THE AMERICAN ARCHITECT AND BUILDING NEWS.

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BOSTON, OCTOBER 5, 1878.

CONTENTS.

A CORRESPONDENT has written to ask us for facts concerning the decisions of cases where the custody of an architect's drawings is involved. Unfortunately the decisions are hard to come at, the custom, which is undoubted, having been seldom brought up in courts, and the records being meagre and scattered. The most famous and important case in English practice is that of the drawings for the new Houses of Parliament; but being one which involved peculiar relations it is not a guide in ordinary practice. We have not had time to look back to the history of the case, which is distributed through a long series of the English building journals of 1867 or thereabout; but the facts, as we remember them, were these. It was a good while after Sir Charles Barry's death that the office of Public Works surprised his son, Mr. Edward Barry, now president of the Royal Institute of British Architects, — who had succeeded to the business and records of his father's office, and to his place as architect of the building, — with a demand that all the drawings should be turned over to the government as its property. Mr. Barry refused, alleging the usage by which drawings remained the property of the architect. Much testimony was introduced to show that this was the undisputed custom of the profession; but the government overruled it as a custom which ought not to apply in the case of so important a public building, and took possession of the drawings by a sort of right of eminent domain, we believe, on the ground that it was essential that the plans of such a building should be in its own possession, and become part of its archives. It has been suggested that Mr. Barry would have done better to acknowledge that the government ought to have plans of the building as a record, and to offer, while pleading the recognized custom of retaining the originals, which in their ordinary condition are seldom very serviceable for this use, to furnish suitable duplicates of the important drawings, requesting a proper allowance for the cost of this unusual service. This seems to be the reasonable suggestion for such cases, recognizing as it does the rights and needs of both parties; how far it might have prevailed against the despotism of the then Commissioner of Public Works, Mr. Ayrton, is questionable.

THE decisions in the United States which bear on the usage, are, as we have said, not easy to get at. The cases have not been many, we suspect; and probably, like most of the cases of architectural practice, have not been carried far enough to make their appearance in the official reports, having either been decided by referees, or by inferior courts whose opinions are not written out, and whose proceedings are recorded, if at all, only in the columns of enterprising newspapers, and live only in the memories of the persons directly concerned in them. Hence it follows, as we have before complained, that the actual jurisprudence of architecture has to be made and remade with every new case, and advances very slowly. It is not long since we printed an article on this subject, giving the facts and the reasons of the custom as it exists (*American Architect*, June 15, 1878). We have made more than one effort for information bearing on this and other like legal matters. Our readers would do a service to us, and also, we think, to the profession, if they would favor us with an account of any apposite cases in their experience.

IT is not to be expected that the promoters of the Enlisted Labor Association now forming in Washington will be able to prevail on the government to undertake a philanthropic venture on the scale that they propose. In some ways it would be a worthy offspring of the visionaries who testified before the Hewitt committee, but as there are points in the scheme which look practicable it may possibly gain some favor. It is proposed to obtain from Congress authorization to enlist for a term of five years a body of one hundred thousand men, who shall do both military and agricultural service and who shall be paid by government at the same rate as the soldiers of the regular army. As soon as a corps of ten thou-and men has been enlisted it shall be sent off to some designated government reservation, and having selected therein a suitable site shall begin to lay out and build a city, to reclaim and till the land, and develop the mineral resources of the country. As one of the provisions of the scheme is that one whole regiment of each corps shall be composed of engineers — a provision which may suggest to the scoffer that the inventor of the scheme is an engineer who wishes to better his home practice by moving his rivals from his path — we might expect these new cities of the plains to have in plan somewhat of the attractiveness of Philadelphia. A much more reasonable provision is that each company shall include a minimum of twelve skilled artisans. Food, seeds, stock, and farming tools are to be supplied to the volunteers by the government, which is also to grant to each man an honorable discharge at the end of his term of service, together with a patent for one hundred and sixty acres, in accordance with the provisions of the Homestead Act, or if the discharged volunteer prefers he may obtain a lot in one of the new cities, wherein every other lot is reserved to the government. This and the benefits that naturally accrue from the reclamation and settlement of land, together with the possibility of temporarily getting rid of a portion of the disturbing element in society, the followers of the Cohens and the Kearneys, are seemingly the only incentives the promoters of the scheme hold out to the government as returns for the very material expenditures they demand.

AS one reads of this latest suggestion for relieving the overstocked labor market, pictures of these modern legionaries intrenched in circumvallated camps, while busied with the vast engineering undertakings which are to serve for the alimentation and protection of future walled towns, present themselves to the mind. One can fancy portions of Roman history repeating themselves, on the plains of the far West; the fratricidal quarrels arising while laying out the city walls; the Agrarian laws; the secessions; the rise of favorite corps commanders to the dictatorship and the consequent internecine wars; expeditions into Mexico and the British Possessions; and as seemingly no provision has been made for sending wives with their husbands, it is possible that that corps which is established nearest to Utah might make a descent on Salt Lake City and beguile the fair dames of Mormondom, as formerly their Roman prototypes prevailed on the Sabine wives and maidens.

DURING the second week of September the eleventh annual congress of trades-unions took place at Bristol, England, and was attended by one hundred and forty delegates, who represented six hundred thousand members belonging to twenty-one trades' councils, and ninety-five affiliated trade societies. Certain of the subjects which were proposed for discussion were pertinent to the occasion, as, for instance, the liability of employers to make compensation to the workmen, or their families, for injuries received in their service; the reform of the jury law, by lowering a juror's qualifications so that a larger number of workmen might be able to share this unpopular function; the extension of the Employers and Workmen Act to English seamen in British waters; certificates of competency for men in charge of steam-engines; coöperation and trade-unionism; representation of labor in Parliament; and overtime and apprenticeship. But when workmen or their delegates propose to discuss a reform in the patent laws; the abolishment of imprisonment for debt; the codification of the criminal law; and the reform of the magistracy, both as to the manner of the appointment of magistrates and as to the manner in which they shall exercise their functions, — one recognizes the time-honored tendency of politicians to capture all social organizations which

are large enough to be made useful, and convert them to the general uses of a political party.

The addresses made at the Congress had running through them an ill-concealed vein of hopelessness, and though the most was made of the few things favorable to the growth of trades-unions that had occurred during the year, the general impression conveyed was that the employers had, and were likely to have, the best of it by reason of the leagues which had been formed among them, and because of the now common custom of inserting in contracts a strike clause which allows contractors to postpone the completion of the work indefinitely, or at least until the strikers have exhausted their resources and are ready to come to terms. The Parliamentary Committee in its report read before the Congress said: "The present year has witnessed the close of two remarkable disputes in the building trade — the masons' of London and the joiners' of Manchester. In both cases the men were supported by powerful unions with large accumulated funds and great resources in the power of buying for extra support. We regret to say that in both cases the men failed to establish their demands. This may be accounted for in many ways. Although the building trades in Manchester and London were in a prosperous state at the commencement of the dispute, yet, under the power of the strike clauses now inserted in all contracts, the employers are enabled to postpone the completion of the works till an indefinite period." These words, and the statement of disbelief in the success of the coming struggle with which the cotton spinners of Blackburn entered upon their strike not many months ago, seem to show that before long these useless conflicts between labor and capital may be abandoned in favor of the more logical and certainly less wasteful method of settling trade disputes, the method of arbitration by referees. It would not be very difficult, we believe, to show in any case where strikers have gained their point that they would have succeeded as well by entrusting their cause to skilled pleaders before a board of arbiters.

In 1862 a select committee of the House of Lords was appointed to investigate the character and amount of the injuries that were due to the noxious vapors and gases which were among the waste products of various manufacturing processes. The investigation bore chiefly on the copper smelting and the alkali works, and as it was proved that muriatic (hydrochloric) acid gas was emitted from the alkali works in quantity sufficient to blast the crops and trees in the direction followed by the prevailing winds, even throughout a distance of six or seven miles, a law was passed which compelled manufacturers to condense ninety-five per cent of the acid produced. It has since been ascertained that it is sulphurous and not muriatic acid that chiefly injures vegetation, so an amendment, passed in 1874, brings into the category of noxious gases sulphuric, sulphurous, nitric, sulphurretted hydrogen, and chlorine gases. Upon the workings of this law a Royal Commission has reported lately and has brought to light facts that are curious and interesting. The complaint as to the destruction of vegetation turned out to be reasonable, but the gases were found to affect most injuriously the trees and plants on high ground, while the vegetation in valleys and on the farther side of slopes was often uninjured. It was also found that the higher the factory chimney was the more wide-spread was the devastation. As regards health it was proved that if not absolutely deadly, the gases at least caused headache and depression. In the neighborhood of London, where there is a great variety of large establishments, other phenomena have been observed, which being proved nuisances, to say the least, call for legislative action. Chief among these obnoxious places are the cement works at Northfleet and Greenbithe on the Thames, which produce such dense vapors while burning the chalk and clay that navigation of the river is made dangerous, and the Thames conservators have been petitioned by fifty steamship masters and one hundred and thirty London Trinity pilots to abate the nuisance. The production of these vapors may throw some light on the late terrible disaster to the Princess Alice. It is said, by the way, that the river at the spot where the steamboat sank was at the time of the disaster nothing more than a mass of sewage, as the outfall sewers were then discharging, consequently it is suspected that when the passengers found themselves in the river they were asphyxiated before they had time to swim ashore. There was probably in the discharging sewage some powerful chemical substance, for the clothing on the bodies changed color, and decomposition set in with such unusual rapidity that identification of the bodies was very difficult.

On Thursday, September 12, the second of Cleopatra's needles was placed upright in what is probably to be for ages its resting place on the Thames embankment. Whether after all a result of real value to the world or to the British people has been accomplished, or whether the enthusiasm and general interest that has been excited is purely factitious and ephemeral it is useless to inquire. The projector of the enterprise, Dr. Erasmus Wilson, has gained his object, whether it was reputation or patriotic vanity. The enterprise has been attended with many unexpected incidents which have added to the monument a subsidiary value that in the eyes of the world at large may give it greater interest than the obelisks at Rome or at Paris possess. The removal of the obelisk to Alexandria, the abandonment of it, through parsimony, by the fleet on the very eve of its removal in the early part of this century, the Khedive's adoption of it as the expression of international good will, its narrow escape from being cut up into building stone by the fellah whose land it cumbered, its redemption by a private citizen of England, its solitary and storm-tossed wanderings in its iron coffin, — an episode worthy the attention of Jules Verne, — its rescue and the subsequent suit for salvage, all these are so romantic that for the time they overshadow the claims of antiquity, claims which it shares with the other imported obelisks. Moreover, the transport and reërection of the obelisk have been watched with widespread interest because of the novel yet simple and very skilful means by which the engineer, Mr. Dixon, has accomplished them. If there is a certain anachronism in forcing upon it the companionship of modern sphinxes, it is probable that they will be less conspicuous and unpleasant than the pedestal on which rests the obelisk of Luxor in the Place de la Concorde at Paris, emblazoned as it is with incised and gilded designs which represent the means employed in the transport of the surmounting obelisk.

ARCHÆOLOGY AND AMERICAN ARCHITECTURE.

The *Architect* had lately under this title an article in which, quoting an expression that we had used, "the tyranny of archæology," it noticed the influence of archæology on English architecture and asked the questions: How far is American art free from this influence, and how far has this freedom led to good results? whether, in fine, the effort to dispense with old art does not lead, in the United States as well as in England, to disappointment. It is true, as the *Architect* says with a pleasant cordiality, that the United States "speak with an English tongue, and think with an English understanding:" and though we can hardly go so far with our fellow-journal as to say that the influence of English traditions and relics is the only influence of the kind that prevails with us, — unless "prevails" is used very literally, — it is doubtless the influence that on the whole shows most in our best work. This is not true of our sculpture and our painting, which draw more inspiration from Italy, France, and even Germany; but it is true of architecture and the decorative arts. Accessibility to the English influence of the day in these arts is nevertheless mainly confined to New York, Boston, and one or two of the most progressive Western cities, Chicago, for instance; and, curiously, it is very much a thing of recent growth. Even in Philadelphia it has but just begun to make itself felt; in cities further south one may almost look in vain for anything to remind one of the progress of English art for two generations past. It is to the influence of an earlier time that we are to turn for whatever of English tradition survives in these cities — in their custom of living in separate houses, and their consequent manner of arranging them; in their social and domestic habits. The influences that have altered their arts, so far as they have changed since the days of our fathers, are not English. From New York as far south as anything has changed the old order of things, and through the most of the West, the predominating influence has been German; in New York and Boston, and to some extent elsewhere, French tendencies have struggled with the others, while in the East there is comparatively little that shows the German mark.

The most significant fact, however, is the survival of the English influence, the power it has shown to reassert itself and overbear its rivals. Persons who have carefully watched the development of American architecture will be disposed to say that a quarter of a century ago, if one foreign element seemed

likely to prevail in it, it was the German; and, as we have seen, over some parts of the country it has prevailed. A little later, the French element, starting with our two most influential cities, bade fair to get the mastery. But the German influence has waned; the French has barely held its actual place, by no means its relative importance. The English element has steadily become more and more prominent until it has on the whole overborne both of the others, and is more or less conspicuous in the greater part of the work that is done nowadays by studious architects. This is due, no doubt, partly to the old habit of looking to English art and English literature for examples; partly to the example of a number of capable English architects who have come to live and practice among us; but more to the accessibility of English examples through the multitude of professional books that are brought to us, and keep us better acquainted with what our professional brothers are doing in England than with what goes on anywhere else; and more still to the English architectural journals, which come weekly with profuse illustrations. But these are not causes sufficient to account for all the phenomena. The Gothic revival has been stimulated by both Germans and English; M. Viollet-le-Duc has been perhaps a more honored prophet than any Englishman; the splendid architectural publications of the French press have been very widely distributed among us, and modern French detail has been imitated abundantly in our city architecture. More than this, the most of our young men who have gone abroad for architectural training have gone to Paris, finding there, what unfortunately does not exist in England, a well equipped and well disciplined architectural school. Nevertheless the English fashion gains ground, and it is not a little curious to see that even these men, trained in French ways of designing, as one by one they have come home, after working for a time according to their training have almost to a man dropped the French manner and taken up an English one. Many causes, which it would be interesting to study, conduce to this gravitating tendency, but behind all must lie a common instinct, the result of long inheritance, which inclines Americans to a natural preference for the same forms which Englishmen elect to use. Commercial as well as literary intercourse helps the influence, and while we see "Queen Anne" houses following "Victorian Gothic," they are lined with Morris papers, and decorated with English tiles and English metal-work.

In all this, however, it must be said that contemporary example has told much more than archæology. American architects as a class are not very studious, at least in a scholarly way. They lack archæological fervor, and are by native affinity more attracted to what is doing than to what has long been done. Nor have they the reverence for purity of style that waits on archæology. Although instinct or association or opportunity may lead them to draw most freely from English examples, they lay hold of their goods, like Molière, wherever they find them; and if a feature or detail from French or Italian or German architecture suits their purpose, they are seldom prevented by respect for style from working it into any design to which they can apply it. The old restraints no longer hold them. The classical period is gone; even the men who would design churches with attention to historical unity of style are passing away. The leader of them has left us within the summer, — and their successors are nothing if not eclectic. The stranger who walks through the new streets of Boston, — which we instance as a typical example because, having been in a great part built over within a few years, its architecture is at once the newest and most consistent, — will see motives of all dates, and of French, German, and Italian parentage, plentifully intermixed with the predominating English, and all transfused with something which, since it can be classed with neither of these, we must be content to call American.

But thus far we have spoken only of one kind of American architecture, the work of the more educated architects, who set the fashion on the most important buildings and to the cultivated classes, who have got their training from the traditions and literature of their profession, and who keep themselves informed of its progress abroad. Nevertheless, we must remember that there is another kind of American architecture, a kind which, though we may incline to consider it less exemplary, is much more abundant, and even more distinctly our own. It is probably what an observant foreigner would carry away in his recollection as the most characteristic part of American art, if he would call it art. It is what we have more than once described, and often referred to, as our vernacular architecture. This architecture is as innocent of archæology as the Romanesque work of the tenth century, or as any architecture can be. In fact it is the modern example of an architecture practised in the way that Mr. Fergusson and some other reformers declare to be the only way in which such an art can be living and healthy, — by men who work without regard for precedent or rule, using forms which they know only by tradition and example, and with a simple adaptation to the wants of a people, to the materials and mechanical processes at their command. It is an art which every capable building-mechanic in the country understands, and can practice without the aid of books or rules or architects or drawings, exactly as did the mediæval builders whose manner of work we are of late urged to imitate. But it is an art that is altogether abhorrent to purists and offensive to artists, one in which persons of education, offended by its coarseness and ugliness and pretentiousness, will see no redeeming promise, unless they can look through these to its vigorous independence, and have confidence that time will develop an artistic sense to chasten and shape it. It is, however, distinct and coherent; in spite of many local differences in mechanical expedients it is the same thing from Maine to California, and it is unlike anything else in the world. It is not without derived forms; no architecture has been so since that of primitive ages. Those who make it have borrowed at second or third hand many details from German and Swiss architecture, and have culled many forms with free eclecticism from the work of educated architects which they saw before them. Their chief glory, the dreadful adaptation known as the French roof, which covers nine in ten of all the works of ambitious builders throughout the land, is plunder. But they have appropriated and altered all these things as the Greeks appropriated and altered the details of their Doric and Ionic orders, and have made them as truly their own.

These then are the two components of architecture in the United States; an art of the people, chiefly in the hands of mechanics, or of architects who are only mechanics grown up; and an art of the educated profession. The two are in their characteristic examples thoroughly different, though there is of course a debatable ground on which they overlap. Out of their fusion or confusion must come the future American architecture. This is not the place to discuss what the interaction of the two elements will be, though it is clear from the present tendencies of society that the prevailing force must be the educated one, more affected perhaps by the reaction of the other than those who wield it could be made to expect. On the one hand we have a popular art, knowing nothing of by-gone ages, owing no allegiance to precedent, taking its fashions by natural selection, or by inoculation, as do shipbuilders or milliners or shoemakers. On the other is an educated profession, — not yet too well educated, on the average, but gaining every day, — more or less studious of the architecture of the past as a repository of convenient material, but not caring greatly for learning, and living much more in the present; fond of license, and quite indifferent to the control of archæology. Yet while we have seen in our freedom from this control (from the "tyranny of archæology" as we have called it) the future opportunity of our countrymen, we are often tempted to wish that for a time, and until they are a little steadier in their march, they could be subjected to it. The vigorous independence of our vernacular architects is their birthright; being their only possession it should not be taken away from them, and it cannot. But the eclecticism of the educated ones is to our mind far too lawless. It seriously impairs their sense of proportion and harmony, which is the architect's most precious artistic quality; in many cases it seems to have expelled it altogether. A study of style close enough to satisfy archæology is the best corrective that we know for this fault. For this reason we have urged the study of individual styles as the necessary means of training in architectural schools. For the same reason we have expected benefit from the tendency which we have lately seen to such archæological study as our country gives opportunity for, — from the inclination to revive what we call "colonial architecture." But we have been disappointed to see how in most cases the irrepressible American instinct has turned the repose of this into fussiness, its quiet order into lawlessness. One shudders to think what would have become of English architecture in these days, with its immense activity and its loose methods of training, if it had not had styles to restrain it. One sometimes shudders to see what has become of the American — vernacular or eclectic — exempt from this restraint.

THE OPEN FIRE-PLACE. I.

The Open Fire-place, as it is and as it has been, with suggestions for its improvement. Heating and ventilation of private houses, with original experiments on the waste heat of flues and on the use of copper, cast and sheet iron pipes in connection with open fire-places for economizing the heat and improving the ventilation.

THE OPEN FIRE-PLACE AS IT IS.

That great radiator of heat to all living beings, the sun, furnishes those beings with the kind of heat best suited to support the life which it has developed, namely, that of direct radiation.

If we would only accept this lesson, repeated every day, as if for the purpose of giving it all possible emphasis, in a manner the most impressive and with apparatus the most magnificent that nature can furnish or the mind of man imagine; if we would accept the lesson, and endeavor to heat our houses after the same principles, these houses might be made as healthy as the open fields. We should be prompted to respect more the open fire-place, as furnishing the best substitute for the life and health giving rays of the sun, and to discard all such systems of heating as are opposed in principle to that employed by nature.

With direct radiation the body is warmed, while the air breathed is cool and refreshing. With the hot-air principle of heating the reverse is the case, and it is found that, when this unnatural method is long employed to the total exclusion of the natural, serious discomfort and disease are the results. That warm air is less effective than cold in purifying the blood by removing the carbonic acid from the lungs is demonstrated both by our own experience and by the investigations of science. Experiments made on birds and animals have shown that the amount of carbonic acid exhaled when breathing air heated from 30° to 41° Centigrade (86° to 106° F.) is less than one half that exhaled when the temperature is near the freezing point.

The open fire, while it radiates an agreeable heat upon our bodies, animating us with a cheering and healthy glow or excitement, like that produced by a bright sun on a frosty morning, leaves the air comparatively cool, concentrated, and invigorating for breathing.

Now, although from the earliest times of which we have record the open fire-place seems to have been the favorite device for heating and ventilating the habitations of man; although no modern house is considered complete without it either for use or for ornament; although the physician regards it as a most valuable ally in the mastery of disease; and although its improvement has at all times claimed the attention of the most distinguished scientists and philanthropists, as well as of the practical mechanic; yet we find it to-day so little understood and generally so incorrectly constructed that at least seven eighths of the heat of the fuel is lost, and its capabilities as a ventilator are almost entirely neglected, so that our fire-places may be properly described as devices contrived in the interest of the coal merchant for the purpose of carrying up to the roof, in the form of smoke, the greatest possible amount of money, and of leaving the smallest possible amount of comfort behind. My definition of the word "chimney" would be this: A long tube open at both ends, the lower opening, called a "fire-place," being used to receive fuel and to emit smoke; the upper, to direct upon the roof from eighty-five to ninety-five per cent of the heat and smoke generated below; generally so constructed as to carry off as much of the warm air of the room as is pure enough to be breathed, and cause large draughts of cold air to supply its place by rushing across the feet of the occupants in the manner best calculated to give them rheumatism, consumption, pneumonia, and other diseases. To complete the apparatus, screens are sometimes added to obstruct the circulation in the apartment.

WASTE OF HEAT.

In the city of Paris, according to M. V. Ch. Joly, there are used annually, for heating purposes, over 500,000 cubic meters of firewood alone, costing about twenty-five million francs, and of this only eight to ten per cent, or in value about two million francs, are actually turned into serviceable heat. The remainder, to the value of about twenty-three million francs, annually disappears in the air without profit to any one. "What must we estimate the total amount of annual loss," says an eminent writer on ventilation, "in fuel, both of wood and coal, throughout the entire world, when we consider that the open fire-place is used to-day by over fifty millions of people!"

DANGEROUS DRAUGHTS AND IMPERFECT VENTILATION.

The "Encyclopædia Britannica," page 897, has on ventilation the following: "An open fire-place, unless the air enters from the ceiling, often produces little or no ventilation above the level of the chimney piece, and, even then, it does not afford the best and purest atmosphere. The air above may be comparatively stagnant, and offensive in the extreme from the products of combustion and respiration, while a fresh current moves along the floor to the fire-place."

So great is the danger from cold draughts occasioned by open fire-places as they are now constructed that one is said to be less liable to take cold standing in the open air, with the thermometer at freezing point, than sitting on such a day in a room heated by a bright open fire. So unequal is the distribution of heat in such a room that water may be frozen in one corner near the window draughts, and boiled in another near the fire, and it has even been found possible to roast a goose in front of such a fire, while the air flowing by it into the chimney was freezing cold.

"I have no doubt in my own mind," said Count Rumford, "that thousands die in this country every year of consumption, occasioned solely by this cause."

In short, it would be difficult to point out any part of our usual domestic edifices which would show such a total absence of scientific principles as the construction of our fire-places and chimneys.

PRACTICAL EXPERIMENTS ON THE WASTE HEAT AND AIR CURRENTS.

The best authorities put the waste heat of our fire-places at from eighty to ninety-five per cent, depending upon the shape of the fire-place, the nature of the fuel, the amount of the draught, and the size and nature of the flue; but I have been unable to find any satisfactory records of experiments made to corroborate their statements. Those made by General Morin answer most nearly, but still not entirely, our questions. I have therefore made a number of careful experiments, the results of some of which are given in the accompanying tables.

The first six experiments were made in houses built on the new land on Marlborough Street, and the second series of five on the house No. 4 Pemberton Square, Boston. The grates, fire-places, and flues tested were of the so-called "most approved" modern construction, and calculated to utilize the greatest amount of heat possible without employing the peculiar or patented forms invented by Franklin, Galton, Winter, Gauger, Fondet, Joly, and others, little known in this country and difficult to obtain and set.

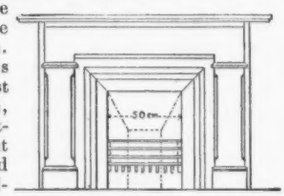

Fig 1.

The fire-place and grate used in the second series of experiments recorded in the accompanying tables are represented in front elevation in Fig. 1, and in section in Fig. 2. The dotted lines show the form of the back only of the fire-place used in the first series of experiments, the sides forming an angle of 135 degrees with the back, to improve their reflecting power. In the second series the fire-place was smaller, shallower, and the sides were at right angles with the back, the upper half of which inclined forward as shown in Fig. 2.

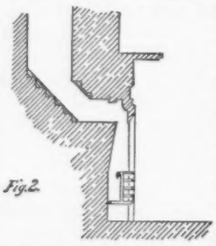
Fig 2.

The entire length of the flue in this case was seventy feet. Half way up, or thirty-five feet from the fire-place, an opening was made in the flue large enough to receive a chemist's Centigrade thermometer, and the heat was tested at this point during the experiments in order to ascertain the amount lost by absorption in the upper half of the chimney. The thermometer was surrounded by putty to render it air-tight. When the readings were taken it was drawn out through the putty far enough to see the head of the mercury column and then pushed back into its place. These readings were recorded by an assistant in columns 6 and 16 of the tables.

For want of space only two of the tables are given, the others agreeing substantially with them, and the results being nearly the same.

The anemometer used was one of Casella's most delicate instruments, lately imported from London. A careful test previously to making the experiments proved it to be exceedingly accurate and reliable. Where possible the observations were made every minute, but where this was impracticable the intervals were made as small as possible, and the figures for the intervening moments were obtained by calculation. The amount of wood burned in each experiment was exactly three kilograms.[1]

From these tables it will be seen that the amount of heat dissipated in the open air through the mouth of the chimney from the combustion of 3 kilograms of dry pine wood, is sufficient to raise the temperature of nearly 16,000 cubic meters of air 1° Centigrade, according to the first experiment, or 16,980 cubic meters according to the second experiment; giving an average of 16,488 cubic meters raised 1°. This is equivalent to 5,070 units of heat, or enough to raise the temperature of over 5 tons of water 1° C., or to raise 50 kilograms of water from freezing to boiling point.

The greatest possible amount of heat which 3 kilograms of dry pine wood is capable of yielding being, according to Rumford, 3,590 × 3 = 10,770 units, we see that one half of the heat generated passes at once up through the chimney and out at its mouth. Of the remainder we shall hereafter see that about four-fifths is absorbed in the brickwork, and either given out from the surfaces of the outer walls or carried up in the air space between the studding and the brickwork to the roof whence it radiates into space.

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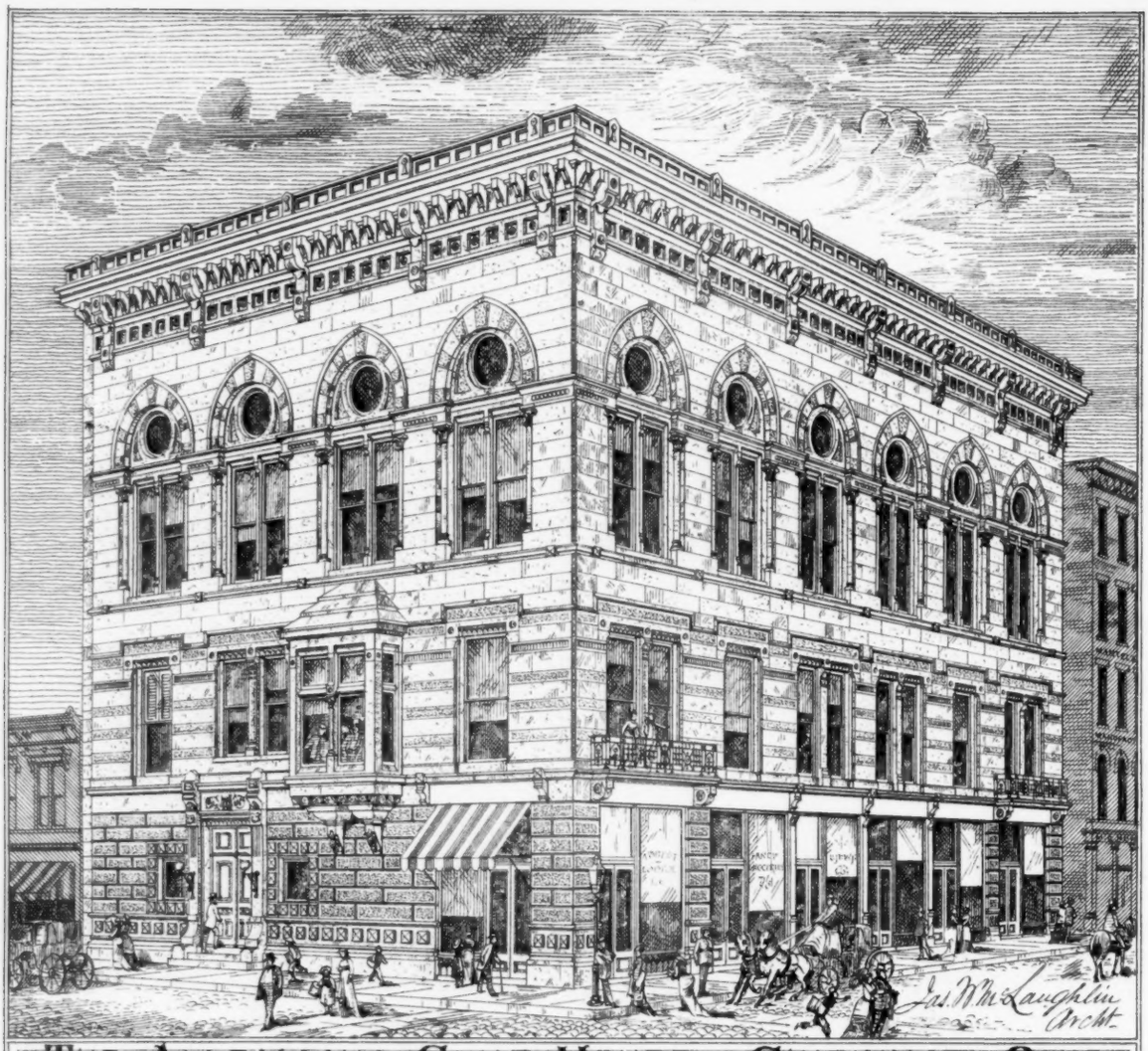
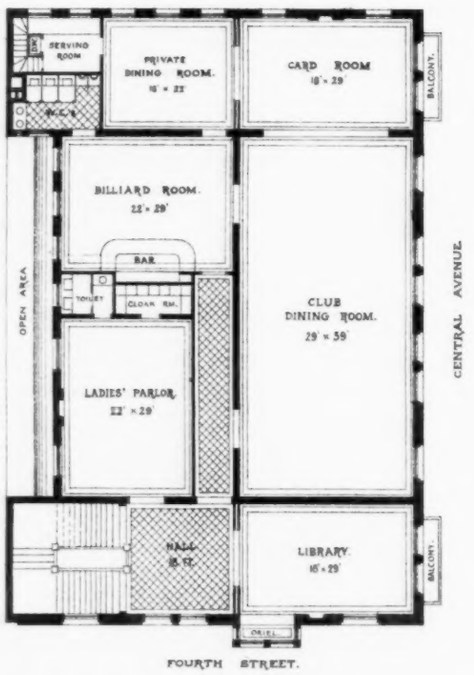
[1] In this article I shall use the metric weights and measures, both because the calculations are made easier by so doing, and because these units have been adopted by most of the writers on the subject whose works we have occasion to consult.

1 kilogram or kilog. = 2.2046 or 2.2 pounds avoirdupois.
1 meter = 3.28 feet; 1 square meter = 10.8 square feet; 1 cubic meter = 35 cubic feet.
1° Centigrade = 1.8° Fahrenheit.
1° Fahrenheit = 0.55° Centigrade.
1 metric heat unit or calorie is the amount of heat required to raise 1 kilogram of water 1° Centigrade.
1 calorie = 3.968 English heat-units.

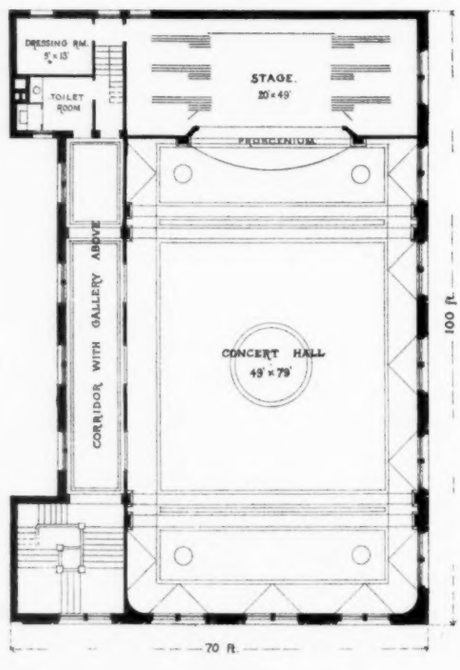


THE ALLEMANIA CLUB HOUSE IN CINCINNATI OHIO

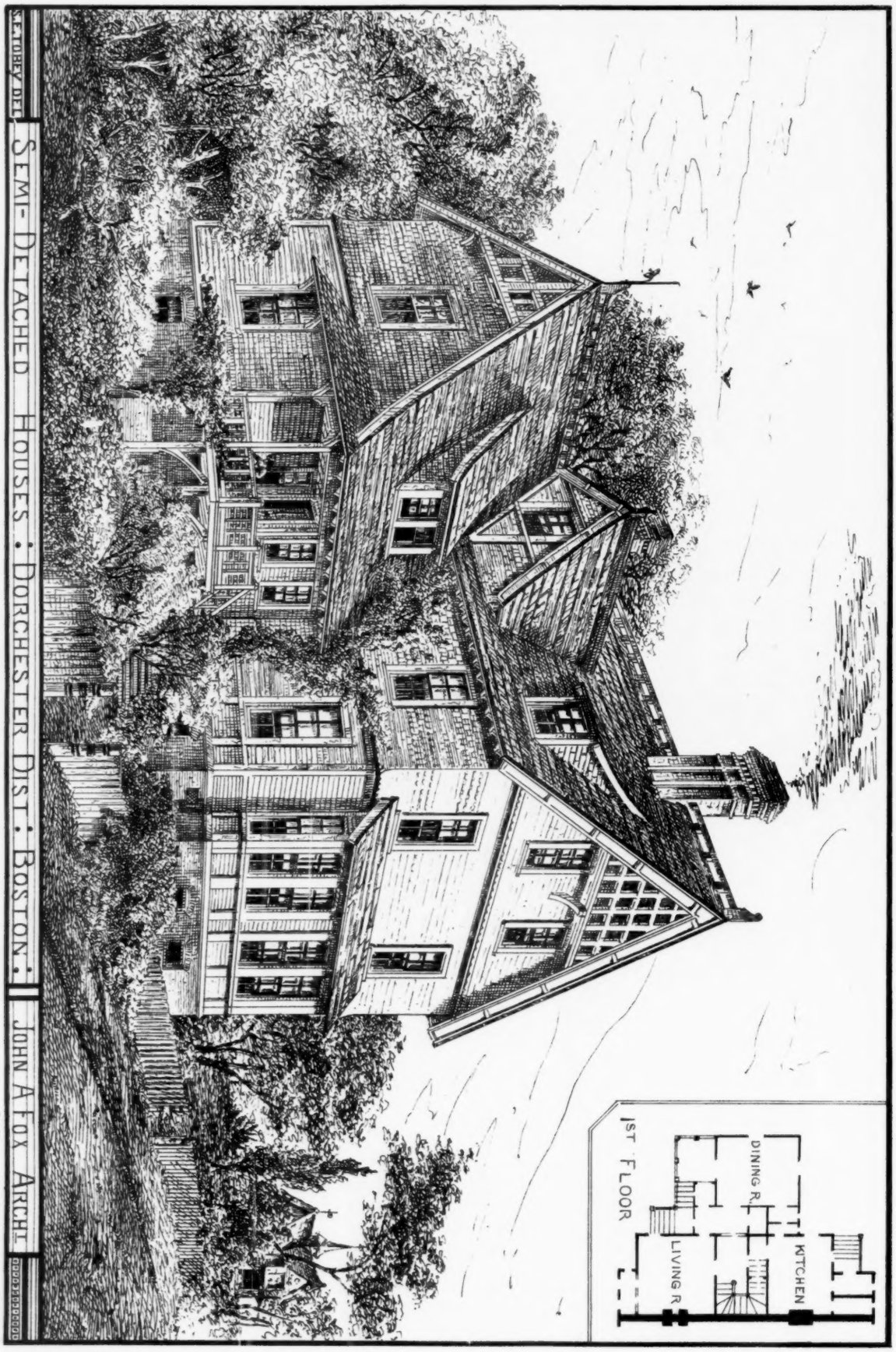
PLAN OF 2d FLOOR.

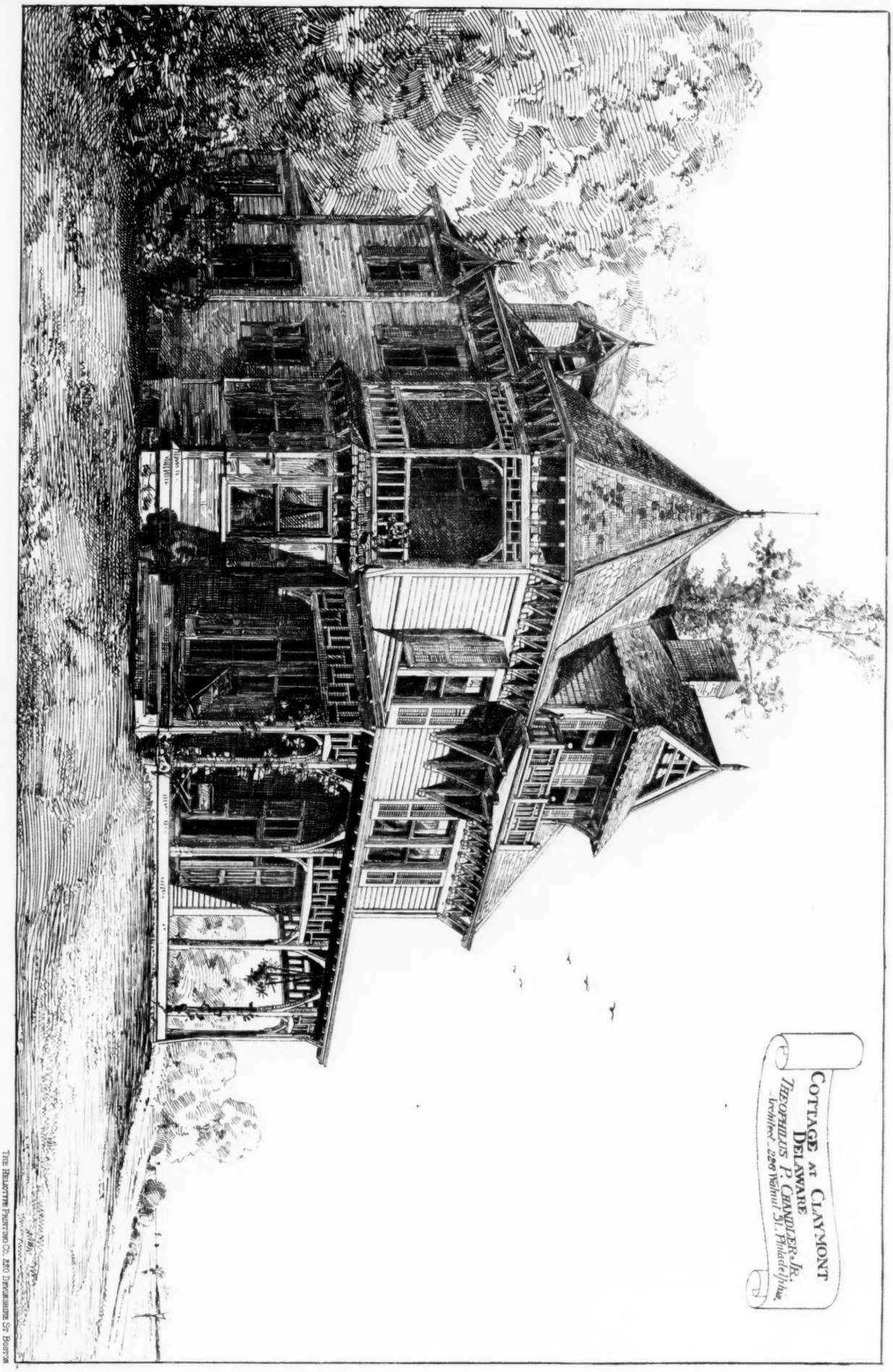


PLAN OF 3d FLOOR.



THE HELIOTYPE PRINTING CO. 220 DEVONSHIRE ST. BOSTON


SEMI-DETACHED HOUSES · DORCHESTER DIST · BOSTON ·
JOHN A FOX ARCHT
1ST FLOOR
KITCHEN
DINING R
LIVING R
SEATOBEY DEL
THE BLAIRTYPE PRINTING CO. 240 DEVONSHIRE ST BOSTON

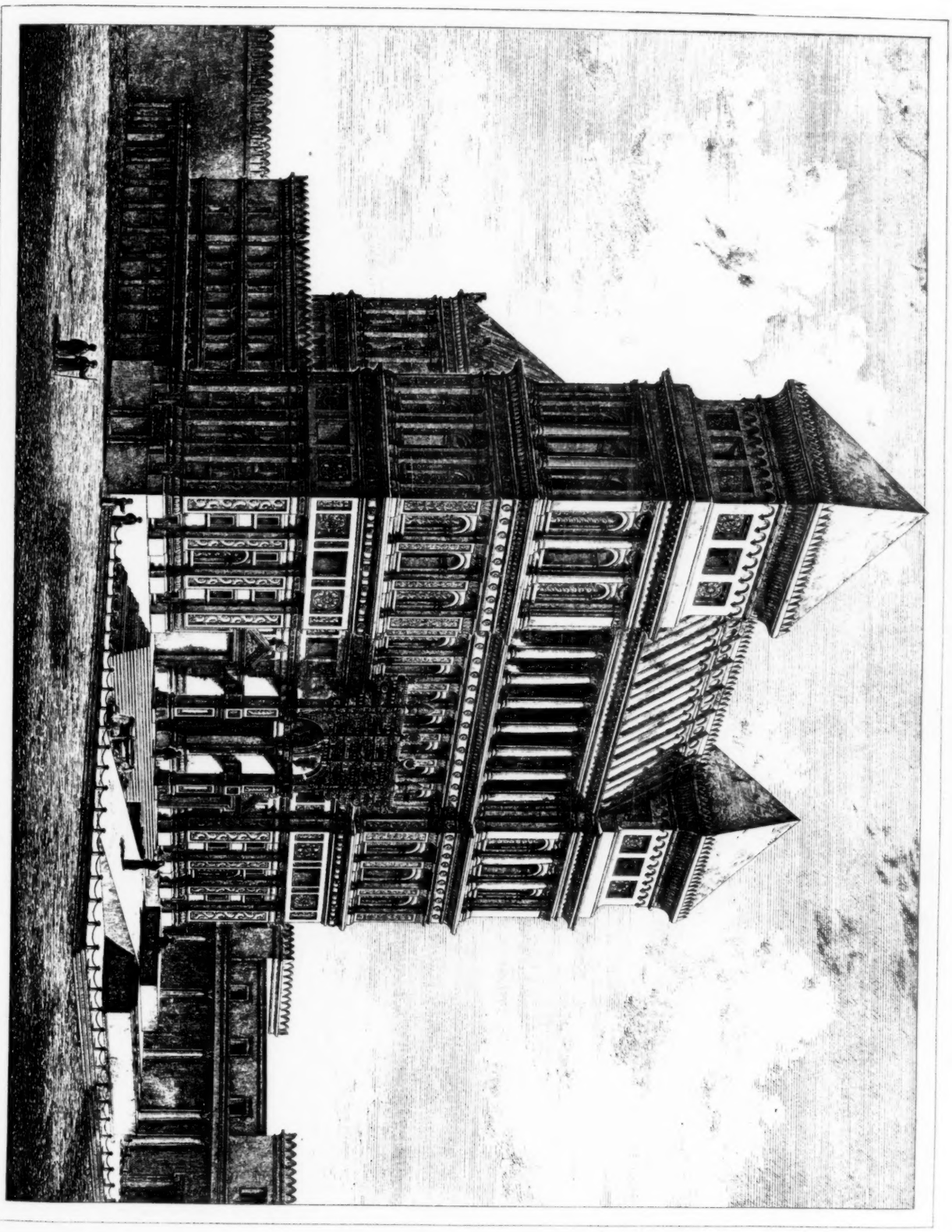


COTTAGE AT CLAYMONT
DELAWARE
THEOPHILUS P. CHANDLER JR.
Architect. 226 Walnut St. Philadelphia.

THE HELIOTYPE PRINTING CO. 240 DEVONSHIRE ST BOSTON

The Temple of Jerusalem, as rebuilt by Herod: restored by James Fergusson F.R.S.

THE HELIOTYPE PRINTING CO. 220 DEVONSHIRE ST. BOSTON



The Temple of Jerusalem, as rebuilt by Herod: restored by James Fergusson F.R.S.

THE HELIOTYPE PRINTING CO. 239 DEVONSHIRE ST. BOSTON

TABLE NO. 1.

(Three kilograms wood.) — Time, May 24, 1878.

Hours P. M.	Experiment No. 1. Without Reflector. Outside Air from 15.5° C. to 13° C.									Experiment No. 2. With Reflector. Outside Air 13° Centigrade. Experiment began 3.55 P. M.							
	Temperature at Top of Chimney.	Velocity of Draught by Anemometer in Meters.	Cubic Meters of Air passing through Chimney.	Difference between External Air and Air at Top of Chimney.	Equivalent in Cubic Meters raised 1° Centigrade.	Temperature of Flue half-way up.	Difference between External Air and Air in Middle of Flue.	Equivalent in Cubic Meters raised 1° Centigrade.	General Remarks.	Temperature at Top of Chimney.	Velocity of Draught by Anemometer in Meters.	Cubic Meters of Air passing through Chimney.	Difference between External Air and Air at Top of Chimney.	Equivalent in Cubic Meters raised 1° Centigrade.	Temperature of Flue half-way up.	Difference between External Air and Air in Middle of Flue.	Equivalent in Cubic Meters raised 1° Centigrade.
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	17.5°	73	3.20	2°	6.40	17.5°	2°	6.40	*A a*	20°	73	3.20	7°	22.40	20°	7°	22.40
1.1	35	88	3.96	19.5	77.22	45	29.5	116.82		125	140	6.20	12	74.40	80	67	415.40
1.2	52	98	4.41	36.5	160.96	61	45.5	200.65	*B b*	152	212	9.54	39	362.02	105	92	877.68
1.3	60	103	4.63	44.5	206.03	80	64.5	298.63		192	187	8.73	49	427.77	100	87	759.51
1.4	66	133	5.98	50.5	303.00	95	79.5	485.41		196	194	8.73	53	462.69	100	87	759.51
1.5	70	194	8.73	54.5	475.78	100	84.5	737.68		173	200	9.00	60	540.00	101	88	792.00
1.6	75	200	9.00	59.5	535.50	106	90.5	814.58		176	203	9.13	63	575.19	102	89	812.57
1.7	80	203	9.13	64.5	588.88	110	94.5	862.78		178	218	9.60	65	624.00	103	90	864.00
1.8	86	212	9.54	70.5	672.57	111	95.5	911.67		180	224	10.09	67	670.00	104	91	910.00
1.9	87	254	11.43	71.5	817.24	115	99.5	1137.28		182	254	11.43	69	788.70	105	93	1061.99
1.10	90	285	12.82	74.5	955.09	120	104.5	1339.68		184	186	8.15	71	578.60	110	97	790.55
.11	89	227	10.00	73.5	735.00	115	99.5	995.00		184	194	8.73	71	619.83	105	92	803.16
.12	85	224	10.00	69.5	695.00	95	79.5	795.00	*C*	183.5	194	8.73	70.5	685.46	100	87	759.51
.13	80	212	9.54	64.5	615.33	80	64.5	615.33	*c*	180	198	8.73	67	584.91	90	77	672.21
.14	76	200	9.00	60.5	544.50	79	63.5	571.50		178	219	9.65	65	627.25	89	67	656.55
.15	66	194	8.73	50.5	440.86	70	54.5	475.78		168	172	7.74	55	425.70	75	62	479.88
.16	60	194	8.73	44.5	389.48	64	48.5	423.40	*d*	163	170	7.70	49	462.00	66	53	408.10
.17	56	180	8.10	40.5	328.05	60	44.5	400.45		159	159	7.20	46	331.20	60	47	338.40
.18	54	165	7.30	38.5	284.51	55	39.5	291.90	*D*	155	148	6.66	42	279.72	53	42	279.72
.19	49	163	7.20	33.5	241.20	52	36.5	262.80		151	142	6.25	38	237.50	53	40	250.00
.20	46	160	7.20	30.5	219.60	50	34.5	248.40		149	141	6.20	36	223.20	50	37	229.40
.21	43	159	7.20	27.5	198.00	45	29.5	212.40	*e*	146	140	6.20	33	204.60	48	35	217.00
.22	41	159	7.20	25.5	183.60	43	27.5	198.00		144	140	6.20	31	192.20	45	32	198.40
.23	40	140	6.20	24.5	151.90	42	26.5	164.30		142	140	6.20	29	179.80	43	30	1-6.00
.24	38	121	5.44	22.5	122.40	41	25.5	138.72		140	138	5.98	27	161.46	42	29	173.42
.25	37	121	5.44	21.5	116.94	40	24.5	133.28	*E*	138.5	130	5.75	25.5	146.62	40	27	155.25
.26	35	115	5.22	19.5	101.79	39	23.5	122.67		137	127	5.71	24	137.04	39	26	148.46
.27	34	115	5.22	18.5	96.57	38	22.5	117.45		136	126	5.70	23	131.10	38	25	142.50
.28	34	115	5.22	18.5	96.57	36	20.5	107.01		135	125	5.62	22	123.64	37	24	134.88
.29	33	115	5.22	17.5	91.35	35	19.5	101.80		134	124	5.58	21	117.18	36	23	128.34
.30	32.5	115	5.22	17	88.74	34	18.5	96.57		133.5	121	5.44	20.5	111.82	35	22	119.68
.31	32	115	5.22	16.5	86.13	33	17.5	91.35		133	115	5.22	20	104.40	34	21	109.62
.32	31.5	115	5.22	16	83.52	32	16.5	86.13		132.5	112	5.04	19.5	98.28	33	20	100.80
.33	31	114	5.20	15.5	80.60	31.5	16	83.20		132	110	5.00	19	95.00	32.5	19.5	97.50
.34	30.5	112	5.04	15	75.60	31	15.5	78.12	*F f*	131.5	108	4.86	18.5	89.91	32	19	92.34
.35	30	112	5.04	14.5	73.08	30	14.5	73.08		131	102	4.80	18	86.40	31.5	18.5	88.00
.40	28	115	5.04	12.5	63.00	28	12.5	63.00		129.5	107	4.80	16.5	79.20	31	18	86.40
.45	26	112	5.04	10.5	52.90	26	10.5	52.90		128.5	103	4.63	15.5	71.76	29	16	74.58
.50	25	103	4.63	10	46.00	25	9.5	46.00		127.7	94	4.23	14.7	62.18	27	14	59.62
.55	24.5	99	4.45	10	44.50	25	10	44.50		127	99	4.10	14	57.40	26	13	53.30
2.	24	98	4.30	9	38.70	24	9	38.70		126.5	86	4.00	13.5	54.00	25	13	52.00
.5	23	98	4.20	8	33.60	24	9	33.60		126	86	4.00	13	52.00	25	12	48.00
.10	22.5	97	4.10	7.5	30.75	23	8	30.75		125.5	94	4.20	12.5	52.50	24.5	11.5	48.30
.15	22.3	88	4.00	7.3	29.20	23	8	29.20		125	92	4.14	12	49.68	24	11	45.54
.20	22.1	85	3.80	7.1	26.98	22	7	26.98		124.5	76	3.30	11.5	37.95	23.5	10.5	34.68
.25	22	83	3.70	7	25.90	22	7	25.90		124	66	2.97	11	32.67	23	10	29.70
.30	21.9	83	3.70	7.9	32.23	21	7	26.27		123.7	64	2.88	10.7	30.81	22.9	9.9	28.51
.35	21.5	82	3.70	7.5	27.75	21	7	26.27		123.6	69	2.70	105.	28.35	22.8	9.8	26.46
.40	21.5	82	3.70	7.5	27.75	21	7	26.27		123.2	60	2.70	10.2	27.54	22.7	9.7	26.19
.45	21.5	82	3.70	7.5	27.75	20.5	6	22.20		123	59	2.65	10	26.50	22.6	9.6	25.44
.50	21.1	82	3.70	7.1	26.27	20	6	22.20		122.7	56	2.52	9.7	24.44	22.4	9.4	23.64
.55	21	82	3.60	7	25.20	20	6	21.60		122.5	73	3.28	9.5	31.16	22.2	9.2	30.17
3.	20.75	82	3.60	7.2	25.20	20	6.5	21.70		122.2	73	3.28	9.2	30.17	22.1	9.1	30.00
.10	20.6	82	3.60	7.1	25.20	20	6.5	21.70		122	72	4.14	9	37.26	22	9	37.26
.20	20.5	82	3.60	7	25.20	19.7	6.2	21.63		121.7	73	3.28	8.7	28.53	21	8	26.24
.30	20.4	82	3.60	7	25.20	19.7	6.7	21.60		121.5	66	2.97	8.5	25.24	20.5	7.5	22.27
.40	20.1	82	3.60	7	25.20	19.7	6.7	21.60		120.1	73	3.28	7.1	25.28	20.1	7.1	23.29
.50	20	82	3.60	7	25.20	19.5	6.5	21.60		120.1	73	3.28	7.1	25.28	20.1	7.1	23.29
4.30	19	82	3.60	6	21.60	19	6	21.60		120	73	3.28	7	22.96	20	7.1	23.29
			884.8		13996.91			18332.35				781.3		16981.16			20294.68

In column 9 of the preceding table the italic capitals refer to the first experiment, while the small italic letters refer to the second experiment.

A, fire lighted; *B*, full blaze; *C*, fire declines; *D*, fire faint; *E*, fire out; *F*, no more heat in cinders.

a, fire lighted; *b*, full blaze; *c*, fire declines; *d*, fire faint; *e*, fire out; *f*, no more heat in cinders.

By columns 2 and 12 we see that before the fire is lighted a ventilating draught of 73 meters per minute is caused by a difference of but 2 or 3 degrees in the temperature of the air in the chimney flue or house, and that of the outside air. But as this difference increases after the fire is lighted until it reaches 70° and 75°, as given in columns 4 and 14, we find the velocity of the draught rising to 285 meters per minute. Thus we have a chimney throwing out hot air raised nearly to the boiling point of water at the rate of 285 meters or nearly 1,000 feet a minute! Yet in some of the chimneys tested on the Back Bay the waste was found to be much greater, one chimney giving out heated air at the rate of over 1,600 feet per minute raised about the boiling point! What might the saving be, if all this heated air could be separated from the smoke, partially cooled or diluted with fresh cool air, and brought into the house for use!

Returning to our table we find by columns 6 and 16 the temperature of the draught at the middle of the flue and, by calculation, an average of 885 heat units absorbed in the upper half of the chimney.

Now we know that the heat generated by our fuel is of two kinds, of which one is given up to the air supporting combustion, and passes entirely away with this air up chimney in combination with smoke and vapor; while the other, and by far the smaller part, is sent off from the fire in rays in all possible directions. This latter part may be considered an *uncombined* heat, or heat combined only with light as distinguished from that combined with smoke and air. Thus only the *radiated* heat of the fire is used in our rooms. The experiments of Peclet show that the radiating power of wood is, under the best possible circumstances, when the rays are all collected, only 23 per cent., leaving 77 per cent to pass off with the air of contact. Therefore $23 \times 10{,}770 = 2{,}477$ units radiated in the case of our 3 kilograms of wood.

In the average fire-place only one-third of these rays, or in our case 826 units, pass directly into the room, the rest falling upon the back, sides, or bottom of the fire-place, or entering the flue through the throat of the chimney.

J. P. PUTNAM.

THE ILLUSTRATIONS.

THE TEMPLE OF HEROD AT JERUSALEM.

WE publish to-day a restoration of the Temple of Jerusalem as rebuilt by Herod, from a drawing by Mr. Fergusson, published in the *Building News*. A greatly reduced copy of the same drawing formed the frontispiece of his work on the "Temples of the Jews," to which the reader is referred, as there the data on which the restoration is based are set forth in detail, accompanied by sections and elevations to scale, with the illustrations and quotations necessary to render its various parts intelligible. The great difficulty of a restoration of this celebrated temple is that the Jews probably aimed at producing a building which should be 100 cubits (150 feet) in length, 100 cubits in breadth, and 100 in height without being a cube, and as there is every reason to believe that they accomplished this, no restoration can be accepted that does not take these dimensions into account. But more than this, both the book of Chronicles and Josephus distinctly assert that some part, at least, of the Temple attained the unusual height, in these days, of 120 cubits, and this is stated with so much circumstantial detail by the latter authority, that it can hardly be overlooked. All the architectural details used in this restoration are copied from examples which are contemporary with Herod's Temple, or at least nearly so. The two pinnacles of the façade, for instance, are adopted from the monoliths now known as the Tombs of Absalom and Zacharias, exactly opposite the Temple in the Valley of Jehosaphat, and probably of about the same age as the Temple. The pillars of the façade are copied from those of a small copy of the Jewish temple at Siah, in the Houran, which was undoubtedly of the same age. The vaults under the Aksah, which were part of the substructure of the Temple, and Herod's own burying place, now known as the Tombs of the Kings, and other sepulchres around Jerusalem, have all afforded hints for the details employed. In fact, as Mr. Fergusson points out in the work above referred to, we now know with tolerable accuracy what the style of architecture was which was practised in Syria between the age of Pompey and the destruction of the city by Titus, and the details of that style are the only ones that are, or can be, employed in any attempt to restore the Temple of Herod. They are not such as modern taste will approve, nor suchas previous attempts at restoration would lead us to expect, but they are the only ones that can at present be adopted in any design which purports to represent the Temple as it was in its days of greatest magnificence. The restoration is therefore interesting; nevertheless, we are inclined to doubt whether the builders of the Temple would recognize it.

THE ALLEMANIA CLUB HOUSE, CINCINNATI, OHIO. MR. JAMES W. M'LAUGHLIN, ARCHITECT, CINCINNATI.

This building, situated on the corner of Fourth Street and Central Avenue, is being erected by Reuben R. Springer, Esq., mainly for the use of the Allemania Society. It has a frontage of 70 feet on Fourth Street by 100 feet on Central Avenue, and will be 74 feet in height to the top of the cornice. The fronts are of Buena Vista freestone, portions being roughly tooled and the remainder rubbed smooth. The entrance hall and upper stories will be finished for club purposes. The large hall on the third floor will 25 feet high, and be provided with a stage, having scenery, dressing-rooms, etc., for the theatrical representations of the Allemania Society, concerts, and receptions.

SEMI-DETACHED HOUSE, DORCHESTER DISTRICT, BOSTON, MASS. MR. JOHN A. FOX, ARCHITECT, BOSTON.

This house is now building for Mr. Franklin King, on Trull Street, in Dorchester. The two tenements are separated by a solid brick wall.

COTTAGE AT CLAYMONT, DEL. MR. T. P. CHANDLER, JR., ARCHITECT, PHILADELPHIA.

The frame is of hemlock, boarded diagonally, covered with heavy sheathing paper, and then with the usual white pine clapboards. The roof is covered with black slate. The shingles under the eaves are painted red, and the remainder of the house a deep, rich brown. There are four rooms on the first floor, six bed-rooms, large bath-room, china-closet, trunk-rooms, etc. The house is heated by a furnace, and has open fireplaces.

NOTES ON ARCHITECTURE IN PALESTINE.

THE remains found at ancient Jewish sites include caves, cisterns, rock-cut scarps, and rock-cut tombs. It is evident that from an early period the inhabitants of the country were skilled in rock-cutting, and that they lived in caves, as the peasantry still do to a great extent. There are often rude tunnels cut into the hillside, from which the water of a spring comes forth. The cisterns are generally bee-hive-shaped, with a man-hole at the top, and from ten feet to fifteen feet deep. Rock-cut tanks of great size are also found at some of the old sites.

The most famous example of a rock-scarp is that which formed the

foundation of the wall of ancient Jerusalem, at its southwest angle. This was bared to its base in 1874, by Mr. Maudslay, M. I. C. E., and proved to be in one part fifty feet high. At the corner is a projection twenty feet square, the base of a tower, with a rock-cut stair from the outer platform of rock; at the east end (as far as excavated) is a second tower and stair. Cisterns are cut in the top of the scarp, and there is, in one part, a ditch in front of it. This solid foundation for the ancient wall reminds us of the solid bases of the great towers, its Hippicus and fellows, mentioned by Josephus. Another rock foundation, forty feet high, exists at the northwest corner of the Haram, and this is scarped in the same way with a vertical face, rudely dressed with some kind of pick.

Fortifications of this kind are found in many parts of Palestine. The village of Bittir (Bether) stands on such scarps, partly natural, partly artificial, and the same method of defending a site is noticed by Josephus in describing Samaria.

The rock-cut tombs are, however, of yet greater interest, and a large number were planned throughout Palestine by the survey party. There is no reasonable cause for doubting their great antiquity, for the typical form of these tombs is described in the Talmud, and no examples are known which can well be ascribed to other nations than the Jews. The only Hebrew inscriptions discovered during the survey were found over the doors of these tombs, and in several cases the golden candlestick was represented on the walls. The face of the rock in which the tomb is hewn is generally vertical, but is sometimes cut back to form a square open court in front of the tomb door. The door-way is very small, two feet six inches, or even only two feet wide by three feet in height. It is closed in various ways: sometimes by a stone door, swinging on hinges, and secured by a lock, — hinges and lock having now been removed, being probably of metal; sometimes by a slab of stone, resting against an inner rim, and secured by a horizontal bar; occasionally by a door which slides up and down; while sometimes the entrance is built up with four or five blocks. The chamber within is four-sided, ranging from six feet to thirty feet in length, and from seven feet to ten feet in height. A stone bench, about two feet high and wide, often runs round three sides, and steps lead down from the door to the floor. The roof is generally flat, but sometimes cut to a low arch, or to a triangular cross-section. The walls are rudely finished with a pick, or some pointed instrument, and the shape is scarcely ever truly rectangular.

The bodies were deposited in long tunnels, which run in from the walls of the chamber, and they lay with the feet towards the centre, and the head furthest in, at right angles to the wall. These pigeon-hole graves are called *kokim* (plural of *koka*) in the Talmud. They range from four feet or five feet (probably for children) up to seven feet in length, and from two feet to three feet in width and in height. The end opening into the chamber was closed by a stone slab, which was plastered over, and in some cases the interior was packed with chips of stone for a distance of one foot or more. The roofs of the *kokim* are sometimes flat, sometimes pointed, and very generally arched out into a semicircular tunnel-vault.

The rude stone towers appear to have been intended — like the smaller and less solid ones now built — to guard the orchards. They are about fifteen feet square, and rather more in height. The corner-stones are sometimes five feet long, and are occasionally dressed, while the rest are quite rude. The lintel-stone of the door is also sometimes well dressed. There is no mortar in the walls, which are very thick. The roof is composed of slabs, seven feet or eight feet long, resting on the walls, and sometimes on a central pier of similar construction. In one case a semicircular arch of well-dressed stones was thrown from wall to wall to support the slabs Six or seven of these towers will sometimes occur close together. The great size of their stones indicates their antiquity, as the natives never employ such large blocks in building. Such towers are noticed in our Lord's parable of the vineyard (Mark xii. 1).

To the Herodian period the greater part of the megalithic masonry of the Temple walls is now generally ascribed. It has been found that the curious criss-cross dressing of these stones occurs also on the voussoirs of the Tyropæon Bridge, which does not date earlier than the time of Herod's Temple. An interesting discovery has also been made recently with regard to these walls. In 1873 Lieutenant Conder reached the wall at a point previously unexplored near the northwest corner of the Haram, and found the ancient masonry, *in situ*, from the rock to a level higher than that of the inner court. The appearance of the wall is shown in a wood-cut in "Tent Work in Palestine" (vol. i., p. 346). At the level of the interior ground it is set back, with a bevelled edge to the stones, and piers are left projecting one foot six inches. This detail is also observable in the walls of the Hebron Haram, which Mr. Fergusson attributes to the Herodian age. The wall at Jerusalem was also found to have a batter below the level of the bevelled stones, each course being set back six inches behind that immediately under it. The horizontal drafts of the stones were in this part six inches wide, the vertical ones being three inches. The object appears to have been to give a more equal effect to the eye. Where the wall is flush, the draft is three inches on each of the four edges of the face of the stone.

The tombs of this later period are especially worthy of notice. They are distinguished from the earlier *kokim* tombs, partly by having sarcophagi under arcosolia at the sides of the chambers, instead of *kokim;* partly by the large porches with rock-cut pillars supporting their roofs. The capitals of the pillars have volutes resembling those of the Ionic order, but the attached pilasters at the corners of the porch are generally of the Doric order. The rock inside the porch (which measures twenty feet to thirty feet in width, by about ten feet in depth) is often cut in imitation of drafted masonry. Sunk places, apparently for metal tablets with inscriptions, such as the Jews employed in the second century B. C., are also found, but only one inscription was recovered, being rudely painted in red, and consisting of the Greek word ΠΑΡΘΕΝΗΣ.

A rock-cut frieze generally occurs above these tombs. The most famous example is that of the tomb of Helena, north of Jerusalem, dating in the first century B. C., according to Mr. Fergusson. In this and in many other examples there are triglyphs with guttæ, and bunches of grapes between. In one case, the door-way had a design of the Greek fret round the jambs and over the lintel, and a rude representation of grapes and vine-leaves above. In many instances rosettes, wreaths, and geometrical patterns, very well executed, occur between the triglyphs.

New examples of very fine character were found by the survey party at Deir el Derb, in Samaria, and again south of Hebron.

The *loculus* tomb, with a rock-cut sarcophagus under an arch, can now be shown to have been used by the Jews, and to be later than the *kokim* tombs. Numerous transition examples of great interest have been found. In some cases, the outer or older chamber had *kokim;* the inner or newer chamber, *loculi.* The *kokim* were often destroyed in making the *loculi,* and in some cases both *loculi* and *kokim* occurred in one chamber.

The well-known rolling stone, closing the tomb door, is almost always found in connection with the *loculi.* Only two instances of *kokim* tombs with a rolling stone have been found. This agrees with its use in the Holy Sepulchre, which cannot have been of the class of the *kokim* tombs, as the angels sat at the head and at the foot of the grave. The stone is *in situ* in the tomb of Helena at Jerusalem, standing in the sloping groove in which it rolled. These stones weigh about six hundredweight, and are generally three feet in diameter. They moved like a cheese rolling on its circumference, and had to be pushed up hill to open the door.

It is worthy of notice that at Umm el 'Amed the pillars of the synagogue were one hundred and sixty inches high, their capitals eight inches high, and the bases sixteen inches. If the cubit was sixteen inches long (as may be deduced from Maimonides), the pillars were thus ten cubits high, the capitals half a cubit, the bases a cubit.

Among the great public works of the Herodian period may be noted the two fine aqueducts leading to Cæsarea, partly rock-cut and partly of earthen pipes carefully joined, resting on a concrete foundation in a masonry trough, and supported on fine round arches, with a double ring of voussoirs. Where tunnelled through the hill, these aqueducts are reached by winding stairs, cut in the rock; no doubt intended to facilitate the excavation of the tunnel in the first instance, and for drawing water in the second.

From the time of Queen Helena's pilgrimage to Jerusalem, and the building of Constantine's basilica, in 333 A. D., down to the year 636 A. D., when Palestine fell into the hands of the Caliph Omar, a large Christian population spread over the country, and numerous monasteries and churches were erected, especially in the south, where large Christian villages existed, according to St. Jerome. The architecture of this period is very distinctive in style, and the large majority of the ruins now found belong to this epoch.

We have unfortunately only two dated examples of this period in Palestine itself, though in Northern Syria Du Vogüé has examined many splendid structures of the same style, some of which are dated with exactitude. In Palestine we have Constantine's basilica, built about 333 A. D., at Bethlehem, and the fortress on Gerizim, built by Justinian in 533 A. D., round the octagonal chapel erected by Zeno in 474 A. D. In the first we find columns, with capitals of the Corinthian order, having the cross on each boss between the volutes. These support a very simple cornice, and from above the columns in the central aisle rises a clear-story, once pierced with windows. The capitals are all of one design, and the columns are uniform in dimensions and detail.

In the second example we find the whole of the exterior walls, built of drafted masonry of a peculiar kind, which is found very commonly in the walls of the early chapels and monasteries. The stones are extremely irregular in dimensions, and the courses are not always carried the whole length of the wall at one level. Very narrow courses sometimes occur near the foundations, and high courses above. The stones vary from two feet to ten feet in length, and are generally two feet to two feet six inches in height. The draft is deeper cut than that of the Herodian masonry at Jerusalem, and is extremely irregular, being sometimes six inches wide at one side of the stone, and three inches or four inches on the other. The boss of the stone is not always of rectangular form. The dressing is rude, and appears to have been executed with a pointed instrument. The boss is always dressed, and projects about two inches. This masonry was evidently quarried for the buildings in which it is now found, being adapted for its present use, and occurring also in arches and lintel stones of a size suitable to the width of the entrances beneath.

Another distinctive feature of the style is the character of the vaulting and arches. The stones are smaller than those in the walls. The keystones are very narrow, the haunch stones wide, and the intermediate voussoirs graduate in width from the one to the other.

This peculiarity is found invariably in all buildings of the period. The vaults are semicircular tunnel vaults, and groined roofs never occur, nor are pointed arches ever found.

One of the finest examples yet examined is the monastery of Deir el Kŭlah, in Samaria. The cloisters remain almost perfectly preserved, with exception of the roof. The doors have flat lintel-stones over them, upon which the cross is always cut. Sometimes elaborate geometrical designs surround it, and over one door the conventional representation of Calvary occurs beneath it. Over these lintel-stones low relieving arches occur. In one case the stones above were only hollowed out, and no structural arch existed.

The masonry of the interior is not drafted, but the outer walls, which rise against the face of the cliff, are of large drafted masonry. In the chapel a simple cornice runs round the walls, and above the small window in the apse this cornice is deflected into a semicircular arch. In this building we thus find two of the characteristic features of the architecture of the Golden Gateway reproduced, but, unfortunately, no date has yet been found in connection with the Samaritan example. The arches and vaults in this building reproduce the peculiarities above enumerated.

The heavy lintel-stones, ten feet to fifteen feet long, which were used in the Byzantine monasteries, are often the only traces left of the building, the smaller stones having been carried away by the peasantry. In one case a Greek inscription was found on a lintel, which was translated, — "This is the gate of the Lord, the righteous shall enter in."

It may be noted that the vaulting of the Single and Double Gateway passages, and of the Twin Pools, and two others of the Haram vaults, show the peculiarities of the Byzantine arching, above described.

It appears that the form of tomb used at this period was the same as that above described, used in the later Jewish times; but the Christian examples are never found in cemeteries in which *kokim* tombs occur.

At Bela, in Samaria, a tomb of this kind was found with the Greek inscription, ΕΙΣ ΘΕΟΣ ΜΟΝΟΣ, "One God only," and a date which appeared to be probably 332 A. D. In Jerusalem another example was found ornamented with large crosses in red paint, and the letters A and Ω at the heads of the graves. In the valley south of Jerusalem the same class of tomb is found with Greek inscriptions, "The monument of certain persons of Holy Sion (a Church so-called) from Rome," and again, — "The excellent monument, the tomb of Amarulph of Germany."

The fine tomb, discovered in 1876 in Galilee, the façade of which is given in a former number of the *Builder* (p. 644, *ante*), is also of this period, and with two others is close to a Byzantine church. The façade is covered with a grape-vine, cut in very hard rock, having birds in the branches. On each side of the door is an illegible Greek inscription. The interior has small attached columns, with spiral fluting and rudely-cut classic capitals. The vine is again cut on the walls, and over each sarcophagus at the back is a boss on which a cross is cut in relief. It is thus clear that the cross is as old as the tomb itself. On the side walls of the open court, before the façade, two lions are rudely represented, and two smaller animals, apparently lambs, with birds and flowers.

Careful plans, sketches, and sections of this curious monument were made by the survey party. A tomb close by has also a cross over the door flanked by two birds in relief. The town where these tombs were found is called Shefa Amr, and was the ancient Shafram, a place where the Sanhedrim sat in the second century A. D., and which was afterwards considered by the Crusaders to be the home of Zebedee. The ancient Jewish cemetery is at some distance from the church and from the Christian tombs.

To this period also several fine structural tombs throughout Palestine probably belong, having domed roofs springing from pendentives. — *The Builder.*

L'ÉCOLE DES BEAUX-ARTS.

L'École nationale et spéciale des Beaux-Arts at Paris, founded in 1648 for the teaching of architecture, sculpture, painting, engraving, and gem-cutting, is, as its name indicates, a public institution, being under the supervision of the Director of the Fine Arts. The school is open to all without distinctions of nationality; and ranking as it does, especially in the department of architecture, as probably the best institution of its kind anywhere, it attracts to itself students from nearly every country of the world. The applicant for admission to the above department is required to have two letters of recommendation, one from the minister of his country in Paris, and the other from the professor in whose *atelier* he is working or expects to work. The inscription as candidate for admission takes place a few days before the examinations, which occur twice a year, in March and July. The aspirants are first tested in cast-drawing, being allowed twelve hours in which to make a shaded drawing from a plaster cast of an antique ornament. The requirements are very decided in this respect, and while a finely finished drawing is not called for, still the student is required to show that he has the ability to make a correct outline, and can faithfully express the lights and shades. The examination in architectural designing and drawing which follows, takes place *en loge*, as it is termed, each aspirant being placed in a stall by himself, with the programme proposed before him, and not allowed to leave the room until the task is completed. As twelve hours is allotted for this also, from 9 A. M. to 9 P. M., the student is expected to bring a lunch with him. The supposition on the part of the authorities probably is that the applicants shall keep reasonably quiet, and work out their ideas independently; but since the average French student is a being mortally opposed to quiet or close application, and as the *loges* are separated only by thin board partitions, and are entirely open towards a central passage, the conditions are often not the most favorable for thoughtful work. The projects given vary, of course, each year. The past July it was a "*piscine dans un établissement thermal.*" The drawings are required to be in line only, the plan to a scale of four millimeters per meter, the elevation double. The design is expected to be strictly classic, with one of the orders used in correct proportions, Vignola being assumed as standard. Many of the drawings sent in are finished in color, but that is entirely optional, the requirements calling more for a sketch than a finished drawing.

At this point in the examinations, judgment is passed upon the work already accomplished, and only those whose drawings are satisfactory are allowed to try the examinations in mathematics and history. These consist in mathematics of first a written examination *en loge*, followed by an oral examination by the professor in charge. The topics embraced are, arithmetic and its applications, algebra as far as equations of the second degree, and geometry, plane and solid, such as is usually taught in the high schools of the United States. Also an amount of descriptive geometry about equal to what is contained in the first seventeen problems of Church's treatise on the subject. In history, the examination is altogether written. Four questions are given, two from ancient history and two from modern, and the student is required to answer but one from each. The questions are quite general, only the leading dates being called for. The examinations are of course all in French, except the history, which may be written in English, if so preferred.

This is all that is required to enter the department of architecture. As will be seen, the examinations are not difficult; but the school evidently proceeds upon the principle, that what a man knows at all, he should know well, for the marking is so close that a large number of the aspirants always fail to pass. This year, out of ninety-four who were first inscribed, but thirty have been admitted, forty-five dropping out on drawing and designing alone.

The system of instruction employed keeps the *ateliers*, to a certain extent, distinct from the school proper. To enter one of these it is necessary only that the applicant be satisfactory to the professor in charge, he being the sole judge of the requisite qualifications. The instruction in the school is entirely gratuitous, no fees of any kind being required. On entering the *atelier*, however, a sum of thirty to forty francs is paid for the use of boards and T-squares, and a fee of five francs per month is called for to meet incidental expenses.

C. H. B.

[During the past three years we have had occasion to explain at length to more than one questioner what is the course of instruction in architecture at the École des Beaux-Arts and what preparations are necessary to ensure passing the entrance examinations. Six months ago, our correspondent tells us he was unable to obtain the information he now sends us, and as there may be others who desire to be better informed on the subject it seems well to supplement the information contained in the foregoing communication by a few more details.

Of the two letters of recommendation mentioned, one must come from the *patron* of the *atelier* where the student is to study and work. In the choice of an *atelier*, one is usually influenced by the advice of friends who have studied in one or another of them. There are at the École itself only three *ateliers*, under the charge of MM. André, Laisné, and Guadet; these are generally well filled, because, being in the school buildings, they are more accessible to the library and collections, and because a certain prestige attaches to them as being under the immediate patronage of Government, partly, too, because they are what are known as *ateliers à mention*, that is, *ateliers* whose pupils are sometimes thought to obtain an undue share of recompenses. These *ateliers* are not much affected by Americans, possibly because in them hazing is practised with some severity. Besides these, the legitimate workrooms, there are eight *ateliers externes* which have a semi-official but well-recognized connection with the École. These are under the charge of M. Coquart, M. Daumet, MM. Ginain-Lebas, M. Guénepin, MM. Moyau-Joyau, MM. Pascal-Questel, M. Train, and M. Vaudremer, men of high standing in the profession, and without exception, we believe, men who have obtained the *Prix de Rome*.

Once admitted to an *atelier* the first thing to do is to obtain a reasonable control of the language, and the next is to brush up one's knowledge of mathematics. The best way of doing this is to attend the lectures of M. Clopet, 10 Rue des Beaux-Arts, who has a semi official connection with the École, and who for the absurd price of ten francs per month goes over the necessary ground in three or four months with the utmost thoroughness. If the aspirant is well grounded in mathematics this course is not necessary, for since the same terms are constantly being repeated in mathematical demonstrations a few private lessons is all that is really needed, but the lectures are admirable training in that they accustom the aspirant to the sound of his own bungling French.

From the secretary's office can be obtained a printed programme or syllabus which contains a list of the topics which will form the basis of the examination. It is well to bear in mind that this syllabus is adhered to strictly; for the authorities have adopted wisely as their standard a minimum of information known with precision rather than a superficial knowledge of a wider range of subjects. Yet, simple as the requirements are, it is no uncommon thing for a Frenchman to fail at four or five successive examinations, a fact which is due probably to the want of even ordinary education among Frenchmen outside of Paris. A foreigner on the other hand rarely gets turned back more than once.

In order to prepare, if preparation is necessary, for the examination in drawing from the "round," it is well to attend some of the free evening drawing schools, where the aspirant should make a point of practising with the pencil and crayon point, for the examiners give to a mediocre drawing in pencil a higher mark than to a good drawing finished with the *estompe*. In the examination in architectural design it is safest to avoid seeking anything *bizarre*; accurate mediocrity will answer every purpose, and the time that can be saved by not seeking for striking combinations of plan or elevation can be to good purpose spent on the rendering of the drawings.

The inspection of the free hand and architectural drawings made at this period usually eliminates more than half of the applicants, while the examinations in mathematics and history, which follow after the lapse of a few days, are apt to eliminate fifty per cent of the remainder. Eds. American Architect.]

BLACK MORTAR.

Westerly, R. I.

To the Editor of the American Architect:

Dear Sir, — In reference to the query about "black mortar" in the *Architect* of September 14, I would say that we use here a preparation called mortar black, put up by the Walpole Color Company, of Walpole, Mass. The preparation is "patented," and, not having analyzed it, I am unable to state what it is composed of. The color is a fresh, rich black, which holds for years. Doubtless the gentleman can obtain the information desired by addressing the Walpole Color Company, Walpole, Mass.

Very truly yours, J. Irving Maxson.

THE OWNERSHIP OF DRAWINGS.

New York, September, 1878.

To the Editor of the American Architect:

Dear Sir, — We believe it has been legally decided that all plans and working drawings furnished by an architect for the erection of any building belong to him, and not to his client. Will you be kind enough to inform us of any such decisions, either by letter or through the columns of the *American Architect?*

Yours very respectfully, Thom & Wilson.

NOTES AND CLIPPINGS.

The Washington Monument Commission. — There was a meeting of the joint commission on the Washington monument September 25 at the White House. There were present President Hayes, Mr. W. W. Corcoran, Col. Casey, General Wright, assistant to the chief of engineers, U. S. A., Architect Hill, and Architect Clarke. The plan for strengthening the foundation of the monument, prepared by Col. Casey, was read and discussed. It was not formerly adopted, though it was generally approved. The plan, which proposes to strengthen the foundation by underpinning and lateral extensions of concrete would, to be carried out, necessitate an expense of more than the $36,000 appropriated for the work. The question was raised whether, under the act, any of the money appropriation made for the completion of the monument proper can be expended on the base. It was decided to refer the question to the Attorney General for an opinion on the subject. Another meeting will be held next Saturday, when final action on Col. Casey's report is expected, and the work of the commission will be mapped out.

Kerosene Reservoirs. — The greater part of the petroleum and mineral oils intended for the consumption of Paris is stored in the docks of St. Ouen, where floating reservoirs, each of the approximate capacity of one hundred barrels, have long been in existence. The constant increase in the consumption has made it necessary to enlarge the storage accommodation; a large number of reservoirs have recently been added, of a total capacity of about nine hundred thousand gallons, and the prospect is that more room will soon be required.

These reservoirs are of plate iron, twenty-eight feet in diameter by some seventeen feet in height to the spring of the arched cover; the thickness of the bottom and of the lowest ring of plates is one quarter of an inch, and of the top-rising three sixteenths of an inch, while the thickness of the cover is only one tenth of an inch. They are filled through openings at the top, three feet three inches in diameter, and, being all in one line, are connected by a bridge or footing, which extends from one extremity to the other, a distance of four hundred and twenty feet. They rest upon a platform of wood, laid upon a rubble foundation. The petroleum, when brought on shore from the vessels in the river, is at first deposited in the floating reservoirs, which are partly submerged; from these it is pumped into the reservoirs, and thence drawn off through the pipes into barrels. The total weight of these wrought-iron reservoirs, fourteen in number, is one hundred and fifty-one tons.

Artificial Stone. — A new stone is now being introduced in Wilmington by the patentee, Mr. George Richardson. The two ingredients are sand and cement. The sand used is that which is found along the Delaware, and that which is used in Chester comes from Pennsgrove. The cement used is the ordinary hydraulic cement. The cement rock is submitted to the process of burning in order to expel the carbonic acid gas, which puts it in a condition for grinding, after which it is ready for use. The sand and cement are mixed in fixed proportions for a mortar of a dark gray color. This is then placed in moulds whose size and shape accord with the article to be produced. These moulds are of wood for hitching posts, window caps, window sills, door-sills, etc., but for draining pipes are of cast iron. The substance when placed in the moulds is in a soft condition and undergoes a thorough packing. It is then removed and is ready for the hardening process. The articles are placed in an air-tight chamber ten feet square, and carbonic acid gas is introduced to harden them. The gas is generated by burning charcoal in a common coal stove, and in passing into the chamber, first goes through cool water to reduce the temperature, as it would otherwise injure the cement. This gas is so rapidly absorbed as to keep up a draft from the stove to the chamber, and as long as the absorption goes on the stone continues to harden. After two or three days the articles are immersed in a tank of water immediately under the floor of the apartment, which makes them harder. They are then ready for all uses that they are intended for.

Revere Memorial. — A tablet commemorating the hanging of the lantern in the old North Church, Boston, April 18, 1775, by Paul Revere, has been put up in that church.

Strange Statements about Yellow Fever. — A singular fact is that the first death from yellow fever occurred on the 21st of July, on a street well paved and in a neighborhood of the wealthy — a fact the more wonderful when it is remembered that New Orleans has very few paved streets, and, further, that by far the largest number of deaths are on the streets well paved and near the Mississippi River, while out in the rear portion, where the draining canals are reeking with filth, where dead dogs and cats are floating around, in a green scum nearly two inches thick, with the hot sun pouring down upon them at a temperature of about ninety degrees Fahrenheit, there has not been a single death from yellow fever. Again, in the Third district of this city, where there were over five hundred deaths from the yellow fever in 1870, not a death has occurred so far, and the same may be said of the Fifth district, situated on the opposite side of the river, surrounded by swamps and very filthy. — *N. Y. Herald.*

Bronze Statue. — In front of the store of Mason & Co., No. 1202 Chestnut Street, Philadelphia, there has been placed a bronze statue of the late William Woodward, of Cincinnati. The figure, which is of colossal size, was modelled by Mr. J. A. Bailly, and was cast at the bronze foundry of Bureau Bros. & Heaton, No. 909 North Ninth Street. The statue will be removed in a few days to Cincinnati, where it will be unveiled about the first of October.

Roman Remains in England. — Walbrook, England, has, within the last quarter of a century, been the scene of many interesting discoveries of Roman remains. To these has now to be added a "find" which has taken place at No. 9 in that thoroughfare. The premises are about to be rebuilt and enlarged: excavations have been made during the past few days at the rear, and the workmen have come upon several objects of interest to the archæologist. One of these is a well, stated to be of Roman origin. It is about 22 feet in depth, the upper portion of the circle being constructed with Kentish rubble, and the lower, to the extent of about 10 feet, being lined with chalk, without cement or other material between the courses. The water is said to have been very pure when the well was first opened by the workmen. A Roman jug, very light and curious, the lower portion of a wine or water cooler (the latter made of Purbeck stone), some pieces of tesselated pavement, etc., were also discovered.

The "Old Bailey." — Newgate will not fall alone. The Old Bailey has been condemned, and a new block of buildings will take its place. Within the dock to be removed have stood Jack Sheppard, Jonathan Wild, and the poet Savage, whose biography was one of the best that Dr. Johnson wrote. It was in the Old Bailey that the regicides had their trial, but that portion of the original structure has disappeared. It is many and curious forms of law that the Old Bailey has seen come and go. "The hangman no longer," says the *Echo*, "sits down by the side of a prisoner halter in hand, as he did in 1669; and the awful warrants are no longer issued in shoals, as formerly, or in the 'good old days.'"

New York Pavements. — There are 328 miles of paved streets in New York south of the Harlem River, which may be classified as follows: Macadam, 22 miles; granite, 26 miles; trap-block, 180 miles; wood, 14 miles; cobble, 83 miles; concrete, asphalt, etc., 3 miles. Of this nearly 150 miles consist of rotten wood, dilapidated cobble, worn-out and shapeless stone blocks.

The Chinese Canal. — The Grand Canal of China is likely to share the fate of the Great Wall. This waterway was constructed by Kublai-Khan and his successors of the Yuen race, and is 600 miles in length. There are 10,000 flat-bottomed boats on this canal, and these are used in the transportation of grain. The *Echo* states that this great waterway is an enormous "white elephant," as it costs an enormous amount every year for repairs, the appropriations there, as elsewhere, not being entirely devoted to the purpose for which they are meant. Junks are delayed every month while channels are being dug for their passage. This year, for the first time since the construction of the canal, the grain from Nankin, with the consent of the Government, has been forwarded by sea, and this fact has impelled the Pekin authorities to consider the expediency of abandoning the canal as a commercial highway.

Optical Illusion caused by Intense Heat and Light. — Dr. Joshua Thorne narrates in the *Kansas City Review* the following facts which lately came under his observation at the rolling mills in that city: —

While looking at the eclipse of the sun July 29, I handed the glass to one of the mill "heaters." He at once told me he could see as well with the naked eye as with the smoked glass. I then tried another "heater," and he at once repeated the same statement. I then went to the rolling mill and tested every "heater," at his furnace. They all told the same story. I hunted up every "heater" in the town except two (who were not found), over twenty in all, and every one declared he could see the phenomenon, and all its phases, as well or better with the eye unshaded. I took the precaution to test each one by himself, told him nothing of what I expected, or of the testimony of others. I made no suggestions to any of them, but let each tell his own story. All told the same tale; one peculiarity all agreed to — the image in the glass was upside down from what they saw with the naked eye. They would describe many peculiarities of color which could not be seen by others with the aid of the glass. It should be remembered that the "heater" has to see his iron in the furnace while it is enveloped in a flame whose intense glare prevents unskilled eyes from seeing anything, an education of the eye peculiar to this class of workers, as no other class of workmen is exposed to the same degree of heat or light. In accordance with your request, I repeated the experiment of Ericsson, and submitted a spherical piece of iron, eight inches in diameter, to a heat of over 3,000° Fahr. It was carried to an almost melting point, withdrawn from the flame and placed on a stand. It had the appearance of a disk at all distances tried, up to over 100 feet. As seen by the chief engineer of the mill, myself and others, it was perfectly flat. The convexity did not appear; it was, while in this state, to all appearance no longer a sphere, but a disk. As the iron cooled off it resumed its original appearance of a sphere.