wherein the two (the building and the performance) are intimately mixed, from my journal without "cutting," because they do not separate easily and because the account of the latter is in some degree interesting for itself. The national sport of bull-baiting to the death seems to be as popular as ever. True, there are a few refined people who set their opinions against those of the populace, but the latter is an enormous majority, and is as unhesitatingly, uublushingly fond of the *Corrida de Toros* as it was a century ago.

"The Plaza de Toros engaged my attention very forcibly. Its striking resemblance to the Roman amphitheatres was the first thing I noticed. It is of enormous size—I believe the largest in Spain, although Seville and some other cities boast great bull-rings, and Andalusia is the native land of the sport. The "*gradas*," or seats stepped one above another, are of granite in the lower tiers, some twelve or more in number, open to the weather like the arena enclosed by them; above the *gradas* rise other tiers of wooden seats, this part being in two stories with a roof supported upon slender Moorish columns and arcades. Outside all are ample corridors in two or three stories and an enclosing wall of brickwork, which externally is designed in semi-Moorish forms with horseshoe arches. To return to the interior — the tiers of seats are broken at frequent intervals by gangways arranged somewhat as in the Roman amphitheatre, too, to lead into corridors under the seats. The lowest step of the *gradas* is some six or seven feet above the arena level; and at a distance of about six feet from this circular wall is a massive fence of timber about six feet high. The interval thus formed all around the arena is the place to which the *toreros* retreat when the ring itself is not comfortable. There are five or six great gates in the fence and corresponding doors in the wall ingeniously arranged so that when opened to admit or provide escape for the bull or the horsemen or mules, they close any two, and open any two, of the four ways. Sometimes the bull in chase of a *torero* leaps the outer barrier. Then whichever way he runs, the nimble gate-keepers have arranged it that his path leads back into the arena. This, the great smooth sand floor, is larger in proportion to the total diameter of the building than were the Roman rings. It is a field surrounded by seats rather than a floor in a large building. Here the liveliest elements of the crowd, which every Sunday afternoon pours along the suburban road in all manner of vehicles and by every gait afoot, lounge and chatter while the better seats fill more quietly. The band (an excellent corps of musicians, too, when I was there) is in place early, and to its music the populace keeps up a continual movement.

"The great circle looks, when viewed from above, like some newly disturbed nest of ants getting darker every minute with more numerous restless spots of black. It is said that the structure will seat

[1] By Robert W. Gibson, Travelling Student of the Royal Academy. Continued from page 42, No. 422.

fourteen thousand persons, but I thought nine or ten thousand would be a more correct estimate. It was enough. As four o'clock, the appointed time of commencement, approached I regained my seat after an inquisitive perambulation. Soon the President appears, the band ceases, the crowd hurriedly scrambles up the *gradas* and ceases to be a crowd as it takes definite order upon the tiers of granite. The gangways and doors are cleared and inspected, the vendors of oranges and fans and other luxuries retire to less conspicuous places, and the audience waits. There is much ceremony and etiquette in the manner of conducting the contests, and many of the items in it seem to be derived from the ancient days of tournaments. The chief place in the great round of seats is a box reserved for the President, usually some distinguished personage to whom all the combatants address themselves. Opposite the chief box is the principal door from the stables and dens, and the platform for the band, and gallery for the heralds and trumpeters. When all is ready, at a sign from the President the trumpets and drums announce the opening of the "*Fiesta.*"

"The doors are thrown open and the whole staff of *toreadores* and *toreros* enters in grand procession and marches across the arena (which looks vaster than ever with this orderly pageant upon it) toward the chief box. The principal fighters are as gorgeous as gold and silver lace and brilliant-hued silks in studied combinations can make them; no tawdry tinsel, but real magnificence of attire, glowing in southern sunshine, richer in appearance than the most splendid of military uniforms — a show worthy of a special day in the capital city. First come the half-dozen mounted *picadors* or spearmen. Their steeds are not altogether satisfactory, but the best of the dozen or so doomed to slaughter are selected for the opening parade. Then follow the company of *chulos* and *banderillos*, unarmed and unarmored except by the deceptive cloak. The *matadors* or swordsmen, who are the great heroes of the fight, who give the *coup de grace* and perform the most dangerous and skilful feats come next; three or four at most, probably only two. Next, the non-combatant grooms and attendants who perform the least dignified offices, one to each *picador*, for example, to help him when he is overthrown or hurt, or to administer whacks with a long stick to the horse if he balks at inopportune times. Lastly the splendid teams of mules, six in each, gaily harnessed and decorated, which drag out the slain.

"Each of the performers in turn salutes as he passes the President, and the procession sweeps round and breaks, those not at first required retiring. Two spearmen with their grooms are posted close to the fence, and near the door by which the bull will enter, and two or three *chulos* near them. Some other *chulos* are stationed right opposite, and are the first remarked by the bull upon his entrance. ("*Chulo*" sometimes means jester; in bull-fighting his office is to lure the bull away from *picadors* or *matadors* when too hard pressed, and to make fun and keep the game going between whiles.) The swordsmen and *banderillos* are not present yet.

"The fight is a tragedy in three acts. All being ready a flourish of trumpets causes every eye to turn toward the *toril* door. It is opened, and in rushes a magnificent, well armed, infuriate bull. I was astonished at the power and ferocity of the animals. They are specially bred on the great plains, and are tested and selected when young, only the bravest being reserved for the chief *fiestas*. They are managed by the aid of tamed cattle, trained to lead them, as are elephants in the East, but even then the herdsmen have dangerous episodes occasionally. At last the bull is loosed in the arena with one or two barbed rosettes stuck upon his sides as he passes the door, to rouse him to all his ability for mischief, like spurs upon a restive horse. It is no child's-play. Of course every bull behaves differently; but probably he will see the *chulos* across the ring and gallop straight for them. They disperse, put a foot upon the rail provided for that purpose, and vault over the fence if the bull is very angry. The latter stops, perplexed. Then he turns and sees the horses near where he entered. Straightway he charges the nearest. The spear is furnished with a point about half an inch long only, protruding from a round top, so that the bull is only just pricked by it, and not wounded. The *picador* endeavors to receive the charge at his right front, and to plant his spear-head on the bull's right shoulder. Thus he is often turned, not stopped but thrust aside, without reaching the horse, and perhaps he will charge the other. Sooner or later he gets an opportunity, and sometimes delivers such a stroke that horse and rider are literally lifted from the ground and overthrown. Often the sharp, long horns pierce and rip the horse without upsetting him, and it is surprising how much injury the wretched creatures can endure. When a catastrophe occurs, the *chulos* hasten up, and a gaudy cloak lures the bull into chase, and two or three more engage him, while the grooms help up the prostrate *caballero*. He has steel gaiters and is padded about the ribs, so he goes through astonishing adventures without serious hurt. But broken bones are common among *picadors*. If a man is hurt he is helped away and another takes his place. Surgeons, and even priests for extreme cases, are in attendance, and such accidents are just frequent enough to keep the danger in full knowledge. So passes a lively five minutes. This, the first act, is a bloody one, for a good bull will kill two or three horses and wound more in that time; and the atrocious thing is that the miserable animals are brought to be killed with as much show of the killing as possible. The populace *demands* the death of two or three horses to each bull, and therefore little skill is exercised to save them, only just enough to make a show of fighting."

"There is much in the bull-fight that is fascinating: the hardihood and address, the excitement of the very life of the combatant depending upon his skill, and the really amazing feats by some of the celebrated men. Many features in it belong to quite another category than the butchering in the *picador's* scene. In the olden times, when gentlemen and nobles fought the bulls, they did it with reliable horses and sharp spears, and there was none of that blood for its own sake which we see now. If this part of the modern bull-fight were corrected, the thing would be much less revolting.

"Presently the trumpets announce Act Two of the tragedy. The *chulos* engage the bull while the horsemen retire, leaving their dead upon the field. These *chulos*, men of the cloak, often have very narrow escapes. In the emulation for applause one of them will occasionally venture too much, and perhaps abandoning the cloak in the hope that *el toro* will vent his spleen upon it, the man runs for the barrier. At such a moment a single slip or turn of the ankle would be death or a near approach of it. The bull is perhaps three feet behind and can run like a horse, and once in a while, when the man safely vaults the timber guard, the bull leaps it after him, so earnest is his pursuit. Yet the men do not run so much as would be supposed; they support one another. Some bulls are easily diverted; others get a settled purpose and attend to one man at a time. The second act is that of the *banderillos*. These are nimble men, provided — one can hardly say armed — with *banderillas*, sticks about two feet long, with small, barbed points, and covered with a quantity of colored paper and ribbons. They stand boldly in the midst of the arena and attract the bull's attention with stamps and shouts. When he charges, with lowered head, the *banderillo* reaches forward right over the blood-stained horns, and plants the barbed sticks one on each shoulder, leaping lightly to one side immediately. There they hang, just hooked into the thick skin, irritating the animal to worse fury than ever. Sometimes the man misses, and then he is in need of help from the *chulos*. But when the feat is well performed it seems to check the bull; he pauses astonished, and the *banderillo* escapes easily. Some of these men are very clever. They will receive a charge seated in a chair, or kneeling upon the ground, and will perhaps vault over the bull's head and shoulders: it depends largely upon the bull. Three pairs of the exasperating ornaments are bestowed upon the bull unless he can avoid some of them, and by that time he is becoming a little fatigued and dazed. The *chulos* are ever alive around him, enticing him into the position required by the greater men, and assisting generally. At the sound of the third trumpet the *matador* (killer) enters, armed with a peculiar, straight, sharp-pointed sword and a red cloth a yard square. He salutes and receives permission to kill the beast, and the field is left to him. He is an experienced *torero*, having been attendant, groom, *chulo* and *banderillo*, in turn from boyhood. He does not run, but simply moves a little to one side or the other, receiving each charge upon the red *muleta*, until the bull, perplexed at meeting no solid resistance, stands to consider the situation. The swordsman studies him, his eyes, his shoulders, and every movement. Every bull has his character, and the *matador* has to learn it. He provokes the animal again and again into a charge at the red flag, and sometimes reduces him to such confusion that he can walk up and take him by the horns while the crowds applaud lustily. Not with all animals, however. Some learn the fraud of the flag, and charge at the man instead. No one can anticipate events with such a bull, but the *chulos* draw nearer. When he is ready the *matador* chooses his position, provokes a last charge, and just as the animal lowers his head almost to the ground for the stroke, he receives the sword between the spine and shoulder, a thrust that buries it to the hilt and pierces the heart. *El toro* falls dead. This is the master-stroke, and for one such there will be many imperfect. The point may strike hard bone. I saw one such, and the next moment the *matador* was pierced by a horn and wrestling to save himself from further injury. He escaped by the help of the *chulos*, but some weeks passed before the ring saw him again. He was carried out without much comment or sympathy; the bull was respected the more, and was even applauded by the noisy mob. The flow of applause or derision is continuous; both man and bull are greeted with bravos or vituperations, according to their deeds. And these critics are very fastidious about the proper performance of certain strokes. The bull must be baited and killed with regard to rules, exact and well remembered, and the man who makes a foul stroke is hissed and pelted from the arena. I saw one swordsman, after a failure, deliver a second stroke, which, though deep and sanguinary, did not affect the vitality of the bull. He bled from the nostrils; his lungs were pierced, but he was only more furious. The swordsman had to regain his weapon, while the crowd derided him for so much blood and so little effect. They played the bull and managed to throw a cloak over the sword-hilt so as to pull it out. Then another stroke. The bull is doomed to die, however brave he may be. If, as occasionally happens, he tires and refuses to fight, the butcher is sent for; such a cowardly animal is not worthy to die by the sword. The gay teams of mules, with ribbons and bells, are attached to the slain bull and horses, and drag them out at a mad gallop, the band strikes up while grooms rake over and restore the floor of the arena, and all is ready for another bull, who will give an entertainment in the same order, but with a programme of his own. There are usually six bulls killed at an afternoon *fiesta*, and each occupies about twenty minutes. There seems to be as much interest in the doings of the last as of the first, for the characters of the brutes are so different that continual variety of event is looked for. Some of them puzzle and tire their human foes. The last I saw at this *fiesta* was so plucky and tenacious of life, that, after getting three sword-thrusts and disabling his man, no one dared continue against him in the waning light, and he was conducted away by a pair of tame oxen, with the sword in his body, the hilt only in view upon his shoulder. And what bravos he earned from the excited people. I, too, thought he deserved to live."

About sixty miles to the west of Madrid is the old city of Avila, and half-way on the borders of a ruggedly beautiful mountain country is the great cold palace of the Escurial. It is big; it is a little imposing by reason of its size, and just a little picturesque, from some points of view, in its spire and dome compositions of sky-line. But that is all. It is an empty, soulless, chilling specimen of Renaissance building of the sixteenth century by Juan Bautista de Toledo and Juan de Herrera, architects, and Philip II, king and founder. The church is big and uninteresting. I read of and remember certain features of marble and jasper and bronze. Yet the whole effect was colorless. There is some miserable fresco painting and plaster-and-gilt decoration. In some of the apartments I saw some really fine inlaid work in wood, probably by Italian artists; but it was on the whole a disappointing visit, and I should say that an hour or so at the Escurial would satisfy any one.

But how different is Avila; an ancient fortified city, still completely surrounded by its old granite walls, with towers and gates in good order. An attractive old cathedral, whose circular apse is built into and forms part of the city fortifications, and two or three churches of the deepest interest. These things were better, and after the many days I had lately passed without seeing anything I wanted to sketch, I got to work here in the certainty that I could not do half I wished to.

THE ILLUSTRATIONS.

THE RENNERT HOUSE, BALTIMORE, MD. MR. E. FRANCIS BALDWIN, ARCHITECT, BALTIMORE, MD.

THE first-story front is rock-faced ashlar, of East Longmeadow stone, and the balance of brick trimmed with the same stone. The first two floors will be fire-proof, and the partitions throughout of hollow blocks, with ceilings plastered on wire lathing so that the whole will be practically fire-proof.

CATHEDRAL OF AVILA, SPAIN, AISLE OF APSE.—SAN VINCENT, AVILA, NORTH SIDE OF NAVE. SKETCHED BY MR. R. W. GIBSON, ARCHITECT, ALBANY, N. Y.

SEE article on "Spanish Architecture."

RESULTS OF TESTS OF THE TRANSVERSE STRENGTH OF BEAMS. PLATE VI.

FOR explanation see article elsewhere in this issue.

SKETCH FOR PROPOSED STATE NORMAL SCHOOL, ALBANY, N. Y. MESSRS. OGDEN & WRIGHT, ARCHITECTS, ALBANY, N. Y.

THE material is to be Philadelphia pressed-brick, with brownstone and terra-cotta finish, and tile roofs. Random brownstone ashlar for basement.

HARD-WOOD LUMBER GRADES IN BOSTON.—White-pine from the West is not sold upon Boston inspection, but hard-woods of all kinds are sold only by our survey and grading. The law reads as follows, and the deputies are required to adhere to it strictly:—

Hard-woods of all kinds are divided into three sorts: number one, number two, and culls. Survey of black walnut and cherry lumber.—Number one includes all boards, plank or joist that are free from rot, shakes, and nearly free from knots, sap and bad taper; the knots must be small and sound, and so few that they would not cause waste for the best kind of work; a split in a board or plank if parallel with the edge of a piece is classed number one. Number two includes all other descriptions, except when one-third is worthless; when a board, plank or joist contains sap, knots, splits, or any other imperfections combined, making less than one-third of a piece unfit for good work, and only fit for ordinary purposes, it is number two; when one-third is worthless it is a cull or refuse. Refuse or cull hard-wood includes all boards, plank, or joist that are manufactured badly, by being sawed in diamond shape, smaller in one part than in another, split at both ends, or with splits not parallel, large and bad knots, worm-holes, sap, rot, shakes, or any imperfections which would cause a piece of lumber to be one-third worthless or waste.

Such is our law regarding the inspection of walnut and cherry, and the same applies to ash, oak, poplar and butternut. All hard-woods are measured from six inches up, and all lumber sawed thin is inspected the same as if of proper thickness, but is classed as thin, and sold at the price of thin lumber. For instance, lumber intended for inch but sawed scant is sold for five-eighths. We have no such thickness as ¾ inch lumber, the regular sizes are ⅝, 1, 1¼, 1½, 2, 2½, 3, 4 inch and up, on even inches. The regular lengths are 12, 14, and 16 feet, shorter than twelve does not command full market price. On equal inspection any lot of lumber averaging twelve inches wide sells at a better price than a narrower run. Many shippers appear not to understand this. The standard of good hard-woods is three-quarters ones and the balance good twos. Any culls made on our inspection are sold at half price of ones and twos, which, by the way, are sold together at one price, instead of two prices as in some other markets.—*Northwestern Lumberman.*

SANITARY PLUMBING.[1]—XVII.

Examination of the Action of Fluids in Traps.

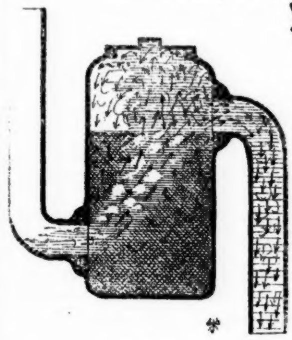


Fig. 68.
Movement of fluids in a Pot-Trap.

TO study to the best advantage the action of the air and water in traps, it is necessary that the traps should be constructed entirely of glass, or have glass strips set in the metal in such a manner that the whole interior of the trap can be clearly seen, and that the interior surfaces shall not be in any way obstructed or roughened by these window casings. Examining first the pot trap, Figure 68: Under a powerful siphonage air is driven through the water in the body of the trap in the manner shown in the sketch. A quantity of water is projected out of the trap in advance of the air column, as shown by the arrows. If the action were continued long enough, all the water above the inlet would be ultimately expelled. It will be observed that part of the water is forcibly thrown up against the top of the body of the trap, whence it is reflected back in the form of spray in all directions. Part of the spray falls back to the bottom of the trap, or to the level of the water standing therein, and part falls across the outlet mouth and is forced out with the general current of the air and water and lost. The smaller the diameter of the pot the more easily it can be emptied by siphonage. The writer has found that an 8-inch pot-trap with 4-inch seal could be siphoned out in a few minutes, but this required a very powerful disturbance, one much more powerful than would ever be encountered in plumbing. A much less powerful action was required to empty a 6-inch trap, still less a 5 and 4 inch trap, and so on, regularly decreasing in degree, as will hereafter be shown,[2] until we come to a modified S-trap as shown in Figure 69.

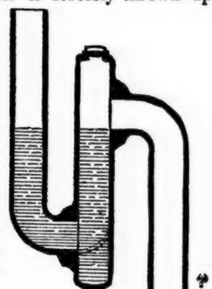


Fig 69.—Pot-Trap reduced to the size of an S-Trap.

This form of trap has a slight advantage over the ordinary S-trap of equal depth of seal. The pockets at the bottom should be dispensed with, and the dotted line followed, since this pocket increases the size without adding to the security in any respect. The upper pocket, however, has a positive advantage as a reflector. The water projected upwards by the air current is not *de*flected into the outlet arm as in the ordinary S-trap, but is partly *re*flected back into the trap. One of the principal reasons why the S-trap is so easily siphoned out is that the curve at the top conducts the water directly into the outlet. The reflecting surface, however, should not be arranged as here shown. The pocket increases the unscoured area of the trap. It is true, it is no worse in this respect than the mouth of a ventilating-pipe, which, under the present law, it is customary to put at this place. But it is just as certain that such a pocket will become clogged in time, as it is that grease and slimy filth will deposit a sediment on everything with which it comes in contact; the higher or deeper the pocket, the more readily will the deposit be formed: a shallow pocket might be partially scoured by the force of the water projected upwards against it by momentum. In this case a certain portion of each deposit of filth would be washed off by friction and the process of clogging would be somewhat retarded. But let the pocket be deep enough and there will then be parts which will be within the *reach* of the waste-water, but beyond its *scouring effect.* The spray thrown up by momentum will at this

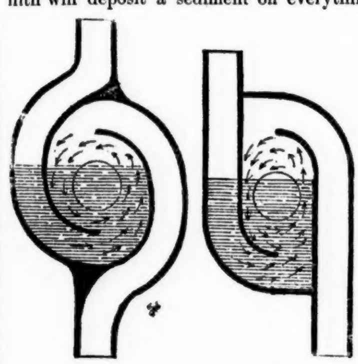


Fig. 70. Fig. 71.
Traps with Curved Reflecting Surfaces.

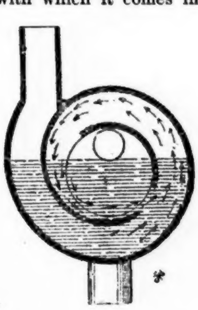


Fig. 72.—Vertical Section.
Trap designed to prevent Siphonage by means of the centrifugal force of the fluids passing through it.

[1] Continued from page 46, No. 422.
[2] In the account of the tests on the siphonage and evaporation of traps made for the Boston City Board of Health.

height have spent its power. The drops of dirty water will simply rise to their turning point, deposit their filth and trickle back again into the trap. The ventilating outlet forms exactly such a pocket: at a certain height above the crown of the trap the inner surface of this flue will receive the *spatterings* of the filth-laden waste-water, but never receive *its scour*. Hence, the area of the vent-opening must infallibly continue to decrease in size, more or less quickly, according to the usage of the fixture, until the opening is too contracted to be of any value in resisting the action of siphonage on the water-seal. Moreover, the cool ventilating draught helps to congeal the fatty vapors arising from the waste-water in the trap and hastens the clogging, The writer has siphoned out the seal of an S-trap in three seconds after the ventilating opening had been reduced to one inch in area in a vent-pipe only eight feet long. The manner of forming this reflecting surface can be improved, as will be seen.

Thus we find that the virtue of the pot-trap lies in its *size*, and that there is no advantage in its form over that of the ordinary S-trap, except in the reflecting surface of the top. A curved top, which will deflect *into the outlet* the water thrown up by siphonage should never be used in a trap. Before becoming convinced of this fact, the writer devised a number of traps like those shown in Figures 70, 71, 72 and 73. In Figure 70 it was intended to deflect the water *away from* the mouth of the outlet, by giving the top of the body of the trap the curved form shown in the figure. The water was expected to follow the direction of the arrows. But though this form presented some advantages in resisting siphonage, it was found on experiment to have less effect than was hoped. The water did not follow the arrows in the drawing, so politely pointing out for it the direction given by theory. It seemed rather to prefer the course taken by the air, and was deflected by the upper curved surface of the trap, after offering a feeble remonstrance, into the outlet and whisked away into the drain. Figure 71 shows a slightly modified form of a trap based upon the same principle, and made at the same time. Figures 72 and 73 show another ineffectual effort of the writer, made in the wrong direction, to take advantage of the superior specific gravity of water over air, by giving the two fluids a rotary movement within the body of the trap and attempting to separate them from each other by centrifugal force. Figure 73 is a vertical section through the centre of Figure 72. It was intended that the water, in its rapid movement through the trap, should be driven by centrifugal force towards the outside of the trap, as shown by the arrows, and continue to whirl around, while the lighter air escaped through the outlet. This again proved upon experiment to be only partially successful. The water had too little respect for the writer's arrows, and apparently forgetting the laws of centrifugal force hastened to follow the course laid out for the air alone. Moreover, these forms of traps were not sufficiently self-cleansing, and were too complicated to be practicable.

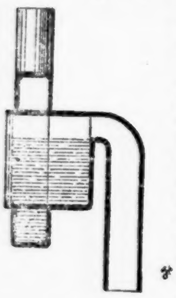


Fig. 73.
Transverse Section of the Trap shown in Figure 72.

Abandoning altogether, therefore, the attempt to attain an anti-siphonic trap by the use of curved reflecting surfaces, and returning again to the pot-trap as a starting-point, we retain its useful feature of a flat reflecting surface at the top, and reject its objectionable one of an excess of sectional area in the body over that of the inlet and outlet arms. How now shall we enable the air to pass through the water without driving the latter out before it? It is evident, first, that a contraction of the inlet and outlet arms at the point of their connection with the body of the trap will have precisely the same effect in transmitting air as if the body were correspondingly enlarged; with this advantage, that such a contraction at two points will not so greatly diminish the friction and scouring effect of the water passing through the trap as an enlargement of the entire length of the body. To make this more clear, we will suppose that instead of enlarging the body of the trap we do what is practically the same thing in effect: *i. e.*, diminish the size of the two arms throughout their entire length. This would evidently diminish the scouring effect of the water exactly as much as if the body were enlarged and the arms remained unaltered. But if we contract the arms *only at two points*, or where they connect with the body, it is clear that the retardation will be correspondingly less, and the scouring effect greater. Our first modification, therefore, consists in contracting the inlet and outlet arms as shown in Figure 74. A very slight contraction at these points will, with a trap otherwise properly formed, be found sufficient. For the present we give our flat reflecting surface the form of a shallow pocket. With a trap formed as shown in Figure 74, a slight contraction does not prove to be sufficient, and further modifications are necessary.

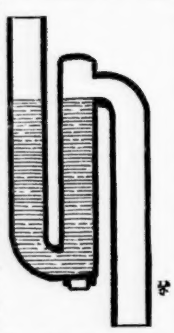


Fig. 74.—First Modification. Contraction of the Inlet and Outlet Mouths.

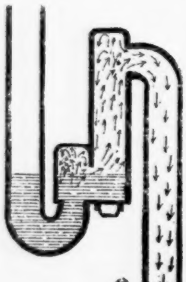


Fig. 75.—Second Step. Reflecting Surface below the Outlet Mouth.

Referring to our glass pot-trap, we shall see that the water projected violently upwards from the surface, by the air-bubbles rushing through the standing water under the influence of siphonage, is obliged to pass *twice* by the mouth of the outlet pipe, once before and once after reflection against the top, and that it is at these moments that it is sucked out and lost. That part of the spray which happens to be thrown farthest from the mouth of the outlet-pipe will be seen to fall back safely into the trap; but that which passes near this outlet, either in rising or after reflection, is drawn out by the concentrated and powerful suction at this point and wasted. And we find that one of the principal reasons why a large pot-trap resists siphonage longer than a small one is that in the large trap the spray has more space above the surface of the standing water than in the small one, so that a smaller proportion of the water thrown up by the rushing air-bubbles passes within the influence of the suction at the outlet-pipe. If our reflecting surface could be placed *below* instead of *beyond* the mouth of the outlet, this loss could be avoided. Our next step must therefore consist in so placing the reflecting surface. In Figure 75 this has been accomplished, but in an awkward manner. Before this surface can come into service, the level of the water must evidently be reduced to the level shown by the shading in the figure. Hence the perpendicular part of the body of the trap above the lower reflecting surface is not placed to advantage. Nevertheless this trap will resist a very powerful siphonic action, even as it is. The two reflecting surfaces, the lower and the upper, are so effective that the trap has proved more tenacious of its last inch or two of seal than a four-inch pot-trap, although its diameter is nowhere greater than that of the outlet and inlet pipes.

In this and in the preceding forms the depth of seal is too great to allow of a free and rapid discharge of the wastes. The air, in passing through the trap, disturbs nearly all the water in it. Our next step will therefore be to diminish the height of the water-column through which the air has to pass, and thus reduce the disturbance of the water without lessening its volume. It may be done by laying the body of the trap horizontal instead of perpendicular, as shown in Figure 76. This immediately gives us a very important improvement in resisting power. The area of the trap is no greater than that in Figure 69, but it is found to offer double the resistance to siphonage. Moreover, while the volume of water is the same as in Figure 69, the seal is not so deep. Hence the flow of water through this trap is more rapid than in the former, and its scouring effect correspondingly increased. As soon as the water in this trap has been lowered to the point indicated in the drawing, ample space is left above it for the passage of the air. It is evident that a much smaller body of water is disturbed by the passage of the air than is the case with the trap shown in Figure 74. The writer has had a number of pot-traps constructed on this principle, and has found their power of resistance to siphonage thereby in all cases immensely increased.

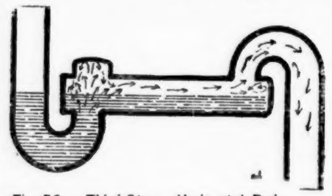


Fig. 76.—Third Step. Horizontal Body.

Nevertheless the trap thus made is far from anti-siphonic. It is moreover, awkward in form and difficult to set in such a manner that it shall remain firm in place. The long horizontal body is liable to sag and lose its form. Moreover, a single reflecting surface is insufficient to separate the water entirely from the air, and a strong and long-continued siphonic action destroys its seal. Other improvements are evidently necessary.

A fourth step consists in increasing the number of reflecting surfaces, and in breaking up the long horizontal body by making it return upon itself in a quadrangle, as shown in perspective in Figure 77. In this form of the trap we have still further greatly increased the reflecting surfaces and the power of resistance to siphonic action, and we are now able to dispense with reflecting pockets, but we have obtained a trap exceedingly difficult to manufacture, awkward in appearance, and troublesome to clean out in case of accident, as when a match or any such foreign substance is dropped into the waste-pipe and becomes lodged in a bend of the trap. How can this form of trap be simplified so as to render it practical, without losing any of the advantages we have thus far arrived at? Figures 78, 79 and 80 show the manner in which this may be done, and the arrangement forms the final step of our improvement. We have here retained all the reflecting surfaces; the horizontal body, which allows the air to pass above the water after a small quantity has been driven out, without disturbing the rest; and the slight contraction of the inlet and outlet pipes at their junction with the body of the trap. We have added a cylindrical clean-out cap of glass, and obtained an apparatus which can be readily cast in lead in moulds of iron. The quadrangular shape of the horizontal body is retained, but the two parallel cylinders are brought together and

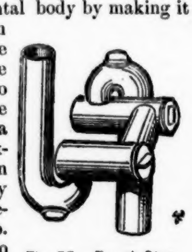


Fig. 77.—Fourth Step. Increase of Reflecting Surfaces.

merged into a single cylinder having a central partition about two-thirds of its length, or extending from one end to the edge of the

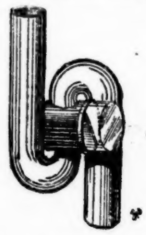


Fig. 78. — Fifth Step. Perspective View.

Fig. 79. — Transverse Section.

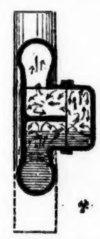


Fig. 80. — Longitudinal Section.

clean-out cap, which at the other end forms about one-third of the total length of the cylinder. A still further step may be made, if desired, to facilitate somewhat the cleansing of the trap during use, as well as to enable it to be detached easily from the fixture it serves.

TRANSVERSE STRENGTH OF TIMBER.[1] — VI.

NO. 32. — Hard-pine beam (North Carolina), 4 1-16″ x 12 3-16″; span = 18′; wood sound.
Tested by Messrs. Davis & Morse.
Moment of inertia = 613.7.

Loads in lbs.	Deflection in inches.	Differences.	Remarks.
485	.0000		
887	.0666	.0666	
1289	.1398	.0732	
1691	.2290	.0892	
2093	.3129	.0839	
2897	.4654	.1525	
3701	.6317	.1663	
4304	.6766	.1199	
11942	—	—	First cracks heard.
12545	—	—	Beam tipped and load was let off.
13751	—	—	Breaking load: beam having rested unloaded for one day; by tension and compression; afterwards by shearing at 12646 lbs.

Modulus of rupture = 7383 pounds per square inch.
Mean deflection for 402 lbs. = .0791 inches.
Modulus of elasticity = 1733976 pounds per square inch.
Max. shear at neutral axis = 242 " " " "

No. 33. — Hard-pine beam (Georgia), 3 15-16″ x 11¼″; span = 18′; very poor; about 12′ sound, the rest very pitchy and considerably split up at the heart.
Tested by Messrs. Davis & Morse.
Moment of inertia = 603.1.

Loads in lbs.	Deflection in inches.	Differences.	Remarks.
485	.0000		
887	.0757	.0757	
1289	.1448	.0691	
1691	.2200	.0752	
2495	.3783	.1583	
3299	.5395	.1612	
4103	.7017	.1622	
8726	—	—	Cracked continually from this point on, but carried load well.
8927	—	—	Splits began to extend.
9832	—	—	Breaking load by shearing; top fibres at centre very much crushed.

Modulus of rupture = 5386 pounds per square inch.
Mean deflection for 402 lbs. = .0780 inches.
Modulus of elasticity = 1793923 pounds per square inch.
Max. intensity of shear at neutral axis = 153 " " " "

Following is a table showing the immediate deflection per 100 lbs. on applying a load; the amount of increase in deflection with time, and the rate of increase per hour: —

Load in lbs.	Time in hours for each load.	Total deflection just before increasing load.	Deflection per load.		
			Immediate per 100 lbs.	Increase with time.	Rate of increase per hour.
485	139	.0116	—	.0116	.0002
1289	98	.2479	.0255	.0325	.0003
2093	94	.4875	.0263	.0290	.0003
2897	49	.7291	.0256	.0370	.0007
3299	52	.8679	.0257	.0361	.0007
3701	21	.9817	.0254	.0121	.0006
4103	93	1.1682	.0258	.0832	.0009
4505	24	1.2971	.0251	.0282	.0012
4907	26	1.4292	.0251	.0318	.0012
5309	6	1.5407	.0259	.0079	.0013
5711	26	1.6995	.0256	.0563	.0022
6113	69	1.9278	.0259	.0246	.0018
6515	73	2.1669	.0265	.1329	.0018
6716	18	2.2320	.0257	.0133	.0007
6917	26	2.3151	.0258	.0318	.0012
7118	126	2.5335	.0273	.1638	.0013
7520	26	2.6558	.0257	.0196	.0008
7922	17	2.7826	.0256	.0243	.0014
8123	24	2.8870	.0260	.0524	.0022
8525	120	3.1899	.0264	.1976	.0016
8927	21	3.3443	.0264	.0509	.0024
9329	59	3.5624	.0264	.1139	.0019
9530	14	3.6272	.0267	.0129	.0010
9731	6	3.6922	.0266	.0105	.0018
9932	19	3.7987	.0269	.0539	.0025
10133	5	3.8635	.0285	.0130	.0026
10334	17	3.9581	.0262	.0375	.0022
10736	9	4.0928	.0273	.0299	.0033
10937	—	—	.0273	—	—

[1] By Gaetano Lanza, Professor of Applied Mechanics, Massachusetts Institute of Technology. Continued from page 18, No. 420.

Breaking load = 11741 lbs.

The modulus of elasticity at different loads is as follows: —

From immediate deflection... 1.721.608
At 4103 lbs.......... 1.377.166
" 6113 " 1.293.046
" 7118 " 1.157.931
" 8123 " 1.169.451
At 8525 lbs.......... 1.113.684
" 9329 " 1.101.809
" 10133 " 1.108.016
" 10334 " 1.103.987

Modulus of rupture = 6742 lbs. per square inch.

No. 34. — *Time Test.* — Georgia pine beam: all heart on one side, about 1¼″ sap on other.
Dimensions: width = 4″, depth = 12.5″. Span = 20′. (N. B. The north end projected over the jackscrew 12.75.″, and the south end 43.75″.)
Tested by Messrs. Davis and Morse.

NOTE.—In this test a stretched piano wire was used for the first time as a datum line from which to measure the deflections, wooden straight-edges having been previously used.
(The sign * indicates that the jacks were screwed up at this point.)

Day.	Hour.	Load. lbs.	Def. inches.	Remarks.
15	10.45	485	.0000	
Nov.	11.00	—	.....	
	12.15	—	.0017 *	
	2.50	—	.0062	
	4.30	--	.0062 *	
16	9.00	—	.0058 *	Micrometer
	10.15	—	.0111	loose — tight-
	12.08	—	.0111 *	ened it.
	1.20	—	.0137	
	2.30	—	.0136	
	4.30	—	.0129 *	
17	9.00	—	.0098	
	12.50	—	.0126 *	Found lever
	4.50	—	.0124	resting against
18	9.00	—	.0097 *	upper support.
	12.00	—	.0155 *	
	4.30	—	.0130	
	5.30	—	.0134	
19	9.30	—	.0090	
	10.30	—	.0108	
	11.30	—	.0106	
	5.45	—	.0098 *	
20	8.30	—	.0111 *	
	9.00	—	.0099	
	11.00	—	.0108 *	
	1.00	—	.0126	
	2.50	—	.0121	
	5.15	—	.0127	
21	9.00	—	.0116	
	9.55	1289	.2154	
	10.05	—	. 958 *	
	1.00	—	.2255 *	
	2.00	—	.2250	
	2.40	—	.2272 *	
	5.08	—	.2291 *	
22	9.00	—	.2339 *	
	12.30	—	.2369 *	
	4.30	—	.2365 *	
	4.40	—	.2389	
23	9.00	—	.2400 *	
	1.00	—	.2443 *	
	4.15	—	.2456 *	
24	9.05	—	.2508 *	
	9.35	—	.2506	
	1.00	—	.2521 *	
	5.05	—	.2514	
	5.50	—	.2510	
25	9.00	—	.2483 *	
	9.20	—	.2479	
	11.45	2093	.4585 *	Slight crack
	6.00	—	.4596 *	heard.
	8.20	—	.4671 *	
26	10.00	—	.4720 *	
	11.35	—	.4719	
	1.00	—	.471	
	4.30	—	.4727 *	
	5.45	—	.4724	
27	9.15	—	.4763 *	
	10.15	—	.4762 *	
	11.35	—	.4771	
	12.00	—	.4771	
	12.40	—	.4767	
	1.00	—	.4783	
	2.15	—	.4783	
	4.45	—	.4798 *	
28	9.00	—	.4816 *	
	11.00	—	.4848 *	
	1.30	—	.4856 *	
	2.20	—	.4864 *	
	5.30	—	.4871	
	6.00	—	.4877 *	
29	9.00	—	.4880 *	
	9.40	—	.4875 *	
	9.45	2897	.6921 *	
	12.00	—	.7048 *	
	1.00	—	.7054 *	
	4.45	—	.7137	
	5.15	—	.7137 *	
30	9.35	—	.7228 *	Load had fallen
	10.15	—	.7227 *	50 lbs. during
	2.30	—	.7242 *	the night.
Dec.	7.15	—	.7241 *	
1	9.45	—	.7292	Load fallen 44
	10.45	—	.7291	lbs.

Day.	Hour.	Load. lbs.	Def. inches	Remarks.
	11.00	3299	.8318	
	11.55	—	.8351	
	2.00	—	.8398	
	3.35	—	.8423	
	5.15	—	.8441	
2	9.30	—	.8566	Load off 60 lbs.
	10.00	—	.8575	
	1.55	—	.8601	
	6.00	—	.8641	
3	10.00	—	.8680	Load off 46 lbs.
	11.00	—	.8687	
	3.00	—	.8682	
	3.30	3701	.8679	
	3.35	—	.9696	
	4.05	—	.9725	Slight crack heard.
	6.00	—	.9725	At 6.00, six cracks in
	8.25	—	.9738	quick succession.
4	9.25	—	.9730	Load off 50 lbs.
	10.10	—	.9774	
	12.15	4103	.9817	
	12.25	—	1.0850	
	1.00	—	1.0860	
	2.30	—	1.0895	
	5.00	—	1.0956	
	7.40	—	1.0985	
5	9.15	—	1.1132	Load off 65 lbs.
	12.05	—	1.1192	
	4.15	—	1.1282	
	4.32	—	1.1292	
	5.00	—	1.1292	
	7.40	—	1.1342	
	10.30	—	1.1384	
6	9.15	—	1.1513	Load off 67 lbs.
	11.05	—	1.1527	
	12.55	—	1.1527	
	1.45	—	1.1531	Found microme-
	3.10	—	1.1524	ter loose and
	3.15	—	1.1536	adjusted.
	4.50	—	1.1557	
	7.30	—	1.1557	
	8.55	—	1.1572	
7	9 15	—	1.1627	Load off 45 lbs.
	11.00	—	1.1623	
	11.20	—	1.1668	
	1.15	—	1.1689	
	1.35	—	1.1691	
	2.45	—	1.1704	
	4.4	—	1.1709	
	6.50	—	1.1692	
8	9.15	4505	1.1682	Load off 38 lbs.
	9.25	—	1.2689	
	1.05	—	1.2769	
	1.25	—	1.2773	
	3.00	—	1.2842	
	4.45	—	1.2856	
	5.15	—	1.2871	
	8.40	—	1.2902	
9	9.0	—	1.2972	Load off 50 lbs.
	9.15	4907	1.2971	
	9.30	—	1.3979	
	11.30	—	1.4031	
	12.45	—	1.4061	
	2.00	—	1.4094	
	4.00	—	1.4124	
	6.45	—	1.4151	
	8.50	—	1.4203	
10	9.50	—	1.4286	Load off 55 lbs.
	10.35	—	1.4290	
	11.30	5309	1.4292	
	11.45	—	1.532	
	1.20	—	1.5348	
	3.00	—	1.5389	
	4.50	—	1.5394	
	5.10	5711	1.5407	
	5.30	—	1.6432	
	5.50	—	1.6469	
	8.15	—	1.6555	
	9.00	—	1.6585	
11	8.50	—	1.6785	Load off 89 lbs.
	12.30	—	1.6857	
	2.15	—	1.6897	
	2.50	—	1.6906	
	4.15	—	1.6947	
	6.57	—	1.6995	

Date. Day.	Hour.	Load. lbs.	Def. inches.	L'd fallen lbs.	Remarks.	Date. Day.	Hour.	Load. lbs.	Def. inches.	L'd fallen lbs.	Remarks.
	7.15	6113	1.8032				8.30	—	2.6409	25	
	7.45	—	1.8073		Load off 120 lbs.	25	9.15	—	2.6461	58	
12	8.50	—	1.8349				9.45	—	2.6461	—	
	12.00	—	1.8454		Crack heard.		10.00	—	2.6466	04	
	1.00	—	1 8494				12.30	—	2.6511	10	
	2.30	—	1.8532				3.15	—	2.6528	07	
	3.05	—	1.8544				7.20	—	2.6558	13	
	5.45	—	1.8544				7.30	7922	2.7582	—	
	6.10	—	1.8670				10.00	—	2.7639	35	
	9.00	—	1.8704			26	9.45	—	2.7760	67	
13	9.10	—	1.8838	85			12.15	—	2.7826	23	
	10.00	—	1.8896				12.30	8123	2.8346	—	
	12.15	—	1.8912				3.15	—	2.8432	42	
	12.45	—	1.8937				6.15	—	2.8564	49	
	2.25	—	1.8961				8.45	—	2.86 6	34	
	5.25	—	1.9020			27	9.15	—	2.8795	90	
14	9.00	—	1.9204	85			12.00	—	2.8870	23	
	11.20	—	1.9240				12.15	8525	2.9924	—	
	2.20	—	1.9280				2.15	—	3.0022	35	
	3.00	6515	1.9278				4.15	—	3.0146	40	
	3.05	—	2.0340				7.15	—	3.0245	40	
	4.15	—	2.0378				10.10	—	3.0338	32	
	5.00	—	2.0407				1.00	—	3.0363	20	
	7.30	—	2.0545	30		28	9.15	—	3.0454	65	
	10.00	—	2.0545				11.45	—	3.0495	20	
	12.30	—	2.0590	25			3.45	—	3.0630	45	Beam slewing towards the west, as shown by readings in original report in file book.
15	9.00	—	2.0705	70			5.45	—	3.0681	20	
	12.30	—	2.0791	30	Loud crack heard at 3.00 P. M., caused by a tension break in the sapwood at the bottom of the beam, near the center.		8.15	—	3.0754	27	
	3.30	—	2.1024	85		29	9.15	—	3.0922	95	
	6.00	—	2.1069	25			12.15	—	3.0993	30	
	8.30	—	2.1143	30			2.45	—	3.1052	22	
16	9.00	—	2.1275	85			7.15	—	3.1145	40	
	11.30	—	2.1331	27		30	9.00	—	3.1352	100	
	2.00	—	2.1383	20			12.00	—	3.1420	25	
	4.30	—	2.1418	20			3.00	—	3.1490	26	
	7.00	—	2.1472	20			6.00	—	3.1549	25	
	9.30	—	2.1487	15			11.00	—	3.1619	35	
17	10.30	—	2.1563	70		31	9.40	—	3.1943	76	
	1.00	—	2.1641	35			12.40	—	3.1764	15	
	3.30	6716	2.1669	15			5.50	—	3.1799	20	
	3.40	—	2.2183	—		Jan.	9.00	—	3.1813	15	
	6.0	—	2.2223	37		1	9.00	—	3.1857	45	
	8.30	—	2.2237	15		1883	12.30	—	3.1899	15	
18	8.30	—	2.2320	58			12.30	8927	3.2955	—	
	9.20	6917	2.2320	—			4.15	—	3.3061	45	
	9.35	—	2.2833	—			8.00	—	3.3116	25	
	12.00	—	2.2869	30		2	9.15	—	3.3251	74	
	2.30	—	2.2927	26			1.00	—	3.3323	30	
	5.00	—	2.2976	20			5.00	—	3.3368	30	
	7.30	—	2.3034	20			8.45	—	3.3443	27	
19	9.00	—	2.3126	70			9.00	9329	3.4485	—	
	11.30	7118	2.3151	20		3	8.00	—	3.4727	127	
	11.45	—	2.3697	—			11.45	—	3.4811	30	
	2.15	—	2.3768	25			3.15	—	3.4964	—	
	5.05	—	2.3842	25			5.15	—	3.5028	55	
	7.15	—	2.3911	25			7.30	—	3.5144	25	
20	8.45	—	2.3930	10		4	9.45	—	3.5434	140	
	9.15	—	2.4043	70			12.00	—	3.5500	27	
	11.30	—	2.4081	20			3.00	—	3.5554	27	
	2.25	—	2.4132	20			7.30	—	3.5624	22	
	5.00	—	2.4174	15			7.45	9530	3.6159	35	
	7.40	—	2.4216	20		5	9.20	—	3.6272	97	
21	9.00	—	2.4371	80			9.30	9731	3.6818	—	
	11.30	—	2.4410	20			11.45	—	3.6858	25	
	2.15	—	2.4494	25			3.00	—	3.6922	30	
	4.45	—	2.4526	22			3.15	9932	3.7428	—	
	7.15	—	2.4564	18			3.30	—	3.7428	—	
22	8.45	—	2.4694	75			7.30	—	3.7565	60	
	11.15	—	2.4731	18		6	9.00	—	3.7849	125	
	1.45	—	2.4781	20			12.30	—	3.7987	45	
	4.15	—	2.4842	22			12.45	10133	3.8505	—	
	6.50	—	2.4996	22			4.45	—	3.8635	55	
23	7.30	—	2.5047	80			5.15	10334	3.9204	—	
	12.15	—	2.5132	38			9.45	—	3.9391	—	
	3.00	—	2.5173	23		7	9.45	—	3.9581	100	
	5.15	—	2.5202	14			9.45	—	3.9581	—	
24	9.30	7118	2.5319	84			10.30	10736	4.0629	—	
	12.00	—	2.5330	14			3.15	—	4 0800	83	
	2.30	—	2.5335	10			7.15	—	4.0928	50	
	4.10	—	2.5341	08			7.15	—	4.0928	—	
	5.40	—	2.5335	00			7.45	10937	4.1473	—	Load fallen 275 lbs.
	5.55	7520	2.6362	—		8	—	—	—	—	

Jan. 8. The beam had now slewed over so far that the readings could not be taken without re-adjusting the wire. This was done, and in fifteen minutes the reading showed an increased deflection of .0154 inch, when it was thought best to take off the deflection apparatus entirely.

During the previous night the broken sap-wood had split off farther, leaving a large opening between it and the beam. Load 10937 lbs.

9. Load fallen during the night (10 hours) 200 lbs. Load was now gradually increased to 11741 lbs., at which point the south piece of the broken sap-wood split farther off.

10. At 7.30 A. M. the beam broke by tension, splintering considerably at the middle.

It will be seen from an inspection of the foregoing table that each additional load ceased, after a certain time, to cause the deflection to increase appreciably. This time varied from three to six days, and usually the loads were not increased till this occurred, until towards the last.

It will be also noted that there was a marked decrease in the rate of deflection during the night and on Sundays, due, probably, to the diminished vibration in the building.

Readings were taken on one or two occasions, as on December 14 and 27, at short intervals during the night, and a decrease in the rate of deflection was noticed.

During the larger part of the test the beam did not slew at all, but towards the last it began to tip badly towards the west and had to be braced to the iron frame of the machine.

35

No. 35.— Spruce beam, 6″ x 12″; span = 18′; loaded at centre.

Experiment before the Boston Society of Civil Engineers; conducted by E. F. Ely, assistant in the department, and Mr. Philip S. Morse.

Heart in the edge.

Loads in lbs.	Deflection in inches.	Differences.	Moment of inertia = 864.
476	.0000		
888	.0706	.0706	
1300	.1424	.0718	
1712	.2181	.0757	
2124	.2935	.0754	
2536	.3688	.0753	
2948	.4422	.0734	
3360	.5184	.0762	
3772	.5922	.0758	
11188	——	——	Breaking load. By shearing.

Modulus of rupture = 4196 lbs. per square inch.
Mean deflection for 412 lbs. = .07427 inches.
Modulus of elasticity = 1317910 pounds per square inch.
Max. intensity of shear at neutral axis = 117 pounds per square inch.

No. 36.— 2″ x 11¾″; length, 7′ 6″; span = 7′ 2″; spruce joist; loaded at centre.

36

Pretty well away from the heart.
Tested by Professor Lanza.
No deflections taken.
Breaking load = 7870 lbs.
Broke by shearing on both sides of the centre, also crushed.
Modulus of rupture = 3599 lbs. per square inch.
Max. intensity of shear at neutral axis = 248 lbs. per square inch.

THE TRANSVERSE STRENGTH OF TIMBER.

New York, January 19, 1884.

To the Editors of the American Architect: —

Dear Sirs,— We are much interested in the experiments at the Massachusetts Institute of Technology on the transverse strength of timber, and trust that the deductions to be made from such a series of valuable tests may give us something in the way of *formulæ* that will be trustworthy and reliable. We do not see, however, that the tests have thus far shown any different results from what should be expected by correct theoretical reasoning, based on the experiments of other authorities, though they establish the fact, not a new one, that the comparative strength of large and small specimens are not to be determined by the usual formulæ.

That the average modulus of rupture for spruce, in the tests above referred to, is found to be only about 2.5 tons, is not surprising, when we consider that the ultimate crushing strength of spruce is given no higher than 3.5 tons per square inch, by reliable authorities, for short specimens. As spruce has a tensile strength nearly double its compressive, theoretically it should fail first at its extreme upper fibre, not at its full compressive strength, but with a modulus of rupture proportionate to the length and area of the section compressed, as in a post.

That Hatfield, or other authorities should assume an equal modulus of rupture for the compression of variable lengths and areas in any material seems strange, particularly when the material is weaker in compression than tension and fails from lateral flexure. In cast-iron, which has a compressive strength six times its tensile, failing under cross-strain (the reverse of spruce) at its lower fibres instead of its upper, the modulus of rupture is found to be greatly in excess of its direct tensile strength, and the ratio of strength between large and small specimens is much better borne out (by the usual formulæ) in cast-iron, than in spruce.

We would like to see a test of two beams, of dimensions that have been already tested singly, put together, thoroughly bridged, and secured against lateral flexure, and note the increase of the modulus of rupture. Rolled wrought-iron beams require to be secured against yielding sideways before being loaded to their full capacity; why should not timber?

That the constants of Hatfield for the transverse strength of spruce timbers will ever be reduced from .25 to .08 tons, which is about the comparative ratio between the modulus of rupture as shown by the above experiments, and the tables of Hatfield, seems questionable from ordinary practice, outside of theory. Unwin says, it is of little value to know what will break material in order to know how to use it, and judging from the data we have at present to go by, he is quite right. We hope, however, that the gentlemen of the Massachusetts Institute of Technology will help us out of the mystery. Yours truly, John C. Babcock.

Boston, January 28, 1884.

To the Editors of the American Architect: —

Dear Sirs,— In regard to Mr. Babcock's first statement, in which he expresses the desire that the deductions to be made from my tests on transverse strength of timber may furnish something in the way of formulæ that will be trustworthy and reliable, I must say that I have not made, and am not making any attempt to devise any new *theory* of transverse strength, believing, as I do, that in the present state of our knowledge the common theory, viz.: that sketched in my first article (*American Architect* for November 10) is the best suited to the facts as far as we know them. The *formulæ* for beams, therefore, which I should advocate are the old ones, *i. e.*, those deduced from the common theory; and it seems to me that a careful study of the results of my tests will warrant such an opinion.

I do claim, however: first, that *all* of the consequences of the *common theory* should be taken into account, and not merely those that are found in the hand-books; second, that the constants given by different authorities for use in these formulæ, and which have **been derived from tests of small pieces, are not applicable to full-size** beams in the case of timber; and third, that as far as my tests have gone I have given some figures which are much more reliable both in the case of spruce and yellow-pine, and perhaps also of oak; and although it may not be a new fact that the constants are different for large and small pieces, a knowledge of this fact would not be of much practical use unless we could say how much they differ. In regard to these constants it is to be said that there are only three ways that I know of in use for determining the load to which a given beam may be safely subjected, viz.: —

1. By determining its breaking strength, and then applying a factor of safety.

2. By determining the load which will cause a deflection not greater than a certain determined fraction of the span.

3. By guess.

In regard to the last method I have nothing to say; any one willing to take the risk of using it is welcome to do so, provided I am in no way concerned in the consequences of his act.

As to the other two I am decidedly of the opinion that the second is the most proper one, though the first is the most usual.

For each of these two methods I have obtained from my tests certain constants, differing from those of the experimenters on small pieces, and the so-called authorities. I will speak first of the breaking strength, and subsequently of the deflection.

1. As to breaking strength the constant for this is the modulus of rupture; the proper value that should be used varies with the quality of the timber, and for spruce is oftener 1.5 tons than 2.5, as Mr. Babcock will see by referring to my statement, in this regard, in the *American Architect* for December 8, and it is only 2.5 tons for spruce of the best quality. As to yellow-pine I did not, it is true, make any similar statement in my summary simply because of my hesitancy to do so before having a larger number of tests, but I think that although my average is nearly 7000, nevertheless, in view of the fact that beam No. 59 gave a modulus of rupture of only 5300, although it was a very straight-grained piece, entirely free from knots, and one that had been selected by a builder of good repute as a very good piece, I should hardly be willing to use more than 5000 pounds as modulus of rupture on large pieces, and should hesitate to use this unless the piece appeared to be of pretty good quality. Nevertheless, I believe 10000 has been considered a very *moderate* value for modulus of rupture of yellow-pine.

As to oak only three beams were tested, and the moduli were very much smaller than those commonly given.

To make it perfectly clear what the consequences of these figures are, we have that, according to Trautwine's lowest figures, *i. e.*, not the average of his experiments, but those recommended for use in view of knots and other defects, we should have for the breaking centre load of a 4" x 12" spruce beam 20 foot span.

$$W = \tfrac{2}{3}\frac{f\,b\,h^2}{l} = \tfrac{2}{3}\frac{5400 \times 4 \times 12 \times 12}{20 \times 12} = 8640 \text{ lbs};$$

and according to my results the breaking strength for the common run of such timber as would be sold at the lumber-yards for good buildings would be

$$\tfrac{2}{3}\frac{3000 \times 4 \times 12 \times 12}{20 \times 12} = 4800,$$

which is considerably less, while according to Rankine, or Hatfield, or Rodman its breaking strength would be much greater than 8640 pounds.

In the case of yellow-pine, whereas the breaking strength of No. 59 was 21000 pounds, Stetson's & Moseley's book computed from Rodman's tests gives about 42000, and Hatfield would give about 63000 as the breaking strength. It seems to me that there is some difference between my figures and those that have been generally used.

Why is it that more accidents have not happened?

1. Because in many cases a much larger factor of safety (which might justly be called the factor of ignorance) has been used than would be used in the case of an iron beam, and in other cases the beams have been taken out or strengthened when they began to show signs of weakness, and nothing has been said about it.

As to factor of safety, it seems to me that if correct values of modulus of rupture are used, 4 ought to be sufficient for ordinary use; whereas, if figures known to be incorrect were used no factor would be suitable unless we knew just how far they were incorrect, and this could only be determined by testing the full-size pieces.

Next as to deflection: The constant for this is the modulus of elasticity, and here it will be found that my average values of the immediate modulus of elasticity are somewhat lower than those usually given. Nevertheless, I should not consider it safe to use the averages, since the poorest piece of timber in any lot ought to decide the strength and stiffness of the lot, and hence we ought to use one of the values lower than the average. By this means, using the ordinary formulæ (those I gave in the *American Architect* for November 10), we should obtain for the loads that would produce a given deflection somewhat smaller values than those deduced by the use of the constants ordinarily given. Moreover, it is not proper to use the immediate modulus, as my time-test of last year (beam No. 34, the details of which appear in this issue) shows that the deflection increases very considerably with time, and if the values which I have given, which take account of time, be used, they will be found to give loads much smaller than those deduced from the figures ordinarily given. It does not seem to me necessary that I should work out an example here, as my articles contain all the necessary figures and formulæ, so that any one can do it for himself.

My tests also point out that the longitudinal shearing should be taken into account. I have not summarized the figures that they seem to warrant, but intend to do so at the end of my article.

Mr. Babcock desires to see a test of two timbers put together and thoroughly bridged, and evidently thinks that the modulus of rupture would be increased by thus securing them against lateral flexure. He will find such a test in No. 52, still to appear, where a floor was built with a header, and three tail-beams floored over and suitably bridged, but this test showed no additional strength from the bridging.

I think I have answered the main points in the communication of Mr. Babcock; he makes some other remarks which, perhaps, I ought to notice: —

1. According to the common theory of beams the modulus of rupture (in the case of symmetrical beams) is always the lesser of the values of the tensile or compressive strength per square inch. What he means by implying that it is anything else I am free to confess I do not understand.

2. As to cast-iron beams it has long been an enigma why the modulus of rupture should often be greatly in excess of the tensile strength, but the experiments of Mr. Edwin Clark, recorded in D. K. Clark's rules and tables, pages 561 and 562, are pretty strong evidence that it is to be mostly, if not entirely, accounted for by the hard outside skin and unequal cooling. I know of no attempt to account for it on purely theoretical grounds, except that of Barlow, and there is no satisfactory evidence of the truth of his theory.

3. Mr. Babcock claims for the crushing strength of spruce 3.5 tons. I doubt if this would be realized in specimens 6 or 8 inches in diameter even of short lengths, unless the stock were selected stock. My evidence is that I found for oak about 3500, while so-called authorities give 6000 or 7000.

4. That the facts and not theory require us to reduce Hatfield's figures my tests evidently show.

5. Spruce beams do not, by any means, fail always by compression first, but just as often by tension or by shearing, as will be evident from the cuts. Very respectfully, GAETANO LANZA.

NOTES AND CLIPPINGS.

PROTECTION OF WATER-PIPES AGAINST RUPTURE. — Messrs. Buxton and Ross attach a special valve to the extremity of a water-pipe, which can be opened automatically by electricity. They connect with it a thermometer, which is so arranged as to close an electric circuit when the temperature approaches the freezing point. By the influence of the current a wedge is released which allows the valve to fall into place and open the emptying faucet. — *Chronique Industrielle.*

THE CHAMPAGNE CELLARS OF RHEIMS. — The champagne cellars of Rheims form a feature peculiar to that city. These wondrous excavations were made to supply ballast, etc., in the building of the ancient city, and the old workmen got out as much chalk as they could without burying themselves. Working scientifically, the excavations became domes, cloisters, and passages, and formed a subterranean city roofed in chalk; and as the domes were pierced subsequently to admit light, at a small point of entrance, the broad spaces beneath appeared like the aisles and roofs of churches. Doubtless the stevedore of a ship, or the packer in a London warehouse, would consider there was an immense waste of space in these splendid cellars; but the space vacant (above storage sometimes seventy feet) is, in truth, their perfection, as it maintains a regular temperature within 3° all the year round, forming the warm climate in which young champagne attains its manhood. The streets of these cellars are thickly populated with 2,000,000 inhabitants in the shape of bottles, and 2,000 to 3,000 great casks of wine. The cellars at Epernay and at Avize are also in the chalk, but in those places the spaces are tunnelled out — brickwork sometimes being used at the archways—and the high-vaulted spaces at Rheims are elsewhere unparalleled.— *Building News.*

DELTA METAL. — It has long been known that the introduction of iron into alloys of copper and zinc materially alters the physical properties of the products for the better. Several attempts have been made to use iron in this connection, but hitherto without practical success. Experimentally, the results have proved satisfactory, but when tried on a working scale the process has failed for want of uniformity in the products. Among others who have directed their attention to the matter is Mr. Alexander Dick, of London, who, after careful experiment and research, has succeeded in introducing the iron into the alloy in such a way as to give good results on a practical scale. This success is obtained by previously alloying the iron in such a manner that it is combined in definite and known proportions with the zinc. When wrought-iron is introduced into the molten zinc the latter readily dissolves or absorbs the former. The exact point of saturation or the proportion dissolved or absorbed varies with the temperature at which the molten zinc is maintained during the process, and it is by carefully ascertaining and controlling this temperature that Mr. Dick has been able to succeed in obtaining a perfectly uniform product. The metal thus produced, and to which the name of "delta metal" has been given, is stated to be as much superior to brass as phosphor-bronze is to gun-metal, or as steel is to iron. It possesses great strength and toughness, and samples cast in sand give a breaking strain of twenty-two tons per square inch. Forged or rolled into bars it shows a tensile strength of more than thirty-three tons per square inch, and drawn into wire of 22-gauge it is found to stand sixty-two tons per square inch before breaking. It has an excellent color, is very easily worked, takes a very high polish, and tarnishes less quickly than brass, and on the whole appears to be susceptible of very wide application, both for useful and ornamental purposes.— *London Times.*

SUMMARY OF THE WEEK.

Baltimore.

BUILDING PERMITS.—Since our last report seven permits have been granted, the more important of which are the following:—

Aug. Cashmeyer & Son, two-st'y brick carriage-house, s s Watson St., w of Central Ave.

Frank A. Warner, three-st'y brick building, e s Valley St., between Biddle and Chase Sts.

Moses Fox, two-st'y brick stable, s w cor. Bond and Lombard Sts.

Geo. W. Donohue, 20 two-st'y brick buildings, w s Bradford Alley, n of Fayette St.

A. C. Hall, two-st'y brick office, w s Eden St., between Baltimore and Lombard Sts.

John Mogarity, 3 three-st'y brick buildings, s s Chew St., w of Broadway.

Boston.

BUILDING PERMITS.—*Brick.*—*Beacon St., Nos.* 18 *and* 20, Ward 10, for Boston University, store and offices, brown-stone, 40′ 11″ x 74′, six-st'y flat; ell, 12′ x 38′ 8″; J. P. Lovering, builder; W. G. Preston, architect.

Myrtle St., No. 130, Ward 9, Joseph Comed, tenements, 26′ 6″ x 55′ 8″, four-st'y flat; John Mack, Jr., builder.

Exeter St., cor. Newbury St., Ward 11, for Working Union of Progressive Spiritualists, church, 82′ x 108′, two-st'y pitch; Norcross Bros. contractors.

Beacon St., No. 98, Ward 9, for J. Quincy Brown, stable, 28′ x 44′, one-st'y mansard; J. J. Lyons, builder.

Appleton St., near Berkeley St., Ward 16, for J. G. Cabe, tenement, 24′ x 60′, four-st'y flat; N. E. O. Sullivan, builder.

Clifton St., cor. Shirley St., No. 20, for Howard Watch Co., manufacturing building, 33′ x 103′, four-st'y flat; ell, 44′ 8″ x 52′; Gooch & Pray, builders.

Castle St., No. 58, cor. Mayo St., Ward 16, for Boston Building Association, hotel tenement, 48′ x 54′, five-st'y flat; G. W. & A. G. West, builders.

Wood.—*Rutherford Ave., No.* 154, Ward 5, for Donovan & Brock, tool-locker, 25′ x 50′, one-st'y flat; Donovan & Brock, builders.

Warren St., No. 21, for Frank Ferdinand, mercantile, 32′ x 50′ and 76′ x 87′, three-st'y flat; J. W. Coburn & Co., builders.

Frothingham Ave., Nos. 23 *and* 25, Ward 5, for W. H. Parks, 2 stables, 19′ x 36′, two-st'y flat; G. M. Starbird, builder.

H St., near East Fifth St., Ward 14, for Wm. P. Cross, 2 dwells., 24′ x 35′, three-st'y flat; Wm. P. Cross, builder.

Rockwell St., near Milton Ave., Ward 24, for Mary E. Moulton, dwell., 22′ and 28′ x 32′ 6′, two-st'y pitch; E. F. Moulton, builder.

Siegel Ave., near Vernon St., Ward 19, for Valentine Bock, carpenter-shop, 12′ x 18′ and 24′ x 35′, three-st'y flat.

C St., near Spring Park Ave., Ward 23, for John C. Betts, dwell., 28′ x 42′ 4″, two-st'y pitch; John C. Betts, builder.

East Fifth St., Nos. 592 *and* 594, Ward 14, for Trustees Hawes Fund, 2 dwells., 23′ x 40′, two-st'y flat; Wm. T. Eaton, builder.

L St., near East Seventh St., Ward 14, for Isaac Riley, 4 dwells., 20′ x 40′, two-st'y flat; Wm. T. Eaton, builder.

Emerson St., near L St., Ward 14, for Wm. T. Eaton, 2 dwells., 22′ x 40′, two-st'y flat; William T. Eaton, builder.

Commercial St., near Preston St., Ward 24, for D. J. Cutter, dwell., 35′ x 58′ 6″, two-st'y flat.

Washington St., near Keyes St., Ward 23, for Hannah E. Kennedy, dwell., 21′ x 38′, two-st'y pitch; Michael Kennedy, builder.

Pratt St., near Linden St., Ward 25, for L. Dunton, 2 dwells., 19′ 8″ x 42′ 8″, two-st'y pitch; W. R. Cameron, builder.

Washington St., Nos. 2668 *and* 2670, Ward 21, for J. E. Ryan, tenement and store, 35′ x 36′, three-st'y flat; Vallie & Julien, builders.

Heath Pl., near Heath St., for Thomas Connor, dwell., 23′ x 32′ 6″, three-st'y flat; Thomas Clune, builder.

East Fifth St., No. 687, near M St., Ward 14, for L. D. Cardill, wagon-shed, 50′ x 90′, two-st'y flat.

Warren Ave., on Bridge Pier, Ward 5, office and boiler-house, 32′ x 35′, two-st'y flat.

West First St., Nos. 17 *and* 19, Ward 13, for Patrick Lally, storage, 30′ x 40′, one-st'y flat.

Vale St., near Lowland St., Ward 15, for Choate, Burnham & Son, stable, 32′ x 70′, two-st'y flat; Geo. W. Rigby, builder.

Brooklyn.

BUILDING PERMITS.—*Eagle St., No.* 80, s s, 150′ e Franklin St., four-st'y frame tenement, gravel roof; cost, $4,580; owner, John Swartz, on premises; architect, Fred. Weber; builders, John Hafford and Port & Walker.

Thirteenth St., s s, and *Fourteenth St.*, n s, 90′ w Sixth Ave., 4 two-st'y brick dwells., tin roofs; cost, $4,000 each; owner and builder, Sampson B. Oulton, 165 Fourteenth St.; architect, Arthur Sterns.

Sixth Ave., n w cor. Fourteenth St., and *Sixth Ave.*, s w cor. Fourteenth St., 2 three-st'y brick stores and flats, tin roofs; cost, $5,000 each; owner and builder, Sampson B. Oulton, 165 Fourteenth St.; architect, Arthur Sterns.

Bushwick Ave., s e cor. Moore St., 2 three-st'y frame stores and tenements, tin roof; cost, $9,000; owner, Chas. Diemer, on premises; architect, Frank Holmberg; carpenter, Chas. Diemer.

Eighteenth St., n s, 450′ w Fifth Ave., two-st'y and basement brick dwell., tin roof; cost, $4,000; owner, Louis Lo kman, Jr., Seventeenth St., between Fourth and Fifth Aves.; architect and builder, W. J. Conway.

Front St., n w cor. Jay St., five-st'y brick store and tenement, tin roof; cost, $14,000; owner, Hugh O'Reilly, 45 West Sixteenth St., New York City; architect, Wm. Graul.

Front St., n s, 25′ w Jay St., five-st'y brick store and dwell., tin roof; cost, $9,000; owner, Hugh O'Reilly, 45 West Sixteenth St., New York City; architect, Wm. Graul.

Georgia St., s s, 100′ w Central Ave., one-st'y brick warehouse for brewery, tin roof; cost, $3,500; owner, Leonard Eppig, Central Ave.; architect, Frank Holmberg.

Oakland St., No. 316, e s, 125′ n Green St., three-st'y frame tenement, gravel roof; cost, $3,800; owner, Patrick Monahan, Green St.; architect, Jas. Mullhall; builders, Gately & Smith and Jas. Doig, Jr.

North Tenth St., n s, about 400′ w First St., one-st'y frame open shed, gravel roof; cost, $3,000; owner, Pratt Manufacturing Co., foot North Twelfth St.; architect, F. Ewert; builders, Jenkins & Gilliess.

Chicago.

BOARD OF EDUCATION ARCHITECT.—The Board of Education has elected J. J. Flanders as architect for the ensuing year, fixing his compensation at $800 for each school-building erected.

The architect was instructed to prepare plans for fifteen-room school-houses, for the Paulina, Walnut, Snell, and Lime Street school lots recently purchased.

BUILDING PERMITS.—W. Wagg, two-st'y store and flats, 348 Robey St.; cost, $4,000; architect, Ray; builder, W. H. Cameron.

W. Wagg, two-st'y store and flats, 350 Robey St.; cost, $3,000; architect, Ray; builder, W. H. Cameron.

H. Potratz, two-st'y dwell., 220 West Eighteenth St.; cost, $3,500; architect and builder, H. Potratz.

F. Oosterbeek, two-st'y dwell., 23 Plum St.; cost, $3,000.

Mrs. Preston and A. M. Hall, 2 two-st'y dwells., 934 and 936 West Adams St.; cost, $8,000.

J. W. Cassel, 2 two-st'y dwells., 1016 West Adams st.; cost, $5,000.

L. S. Kirkwood, two-st'y rear addition, 113 and 115 East Chicago Ave.; cost, $8,000.

Louis Weick, three-st'y dwell., 451 Hurlbut St.; cost, $5,000; architects, Burling & Whitehouse; builder, L. Weick.

J. W. Rich, three-st'y store and dwell., 287 Wells St.; cost, $6,000; architect, Meister; builder, L. Weick.

New York.

BUILDING NOTES.—The January permits show a great falling off in number and amount as against the two previous years, and architects are not as busy as usual at this season of the year.

CHURCH.—A stone church, 44′ x 136′, to cost not less than $50,000, is to be built by the New York City Mission and Tract Society, on the s e cor. of Broome St. and Central Market Pl.

HOUSES.—On the n e cor. of Madison Ave. and Sixty-fifth St., on a plot of ground 1 0′ x 125′, Messrs. Charles Buek & Co. will build first-class dwellings.

On the south side of Ninety-fifth St., 200′ w of Ninth Ave., 2 two-st'y basement and attic brick houses, 18′ x 50′ each, are to be built by Messrs. E. & C. Fisher, from designs of Mr. Louis Falk.

TENEMENTS.—A number of cheap tenements are every week projected, plans for which are generally paid for by a lump sum, and over which the architect has no control.

BUILDING PERMITS.—*Second Ave.*, n e cor. One Hundred and First St., 4 five-st'y brick tenements and stores, tin roofs; cost, each, $15,000; owner, Wilhelmine Juch, 307 East One Hundred and Sixth St.; architect, C. V. Biela; builders, Ed. Hammer and C. Duden.

One Hundred and First St., n s, 75′ e Second Ave., 7 five-st'y brick tenements, tin roofs; cost, each, $12,000; owner, architect and builders, same as last.

Mulberry St., No. 239, five-st'y brick tenement, tin roof; cost, $13,000; owner, Michael Gaffney, 127 Broad St.; architect, Jos. M. Dunn.

Greene St., Nos. 126 *to* 134, 3 six-st'y iron warehouses, tin roofs; total cost, $175,000; owners, Simon Goldenburg, 468 Broome St., and Louis Schoolherr, 451 Broadway; architect, A. Zucker.

Bleecker St., Nos. 410 *and* 412, five-st'y brick factory, tin or gravel roof; cost, $6,500; owner, P. M. Wilson, 144 West Twenty-second St.; architects, D. & J. Jardine; builder, A. Brown.

Tenth Ave., e s, 90′ s Fifty-seventh St., 2 five-st'y brown-stone front flats and stores, tin roofs; cost, total, $45,000; owner, Wilson H. Rankin, 338 West Forty-seventh St.; architects, Thom & Wilson.

West Fifty-eighth St., No. 211, five-st'y brick tenement and store, tin roof; cost, $18,000; owner, Benjamin Sire, 160 Fulton St.; architect, Wm. Graul.

East Fifty-fourth St., Nos. 223 *and* 225, one-st'y brick engine-room and boiler-house, tin roof; cost, $4,000; owners, Jos. Doelger Sons, on premises; architect, Chas. Stoll.

West Eighteenth St., Nos. 12 *and* 14, eight-st'y brick flat, terra-cotta and asphalt roof; cost, $110,-00; owner, the Randolph Co., Latham G. Reed, President, 62 Wall St.; architect, T. M. Clark; builders, David H. King and H. Edgar Hartwell & Co.

Eighty-ninth St., n s, 81′ w Lexington Ave., 5 five-st'y brown-stone tenements, tin roofs; cost, each, $20,000; owner, Dennis Loonie, 224 East One Hundred and Sixteenth St.; architect, Eugene Parker.

Southern Boulevard, n s, about 300′ from Portchester R. R., two-st'y frame stable, shingle roof; owner, William Simpson, 51 Chatham St.; architect, L. Brush; builders, W. Worry and C. H. Smith.

Philadelphia.

BUILDING PERMITS.—*South Fourth St., Nos.* 125 *to* 129, six-st'y office-building, 56′ x 81′; Stacy, Reeves & Co., contractors.

Various alterations and additions complete the list of permits for the week.

COMPETITION.

PUBLIC LIBRARY BUILDING.
[At Boston, Mass.]

The Committee on Public Library, having been authorized to procure plans for a new public library building, to be erected on the lot bounded by Dartmouth Street, St. James Avenue and Boylston Street, and being desirous of interesting architects to produce the best plan for the same, hereby offer four premiums of $4,000, $3,000, $2,000, and $1,000, respectively, to the authors of the four best designs, according to the order of their merit.

The plans for which premiums are awarded will become the property of the city, with the right to use the whole or any part, or any modification thereof, without further claim from the authors for compensation or employment.

All designs must be sent to the Trustees of the Public Library on or **before June 1, 1884.**

Further particulars may be had by applying to William H. Lee, Clerk of Committees, City-Hall.

For the Committee,
CHARLES V. WHITTEN,
Chairman.

PROPOSALS.

SCHOOL-HOUSE.
[At Fergus Falls, Minn.]

FERGUS FALLS, MINN., January 16, 1884.

Until February 15, 1884, the undersigned will receive sealed bids for the building of a brick school-house in Fergus Falls, Minn.

Right reserved to reject any or all bids.

The plans and specifications can be seen at the office of the clerk, and, upon application to him, full information and conditions will be furnished.

CHAS. L. LEWIS,
424 Clerk Board of Education.

LABOR AND MATERIALS.
[At Buffalo, N. Y.]

OFFICE OF SUPERVISING ARCHITECT,
TREASURY DEPARTMENT,
WASHINGTON, D. C., February 5, 1884.

Sealed proposals will be received at this office **until 12 M., on the 28th day of February, 1884,** for all the labor and materials, bricks and mortar, and setting stone, required to complete the extension of the custom-house and post-office at Buffalo, N. Y., in accordance with drawings and specification, copies of which and any additional information may be had on application at this office or the office of the Superintendent.

M. E. BELL,
425 Supervising Architect.

CANAL LOCKS.
[St. Lawrence River, Canada.]

DEPARTMENT OF RAILWAYS AND CANALS,
OTTAWA, CANADA, January 21, 1884.

Sealed tenders, addressed to the undersigned and endorsed "Tender for St. Lawrence Canals," will be received at this office until the arrival of the eastern and western mails **on Tuesday, the 12th day of February next,** for the construction of a lock and regulating weir and the deepening and enlargement of the upper entrance of the Cornwall Canal.

Also for the construction of a lock, together with the enlargement and deepening of the upper entrance of the Rapide Plat Canal, or middle division of the Williamsburg Canals, and the deepening, etc., of the channel at the upper entrance of the Galops Canal.

A map of the head or upper entrance of the Cornwall Canal, and the upper entrance of the Rapide Plat Canal, together with plans and specifications of the respective works, can be seen at the Resident Engineer's office, Dickenson's Landing; and for the works at the head of the Galops Canal, at the Lock-keeper's house, near the place, and in each case plans, etc., can be seen at this office on and after Tuesday, the 29th day of January, inst., where printed forms of tender can be obtained.

Contractors are hereby informed that trial-pits have been sunk on the Cornwall and Rapide Plat sections of the works, and they are requested to bear in mind that tenders will not be considered unless made strictly in accordance with the printed forms, and be accompanied by a letter stating that the person or persons tendering have carefully examined the locality and the nature of the material found in the trial-pits, etc.

In the case of firms there must be attached the actual signatures, the nature of the occupation and residence of each member of the same; and further, a bank deposit receipt for the sum of four thousand dollars must accompany the tender for the Cornwall Canal Works.

The tender for the Rapide Plat works must be accompanied by a bank deposit receipt for the sum of three thousand dollars.

The tenders for the deepening, etc., at the head of the Galops Canal must be also accompanied by a bank deposit receipt for the sum of three thousand dollars.

The respective deposit receipts (checks will not be accepted) must be endorsed over to the Hon. the Minister of Railways and Canals, and will be forfeited if the party tendering declines entering into contract for the works at the rates and on the terms stated in the offer submitted. The deposit receipts thus sent in will be returned to the respective parties whose tenders are not accepted.

This Department does not, however, bind itself to accept the lowest or any tender.

By order,
424 A. P. BRADLEY, Secretary.

IRON AND SLATE WORK OF STAIRWAYS.
[At Memphis, Tenn.]

OFFICE OF SUPERVISING ARCHITECT,
TREASURY DEPARTMENT,
WASHINGTON, D. C., February 2, 1884.

Sealed proposals will be received at this office **until 12 M., on the 27th day of February, 1884,** for furnishing and fixing in place, complete, the iron stairways, etc., required for the custom-house and post-office building at Memphis, Tenn., in accordance with drawings and specification, copies of which and any additional information may be had on application at this office or the office of the Superintendent.

M. E. BELL,
425 Supervising Architect.